Keeyask Generation Project

Aquatic Effects Monitoring Plan

Juvenile Lake Sturgeon Population Report

AEMP-2017-06

KEEYASK

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KEEYASK GENERATION PROJECT

AQUATIC EFFECTS MONITORING PLAN

REPORT #AEMP-2017-06

JUVENILE LAKE STURGEON POPULATION MONITORING, FALL 2016: YEAR 3 CONSTRUCTION

Prepared for

Manitoba Hydro

By

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SUMMARY

Background

The Keeyask Hydropower Limited Partnership (KHLP) was required to prepare a plan to monitor the effects of construction and operation of the Keeyask Generating Station (GS) on the environment. Besides 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. They were chosen because they are culturally important to local people, the local populations have been previously impacted, and construction and operation of the GS will change or negatively impact important habitat. The plan to monitor the impacts of GS construction and operation on sturgeon includes several types of studies:

- 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).

The mitigation and offsetting plan for Lake Sturgeon included a commitment to a long term stocking program. This plan addressed the loss of spawning habitat at Gull Rapids during the construction and initial years of operation (*i.e.*, before the constructed spawning habitat was fully effective) by releasing young sturgeon into Stephens Lake. Stocking will also support the recovery of the sturgeon populations in Gull Lake, Stephens Lake and the Upper Split Lake Area. Stocking began in 2014 and its effectiveness is assessed through juvenile population monitoring.

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 report presents results of juvenile Lake Sturgeon population monitoring conducted during fall 2016. Data from juvenile populations in the study area have been collected intermittently since 2008 and the juvenile population monitoring study set out in the AEMP was conducted for the first time in 2014. The plan is to conduct juvenile population monitoring annually until 2044. Each year, sampling will be conducted using the same capture methods, so that results can be compared between different years and trends can be seen.

The juvenile Lake Sturgeon population monitoring is being done to answer several questions:

Does recruitment of wild sturgeon occur upstream and/or downstream of the GS during construction?

This question is important because if no young sturgeon are born during the six to seven year construction period, then in the future fewer adult sturgeon will be reproducing.

Is there a change in condition factor and growth of juvenile sturgeon during construction?

This question is important because if sturgeon become fatter or skinnier than they used to be, then something is changing in their environment. If the condition of juveniles decreases, it can also mean that stocking is adding too many fish to the environment and they cannot find enough food. In that case, the stocking plan will be adjusted.

What is the survival rate of stocked sturgeon?

This question is important because if the survival rate is high then the number of fish stocked may be reduced. If the survival rate is low, then the stocking plan would be adjusted (*e.g.*, may change time or location of release).

What is the proportion of hatchery-reared to wild recruits within a birth year (i.e., how successful is the stocking program)?

The answer to this question will also tell us about the effectiveness of the stocking program.

What was done?

Sampling was done in the Upper Split Lake Area (including the Burntwood River, downstream of the Kelsey GS, and Split Lake), the future Keeyask reservoir (the Nelson River between Clark Lake and Gull Rapids), and Stephens Lake in the fall of 2016. Gill nets were used to catch juvenile sturgeon, defined as those that are less than 800 mm in length. The gill nets were set in deep water habitats preferred by juveniles. When a fish was caught it was measured and weighed. If the fish was not already tagged, then two different tags were applied; an external (Floy®) tag and a small, internal (PIT) tag to make sure the fish is identifiable if one tag is lost. If the captured fish had already been tagged, then the tag numbers were recorded before the fish was released. Tagging and recapturing fish makes it possible to determine how much a fish

grew or the distance they moved. An ageing structure (a small piece of fin) was collected to determine the year that the fish was born.

What was found?

In the Upper Split Lake Area, 40 sturgeon of many different sizes and ages were caught, with many born in 2010, 2011, and 2013. Two Lake Sturgeon born in 2016 (called young-of-the-year [YOY]) were captured in the Burntwood River. The presence of a number of different year classes shows that sturgeon have successfully reproduced over many years including in 2016. Three sturgeon caught in previous years were recaptured in the Upper Split Lake Area in 2016: one in the Burntwood River, one in the area downstream of the Kelsey GS, and one in Split Lake. The three fish moved between 0.96 and 10.32 km from where they were first tagged. One fish that was raised in the Grand Rapids hatchery and released as a one-year-old in 2014 was caught in the Burntwood River.

In Gull Lake, a total of 96 Lake Sturgeon were caught in 2016. Fish born in 2008 continued to be prominent in the catch although their numbers were lower than in past years. Sturgeon born in 2006, 2013, and 2014 were also caught quite frequently. Five YOY sturgeon were caught in Gull Lake showing that sturgeon successfully reproduced in 2016 or that some larvae stocked during spring 2016 survived. There were 11 sturgeon captured in 2016 that had existing tags, seven of these were hatchery reared sturgeon released as PIT tagged yearlings in 2015. These fish made up half of the 2014 year class. Hatchery fish were caught as far as 7.3 km downstream and 5.7 km upstream of their release location.

In Stephens Lake, a total of 66 Lake Sturgeon were caught in 2016. Similar to Gull Lake, the largest number of sturgeon caught in Stephens Lake were born in 2008. Fish born in 2014 and 2015 were also common in the catch. No YOY sturgeon were captured in Stephens Lake in 2016. There were 14 sturgeon captured in 2016 that had existing tags, including five hatchery-reared sturgeon. One of the hatchery-reared sturgeon was released as a yearling in Gull Lake in 2015 and was captured 14.1 km downstream in Stephens Lake, having passed through Gull Rapids. The remaining four were released as yearlings in Stephens Lake in 2015. Over 60% of the 2014 year class in Stephens Lake was made up of hatchery raised fish released as one-year-old fish.

What does it mean?

The capture of YOY sturgeon in 2016 shows that, like in 2015, recruitment is occurring during construction of the GS. Although no YOY were caught in Stephens Lake, recruitment cannot be ruled out because the small size of YOY sturgeon often prevents them from being captured in gill nets.

There were some changes in growth rate and condition among fish caught before construction and fish caught during construction, however, there was no consistent pattern and the differences observed are likely not biologically significant.

Early results show that at least some of the stocked sturgeon are surviving in the wild and that they are growing after release.

What will be done next?

Monitoring will continue each fall until 2044. Further monitoring will show whether construction is affecting the growth of juveniles in Gull and Stephens lakes and whether sturgeon continue to reproduce. As more data are collected, the survival and growth of stocked fish will be determined.

ACKNOWLEDGEMENTS

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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) during the construction and operational phases of the Project was developed, detailing the monitoring activities 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).

Juvenile population monitoring is a key component of the overall Lake Sturgeon monitoring program. The Project is predicted to affect sturgeon recruitment by destroying existing spawning habitat at Gull Rapids (which will be replaced with constructed habitat) (Map 2) and altering spawning habitat at Birthday Rapids. Stocking aims to assist the recovery of sturgeon populations in the Upper Split Lake Area (*i.e.*, the Burntwood River and the Nelson River between the Kelsey GS and Split Lake) and in Gull and Stephens lakes near the Project site

and is a key component of the offsetting plan. Results of juvenile population monitoring will determine the impact of the loss of spawning habitat earlier than would be possible using adult population monitoring data, allowing timely adaptive management and mitigation, if required. Results of juvenile population monitoring will also assist in assessing the effectiveness of stocking and identify whether changes to the stocking plan are required. Data collected during juvenile population monitoring will be used to measure cohort strength, identify changes in condition factor, determine whether natural reproduction is occurring, determine the need for young-of-the-year (YOY) habitat creation and determine whether stocked fish are surviving and growing.

Juvenile Lake Sturgeon studies have been conducted in the Burntwood River, Gull Lake and Stephens Lake since 2008. These studies have increased the understanding of YOY and juvenile abundance, habitat use, condition, growth, year-class strength and factors influencing year-class strength in the Upper Split Lake Area, in the future Keeyask reservoir and in Stephens Lake (MacDonald 2009; Michaluk and MacDonald 2010; Henderson *et al.* 2011; Henderson and Pisiak 2012; Henderson *et al.* 2013; Henderson *et al.* 2015; Burnett *et al.* 2016). Results from the Burntwood River show that moderate quantities of juvenile Lake Sturgeon are spread amongst multiple cohorts, indicating that recruitment has occurred fairly consistently in the Burntwood River over the previous 10 years (Henderson and Pisiak 2012; Henderson *et al.* 2013; Henderson *et al.* 2015; Burnett *et al.* 2016). Conversely, in both Gull and Stephens lakes, the cohort-frequency distribution of juvenile catches has consistently been dominated by a single cohort produced in 2008 (Henderson *et al.* 2011; Henderson and Pisiak 2012; Henderson *et al.* 2013; Henderson *et al.* 2015; Burnett *et al.* 2016). It has also been shown that the growth of Burntwood River Lake Sturgeon is slower than conspecifics captured in Gull and Stephens lakes (Henderson *et al.* 2013; Henderson *et al.* 2015; Burnett *et al.* 2016). Juvenile Lake Sturgeon studies below the Kelsey GS and in Split Lake were only started in 2015, as a result more data need to be gathered before conclusions can be drawn about the juvenile populations in these areas.

Lake Sturgeon stocking in the Keeyask study area is being conducted using wild caught broodstock from the Burntwood River and from the Nelson River between Birthday Rapids and Gull Rapids. To maintain the genetic structure of each population, progeny from each broodstock location are released back into their respective rivers (*i.e.*, Burntwood River progeny released back into the Burntwood River and Nelson River progeny released back to the Nelson River). Stocking occurred for the first time in 2014 and has occurred annually since with a variety of lifestages (larvae, fingerlings, yearlings) being released (Table 1; Klassen *et al.* 2017).

This report presents results from the 2016 juvenile population monitoring conducted in the Upper Split Lake Area, Gull Lake, and Stephens Lake. Juvenile monitoring is being conducted to address the following key questions relevant during the construction period, as described in the AEMP:

- Does recruitment of wild sturgeon occur upstream and/or downstream of the GS during construction?

- Is there a biologically meaningful (and statistically significant) change in condition factor and growth of juvenile sturgeon during construction?
- What is the survival rate of stocked sturgeon?
- What is the proportion of hatchery-reared to wild recruits within a cohort (*i.e.*, how successful is the stocking program)?

Juvenile population monitoring data will be collected annually until 2044.

2.0 STUDY SETTING

Juvenile population monitoring in 2016 was conducted at three locations: 1) the Upper Split Lake Area, 2) the future Keeyask reservoir, and 3) Stephens Lake.

The Burntwood River flows in a south-easterly direction from First Rapids for approximately 35 km prior to emptying into the western arm of Split Lake (Map 1). It is unknown if First Rapids represents a natural barrier to upstream fish passage, however, it is assumed to be under high flow conditions. Hard substrates predominate in the main channel, while loose, fine sediments and associated macrophyte growth occur in many off-current areas.

The Kelsey GS is located on the upper Nelson River, approximately 90 km upstream of Gull Rapids (Maps 1 and 3). Kelsey GS was completed in 1961 and was the first hydroelectric station built on the Nelson River. Downstream of the GS there is an approximately 5 km long reach of the Nelson River, characterized by predominantly fast moving water with rocky shoreline and substrate, after which the Nelson River splits into two channels around a large island. Each channel contains a set of rapids: the Anipitapiskow Rapids (~7 km north of the GS on the north channel) and Sakitowak Rapids (~10.0 km northeast of the GS on the south channel). Both channels empty into Split Lake.

Split Lake is immediately downstream of the Kelsey GS at the confluence of the Burntwood and Nelson rivers. Due to the large inflows from the Nelson and Burntwood rivers, the lake has detectable current in several locations (Maps 1 and 3). Split Lake has maximum and mean depths of 28.0 m and 3.9 m, respectively, at a water surface elevation of 167.0 m above sea level (ASL; Lawrence *et al.* 1999). The surface area of Split Lake was determined to be 26,100 ha (excluding islands), with a total shoreline length, including islands, of 940.0 km (Lawrence *et al.* 1999). The numerous islands in Split Lake represent 411.6 km of the total shoreline.

Birthday Rapids is located approximately 10 km downstream of Clark Lake and 30 km upstream of Gull Rapids (Map 1). 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 4), 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.

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 (Map 1). 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. 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 2) 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

A standardized sampling methodology has been developed for sampling juvenile sturgeon in Boreal Shield rivers using data sets collected from several populations in the Hudson Bay drainage basin (McDougall *et al.* 2014). This standardized methodology (described below) is being used during Keeyask monitoring to enable comparisons of cohort strength, abundance, growth and condition among years as well as with other sturgeon populations.

Gillnetting was conducted in the Upper Split Lake Area, the future Keeyask reservoir, and the upper 10 km of Stephens Lake. Three locations were sampled in the Upper Split Lake Area: 1) the Burntwood River between First Rapids and Split Lake; 2) the Nelson River between the Kelsey GS and Split Lake; and 3) Split Lake. Gill nets were composed of five panels of: 1, 2, 3, 5, and 6" stretched mesh (25, 51, 76, 127, and 152 mm). Each mesh panel was 25 yards (yd) (22.9 m) long and 2.7 yd (2.5 m) deep. Mesh sizes were staggered in the order of 1, 5, 2, 6, and 3" to better capture small and large juveniles across the length of each gang. These gill nets have been used to capture juvenile Lake Sturgeon in the Keeyask study area since 2008.

Gill nets were set in deep water habitats (average depth = 13.6 m) since YOY and juvenile Lake Sturgeon have been found to prefer these areas in the Winnipeg, Burntwood, and Nelson rivers (Barth *et al.* 2009; Michaluk and MacDonald 2010; McDougall *et al.* 2013; Henderson *et al.* 2014). Each gillnet set was given a unique identification number, and net locations were recorded using a Garmin Etrex GPS receiver (Garmin International Inc., Olathe, KS). Water depth at each end of the net was measured using a PiranhaMax Series 150 Portable Sonar (Humminbird, Eufaula, AL). 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 Gull and Stephens lakes. These temperature loggers were previously deployed on acoustic receivers as part of the fish movement studies in these areas. The orientation of each gill net was dependent on water velocity. In low (0.20–0.49 m/s) or moderate (0.50–1.49 m/s) water velocities, nets were set parallel to flow, and in standing (0.00–0.19 m/s) velocities set perpendicular to flow. Gill nets were checked approximately every 24 hours, weather permitting. For comparability among years, similar gillnetting locations were used in 2014, 2015, and 2016. However, suitable gillnetting sites change between years depending on water levels and flows.

3.2 BIOLOGICAL SAMPLING

All fish captured were counted by species and location. Lake Sturgeon were measured for fork length (FL), total length (±1 mm), and weight (±5 g using a digital scale, or nearest 25 g for fish greater than 4,000 g).

For age analysis, the first fin ray of the left pectoral fin was removed immediately adjacent to the articulation from each Lake Sturgeon captured for the first time (measuring less than 800 mm FL). In cases where Lake Sturgeon had been previously aged, the right pectoral fin was collected. If fish appeared to have been aged twice before or had deformed pectoral fins, ageing structures were not collected. All collected fin rays were placed in individually numbered envelopes, air dried, and brought back to the North/South Consultants Inc. laboratory for ageing (Section 3.4).

Small fin clips (1–2 cm^2) from the left pelvic fin were also removed from each Lake Sturgeon and preserved in 95% Biological Grade Ethanol for genetic analysis.

3.3 TAGGING

Lake Sturgeon greater than 300 mm FL were marked with individually numbered external Floy-GD-94 T-bar (FT) anchor tags (Floy-tag Inc., Seattle, WA). Floy-tags were inserted into the base of the dorsal fin using a Dennison Mark II tagging gun (Avery Dennison Corporation, Pasadena, CA).

Uniquely numbered Passive Integrated Transponder (PIT) tags from Oregon RFID (Oregon RFID Ltd., Portland, Oregon) were also used to mark Lake Sturgeon. Those measuring greater than 250 mm FL received 12 mm HDX tags (12.0 mm x 2.12 mm; 0.1 g) and those measuring less than 250 mm FL (smallest fish tagged was 98 mm) received 8 mm FDX-B tags (8.0 mm x 1.4 mm; 0.027 g). Each Lake Sturgeon was scanned for an existing PIT tag using an Agrident APR 350 Reader (Agrident Ltd. Steinkippenstrasse, Germany). For each untagged fish, a PIT tag was injected under the third dorsal scute using an Oregon RFID tag injector needle, dipped in Polysporin® to minimize the risk of infection (Photos 1–3). Tags were injected parallel to the horizontal axis of the fish, into muscle tissue (not the body cavity). Following implantation or upon recapture, the tag data were logged, and the last six digits of the PIT tag manually recorded. Injector needles were sterilized between uses in boiling water.

3.4 AGEING ANALYSIS

Lake Sturgeon fin rays were hardened in an epoxy resin (Cold Cure) and two 0.7 mm fin sections were cut distally within 5 mm of the articulation using a Struers Minitom (Struers Inc. Cleveland, Ohio) low speed sectioning saw. Fin sections were mounted on glass slides using

Cytoseal-60 (Thermo Scientific, Waltham, Massachusetts) and viewed at five times magnification under a compound microscope. Annuli (growth rings) were counted by three experienced readers (independently), without prior knowledge of fish length or weight, or ages assigned by other readers. If readers assigned different ages to a fish, either the modal age or the median age was chosen. The rate of three-reader agreement was calculated in percent (%). Examples of Lake Sturgeon ageing structures are provided in Appendix 3.

3.5 DATA ANALYSIS

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

To better describe sampling locations, relative abundance (CPUE), and fish movements, each sampling area was divided into distinct geographical zones (see Maps 3–5).

Mean FL (mm), weight (g), and condition factor (K) were calculated for all Lake Sturgeon by location. Condition factor was calculated 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).

To determine if growth and condition of juvenile sturgeon were affected by construction, mean length-at-age and mean condition factor-at-age were compared using Mann-Whitney U-Tests among fish captured pre-project (*i.e.*, 2008–2013) and those captured during construction (*i.e.*, 2014–2016) (statistical comparisons only conducted where sample sizes were greater than eight individuals). Condition was compared by age-class and the significance level was set at 0.05 (5%).

Length-frequency distributions were plotted in 50 mm length class intervals (*e.g.*, 300–349 mm) and length-weight regression equations were derived using least squares analysis on logarithmic transformations of fork lengths and weights according to the following relationship:

$$\ln(W) = \ln(a) + \ln(L)*b$$

Where:

W = weight (g);

L = fork length (mm);

a = Y-intercept;

b = slope of the regression line; and

were presented as:

$W = a(L)^b$

Cohort frequency distributions were plotted for each location.

Gillnetting hours (*i.e.*, effort) was calculated as the number of sampling hours per 100 m of net set using the following equation:

Effort (hours) = set duration × (net length/100 m)

Catch-per-unit-effort (CPUE) was calculated and expressed as the number of fish captured in 100 m of net per 24-h period using the following formula:

CPUE = ∑ # Lake Sturgeon / ∑ Effort × 24 h

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

CPUE was calculated by geographical zone for each study location and study year.

4.0 RESULTS

4.1 UPPER SPLIT LAKE AREA

4.1.1 BURNTWOOD RIVER

Five fish species (n = 84) were captured at 24 sites in the Burntwood River from September 7-18, 2016 (Tables 2–4; Map 3). Lake Sturgeon (n = 26; 31.0%) were the second most abundant species captured (Table 4). Gill net site data and biological and tagging information for all Lake Sturgeon captured are provided in Appendices A1-1 and A2-1. Water temperature of the Burntwood River decreased from 16.0°C to 14.0°C over the course of the study (Appendix A1-1).

Twenty-six Lake Sturgeon were captured in 594.1 gillnet hours, producing an overall CPUE of 1.05 LKST/100 m net/24 h (Table 5). Gill nets were set in all three zones of the Burntwood River below First Rapids (Map 3). CPUE values by zone were as follows:

- 0.56 LKST/100 m net/24 h in Zone BWR-A (n = 8 sites);
- 0.73 LKST/100 m net/24 h in Zone BWR-B (n = 6 sites); and
- 1.70 LKST/100 m net/24 h in Zone BWR-C (n = 10 sites) (Table 5).

Overall CPUE values for the Burntwood River catch since 2011 are presented in Table 6.

4.1.1.1 YEAR-CLASS STRENGTH

Ageing structures were collected from 24 Lake Sturgeon (structures were not collected from two fish, one YOY that measured 98 mm FL and one adult that measured 836 mm FL). Three-reader agreement for age assignment was 88% (*i.e.*, 21 out of 24). The modal age was used for three fish (age 6, 13, and 17), aged one year lower or higher by a single reader. Aged Lake Sturgeon ranged from 0 to 17 years old, with the 2013 cohort (age 3) making up the largest proportion (n = 8; 33.3%) of the catch. The next most abundant cohorts were the 2011 (age 5) and 2010 (age 6), accounting for 20.8% (n = 5) and 16.7% (n = 4) of the aged Lake Sturgeon, respectively. Two YOY Lake Sturgeon were captured in zone BWR-C (Map 3). Cohort frequency distributions for all zones sampled in the Burntwood River in 2016 are presented in Figure 1. Several cohorts (2000–2002, 2005–2007, 2009, 2012, and 2015) were not present in the catch in 2016. Cohort frequencies for all juvenile Lake Sturgeon captured in the Upper Split Lake Area from 2011 to 2016 are presented in Table 7. Every cohort since 1998 has been present in the catch, except for the 1998 and 2009 cohorts, which have not been captured since studies began.

4.1.1.2 GROWTH AND CONDITION

Captured Lake Sturgeon had a:

- Mean FL of 421 mm (n = 26; StDev = 159 mm; range 98–836 mm);
- Mean weight of 737 g (n = 24; StDev = 821 g; range 110–3,760 g); and
- Mean condition factor of 0.63 (n = 24; StDev = 0.07; range 0.50–0.77) (Table 8).

Lake Sturgeon in the 300–349 mm FL interval were captured most frequently (n = 7) representing 26.9% of the total catch (Figure 4). The length-weight relationship for Lake Sturgeon captured in the Burntwood River during fall 2016 was similar to those captured in other areas and is presented in Figure 5.

There were not enough baseline or construction data available on condition factor and growth from this area to make pre- and post-construction comparisons (Figures 2 and 3).

4.1.1.3 RECAPTURES

One previously tagged juvenile Lake Sturgeon was captured in the Burntwood River (Table 9):

- PIT #900043000119453 was stocked as a one year old in 2014 in Zone BWR-A. It was captured in Zone BWR-B, 10.3 km downstream from its release location, on September 14, 2016.

4.1.2 KELSEY GS AREA

Nine fish species (n = 162) were captured in nine gillnet sets from September 7–18, 2016 (Tables 2-4; Map 3). Lake Sturgeon were the fifth most abundant species captured (n = 8; 4.9%; Table 4). Gillnet site data, biological and tagging information for all Lake Sturgeon captured are provided in Appendices A1-1 and A2-1. Water temperature in the Nelson River mainstem declined from 16.5 to 14.5°C during the study (Appendix A1-1).

Eight Lake Sturgeon were captured in 202.7 gillnet hours, producing an overall CPUE of 0.95 LKST/100 m net/24 h (Table 5). Gill nets were set in four zones below the Kelsey GS (Map 3). CPUE values by zone were as follows:

- 0.00 LKST/100 m net/24 h in Zone KGS-A (n = 1 site);
- 0.39 LKST/100 m net/24 h in Zone KGS-B (n = 3 sites);
- 1.72 LKST/100 m net/24 h in Zone KGS-C (n = 3 sites); and
- 0.95 LKST/100 m net/24 h in Zone KGS-D (n = 2 sites) (Table 5).

Overall CPUE values for the Kelsey GS Area catch since 2011 are presented in Table 6.

4.1.2.1 YEAR-CLASS STRENGTH

Ageing structures were collected from five Lake Sturgeon. Three-reader agreement for age assignment was 60% (*i.e.*, 3 out of 5). The modal age was used for one fish (age 12), aged one year higher by a single reader. The median age was used for one fish (age 13), aged between 12 and 14 years by three readers. Aged Lake Sturgeon from the Kelsey GS Area ranged from 3 to 13 years old. One sturgeon was captured from each of the 2003, 2004, 2006, 2011, and 2013 cohorts. Cohort frequency distributions for all zones sampled in the Kelsey GS Area in 2016 are presented in Figure 6. Cohort frequencies for all Lake Sturgeon captured in the Upper Split Lake Area from 2011 to 2016 are presented in Table 7.

4.1.2.2 GROWTH AND CONDITION

Captured Lake Sturgeon had a:

- Mean FL of 729 mm (n = 8; StDev = 181 mm; range 384–925 mm);
- Mean weight of 3,510 g (n = 8; StDev = 2,234 g; range 420–7,180 g); and
- Mean condition factor of 0.77 (n = 8; StDev = 0.07; range 0.68–0.91) (Table 8).

There was not a dominant size class of juvenile fish as Lake Sturgeon in the 850–899 mm FL interval (considered adults) were the most frequently captured size class in the Kelsey GS Area (n = 2; 25.0%; Figure 4). The length-weight relationship for Lake Sturgeon captured in the Kelsey GS Area during fall 2016 is provided in Figure 5.

Juvenile sampling was not conducted in the Kelsey GS area prior to construction of the Keeyask GS, therefore condition factor and FL comparisons between pre-construction and construction monitoring data could not be made.

4.1.2.3 RECAPTURES

One previously tagged juvenile Lake Sturgeon was recaptured in the Kelsey GS Area (Table 9):

- Floy #56578 was recaptured in Zone KGS-C on September 9, 2016, 4.48 km upstream from where it was initially captured (zone SPL-A) on August 12, 2014.

4.1.3 SPLIT LAKE

Ten fish species (n = 130) were captured at seven sites from September 7–18, 2016 (Tables 2–4; Map 3). Lake Sturgeon were the sixth most abundant species captured (n = 6; 4.6%; Table 4). Gillnet site data and biological tagging information for all Lake Sturgeon captured in Zone SPL-A (Map 3) are provided in Appendices A1-1 and A2-1. Total effort for the seven gillnetting sites was 193.2 gillnet hours, producing an overall CPUE of 0.75 LKST/100 m net/24 h (Table 5). Overall CPUE values for the Split Lake catch since 2015 are presented in Table 6.

4.1.3.1 YEAR-CLASS STRENGTH

Ageing structures were collected from five Lake Sturgeon. Three-reader agreement for age assignment was 100%. Aged Lake Sturgeon from Split Lake ranged from 1 to 9 years old and represented the 2007, 2008, 2010, 2014, and 2015 cohorts. Cohort frequency distributions for all Lake Sturgeon sampled in Split Lake are presented in Figure 7. Cohort frequencies for all Lake Sturgeon captured in the Upper Split Lake Area from 2011 to 2016 are presented in Table 7.

4.1.3.2 GROWTH AND CONDITION

Captured Lake Sturgeon had a:

- Mean FL of 536 mm (n = 6; StDev = 257 mm; range 165–805 mm);
- Mean weight of 1,509 g (n = 5; StDev = 1,621 g; range 23–3,942 g); and
- Mean condition factor of 0.69 (n = 5; StDev = 0.12; range 0.51–0.79) (Table 8).

The six Lake Sturgeon captured in Split Lake were all from different FL intervals (Figure 4).

Juvenile sampling was not conducted in Split Lake prior to construction of the Keeyask GS, therefore condition factor and FL comparisons between pre-construction and construction monitoring data could not be made.

4.1.3.3 RECAPTURES

One previously tagged juvenile Lake Sturgeon was recaptured in the Split Lake Area (Table 9):

- PIT #1380347913 was recaptured in zone SPL-A on September 8, 2016, less than 1 km downstream from where is was first caught on June 26, 2013.

4.2 FUTURE KEEYASK RESERVOIR

Twelve fish species (n = 281) were captured at 37 gillnetting sites from September 12–23, 2016 (Tables 2–4; Map 4). Lake Sturgeon (n = 96; 34.2%) were the most abundant species captured (Table 4). Gillnet site data and biological and tagging information for all Lake Sturgeon captured are provided in Appendices A1-2 and A2-2. Water temperature decreased from 15.0°C to 13.0°C during sampling (Appendix A1-2).

In total, 94 juvenile and 2 adult Lake Sturgeon were captured in 997.4 gillnet hours, producing an overall CPUE of 2.31 LKST/100 m net/24 h (Table 5). Gill nets were set in all three Gull Lake zones, as well as the first zone upstream of Gull Lake (*i.e.*, BR-D) (Map 4). CPUE values by zone, from upstream to downstream were as follows:

- 1.00 LKST/100 m/24 h in Zone BR-D (n = 4 sites);
- 1.05 LKST/100 m/24 h in Zone GL-A (n = 11 sites);
- 3.55 LKST/100 m/24 h in Zone GL-B (n = 11 sites); and
- 3.05 LKST/100 m/24 h in Zone GL-C (n = 11 sites) (Table 5).

CPUE values for future Keeyask reservoir catches since 2007 are presented by zone in Table 6. CPUE values in 2016 were slightly lower relative to other years.

4.2.1 YEAR-CLASS STRENGTH

Ageing structures were collected from 93 Lake Sturgeon (structures were not collected from three individuals measuring 122, 809 and 836 mm FL). Three-reader agreement for age assignment was 87% (*i.e.*, 81 out of 93). The modal age was used for all 12 fish (age 2 [n=1], 3 [n=1], 7 [n=2], 8 [n=4], and 10 [n=4]), aged one year lower or higher by a single reader. Aged Lake Sturgeon ranged from 0 to 11 years old (2005–2016 cohorts), with eight-year-old fish (*i.e.*, 2008 cohort) captured most frequently (n = 29; 31.2%). The next most abundant cohort was 2006 (age 10), which accounted for 16.1% (n = 15) of aged Lake Sturgeon. The 2007 cohort was the only year-class absent between 2005 and 2016. Five YOY fish were captured: one in zone GL-B and four in zone GL-C (Map 4). Cohort frequency distributions for all zones sampled in 2016 are provided in Figure 8. Cohort frequencies for all Lake Sturgeon captured in Gull Lake from 2008 to 2016 are presented in Table 7. All cohorts since 1998 have been represented in the catch, except for the 2002 cohort which has never been captured.

Two of the age-2 fish exhibited weak/absent first annuli, characteristic of hatchery reared-fish, but did not have PIT tags. Weak annuli occasionally occur in wild fish, or these fish may have been stocked as yearlings and shed their PIT tags.

4.2.2 GROWTH AND CONDITION

Captured Lake Sturgeon had a:

- Mean FL of 522 mm (n = 96; StDev = 179 mm; range 98–836 mm);
- Mean weight of 1,506 g (n = 93; StDev = 1,181 g; range 8–4,560 g); and
- Mean condition factor of 0.75 (n = 93; StDev = 0.11; range 0.42–1.10) (Table 8).

Mean condition factor-at-age for Lake Sturgeon captured in Gull Lake was significantly higher for age-4 and age-5 Lake Sturgeon captured during construction (*i.e.*, 2014–2016) than during baseline (*i.e.*, 2008-2012) studies (Mann-Whitney U test, $p < 0.05$; Figure 9). Mean FL-at-age was significantly lower for age-1 and age-7 Lake Sturgeon captured during construction than during baseline studies (Mann-Whitney U test, $p < 0.05$) (Figure 10).

Lake Sturgeon in the 600–649 mm FL interval were captured most frequently, representing 14.6% of the total catch (Figure 11). Fish measuring 350–399 mm and 650–699 mm FL were also frequently captured, each representing 12.5% of the total catch (Figure 11). The length-weight relationship for Lake Sturgeon captured in the future Keeyask reservoir during fall 2016 was similar to those captured in other areas and is presented in Figure 5.

4.2.3 RECAPTURES

Eleven Lake Sturgeon tagged in previous years, as well as seven hatchery-reared fish, were captured in Gull Lake (Table 9). Of the fish tagged in previous years:

- Three were tagged in 2010;
- One was tagged in 2011;
- One was tagged in 2012;
- One was acoustically tagged on August 29, 2013 as part of the Keeyask juvenile Lake Sturgeon movement study. Details on its movements can be found in Lacho and Hrenchuk (2017);
- Four were tagged in 2014; and
- One was tagged in spring 2016.

Recaptured fish moved varying distances from their original capture locations (Table 9):

- Three were recaptured less than 1.0 km from their last capture location;
- Seven were recaptured 1.0–5.6 km from their previous capture location; and
- One was recaptured 16.6 km from its previous capture location.

Seven hatchery-reared fish stocked as one-year-olds in Gull Lake in 2015 were captured in fall, 2016 (Table 9):

- Three were stocked on June 30, 2015:
    - One (PIT #900067000058464) was captured on September 16, 2016, 7.3 km downstream from its release location. This fish grew 146 mm (FL) since being released.
    - Two (PIT #900067000055036 and #900067000055050) were captured on September 17, 2016, 0.9 km upstream of their release location. These fish grew 155 mm and 144 mm (FL), respectively, since release.
- Four were stocked on September 16, 2015:
    - Two (PIT #900067000055441 and #900067000055347) were recaptured 0.1 and 4.6 km downstream of their release location, respectively. Since release, these fish had increases in fork lengths of 59 mm and 66 mm, respectively.

- One (PIT #900067000055302) was recaptured on September 18, 2016, 1.2 km upstream from its release location. It grew 72 mm (FL) since release.
- One (PIT #900067000055197) was recaptured on September 17, 2016, 5.9 km upstream from its release location. It grew 86 mm (FL) since release.

4.3 STEPHENS LAKE

Nine fish species (n = 283) were captured at 37 gillnetting sites in upper Stephens Lake from September 12–23, 2016 (Tables 2–4; Map 5). Lake Sturgeon (n = 66; 23.3%) were the second most abundant species captured (Table 4). Gillnet site data, as well as biological and tagging information for all Lake Sturgeon captured in Stephens Lake, are provided in Appendices A1-3 and A2-3. Water temperature decreased from 15.0°C to 13.0°C during sampling (Appendix A1-3).

In total, 62 juvenile and 4 adult Lake Sturgeon were captured in 1,384.1 gillnet hours, producing an overall CPUE of 1.14 LKST/100 m net/24 h (Table 5). Gill nets were set in both zones located within the upper 10 km of Stephens Lake (Map 5). CPUE values by zone were as follows:

- 1.11 LKST/100 m/24 h in Zone STL-A (n = 22 sites); and
- 1.19 LKST/100 m/24 h in Zone STL-B (n = 15 sites) (Table 5).

CPUE values for Stephens Lake catches since 2007 are presented in Table 6. In 2016, the CPUE value was similar to that of 2015 despite more Lake Sturgeon being caught.

4.3.1 YEAR-CLASS STRENGTH

Ageing structures were collected from 62 of the 66 captured Lake Sturgeon (structures were not collected from four individuals that measured 680, 791, 852, and 1000 mm FL). Three-reader agreement for age assignment was 82% (*i.e.*, 51 out of 62). The modal age was used for 11 fish (age 2 [n=3], 5 [n=1], 8 [n=5], and 9 [n=2]), aged one year lower or higher by a single reader. Aged juvenile Lake Sturgeon ranged from 1–12 years, with eight-year-old fish (*i.e.*, 2008 cohort) representing 50.0% (n = 31) of aged fish. The 2015 and 2014 cohorts (ages 1 and 2, respectively) were the next most abundant age-classes each representing 12.9% (n = 8) of aged fish. Cohort frequency distributions for the two Stephens Lakes zones are provided in Figure 12. Lake Sturgeon from the 2005, 2009, 2010, and 2016 cohorts were not present in the catch. Cohort frequencies for all Lake Sturgeon captured in Stephens Lake from 2009 to 2016 are presented in Table 7. All cohorts between 2000 and 2015 have been represented in the catch since studies began.

One of the age-2 fish exhibited weak/absent first annuli, characteristic of a hatchery reared fish, but did not have a PIT tag.

4.3.2 GROWTH AND CONDITION

Captured Lake Sturgeon had a:

- Mean FL of 591 mm (n = 66; StDev: 184 mm; range 233–1,000 mm);
- Mean weight of 2,091 g (n = 66; StDev: 1,545 g; range 80–8,400 g); and
- Mean condition factor of 0.75 (n = 66; StDev: 0.13; range 0.47–1.12) (Table 8).

Mean condition factor-at-age was significantly lower only for age-3 Lake Sturgeon captured during construction (*i.e.,* 2014-2016) compared to baseline (*i.e.*, 2009-2012) studies (Mann-Whitney U tests, $p < 0.05$; Figure 13). Mean FL-at-age was significantly lower only for age-4 Lake Sturgeon captured during construction compared to baseline studies (Mann-Whitney U test $p < 0.05$; Figure 14).

The length-weight regression for Lake Sturgeon captured in Stephens Lake during fall 2016 is provided in Table 9. The majority of fish captured were in the 650–699 mm FL interval, which represented 27.3% of the total catch (Figure 11). Fish in the 700–749 mm FL interval were also captured frequently, representing 21.2% of the total catch (Figure 11).

4.3.3 RECAPTURES

Fourteen Lake Sturgeon tagged in a previous year, as well as five hatchery-reared fish, were recaptured in Stephens Lake (Table 9). Of the fish that were tagged in previous years:

- Two were originally tagged in 2010;
- One was tagged in 2011;
- Four were tagged in 2012
    - One was tagged on June 16 as part of the Keeyask adult Lake Sturgeon movement study. Details on its movements can be found in Hrenchuk and Barth (2017).
- Two were tagged in 2014;
- Four were tagged in 2015; and
- One was tagged in spring 2016.

All 14 fish were recaptured within 4.9 km of their original capture location (Table 9):

- Four were caught less than 1.0 km from their original capture locations; and
- Ten were caught between 2.3 and 4.9 km from their initial capture locations.

Four were hatchery-reared fish released as one-year-olds in Stephens Lake in 2015:

- Two (PIT #900067000055326 and #900067000055361) were released on June 30, 2015. They were both recaptured 3.2 km upstream of the stocking site on September 18, 2016. These fish both increased in size by 182 mm (FL) since the time they were released.
- Two (PIT #900067000055566 and #900067000055344) were released on September 14, 2015.
    - #900067000055566 was recaptured 3.0 km upstream on September 17, 2016. It grew 81 mm (FL) since its release.
    - #900067000055344 was recaptured 0.1 km upstream on September 23, 2016. It grew 78 mm (FL) since release.

One hatchery-reared fish was released as a one-year-old in Gull Lake on September 21, 2015):

- #900067000055559 was recaptured on September 21, 2016, 14.1 km downstream of its release location. It grew 68 mm since it was released.

5.0 DISCUSSION

The juvenile Lake Sturgeon population monitoring program described in the AEMP began in the fall of 2014, immediately after the start of Keeyask GS construction. The monitoring program will enable comparisons to data gathered during studies conducted since 2008, that measured juvenile sturgeon abundance, habitat use, condition, growth, year-class strength and factors influencing year-class strength in the Upper Split Lake Area, the future Keeyask reservoir, and in Stephens Lake (MacDonald 2009; Michaluk and MacDonald 2010; Henderson *et al.* 2011; Henderson and Pisiak 2012; Henderson *et al.* 2013; Henderson *et al.* 2015; Burnett *et al.* 2016).

5.1 JUVENILE ABUNDANCE

Juvenile sturgeon CPUE values (Lake Sturgeon/100 m net/24 h) indicate a low to moderate abundance of juvenile sturgeon in the Keeyask Study Area relative to other systems. Juvenile abundance remains lower than observed in several reaches of the Winnipeg River where CPUE values can be greater than 10 (Henderson *et al.* 2014; McDougall *et al.* 2014; Lacho *et al.* 2015). CPUE values however, are similar to those observed elsewhere on the Nelson River (*i.e.*, Landing River reach of the Nelson River). Specific benchmarks set out in the AEMP to assess the juvenile Lake Sturgeon population in the Keeyask Study Area rely on comparisons to the Sea Falls to Sugar Falls reach of the Nelson River (Figure 15). In 2014, mean CPUE of all Lake sturgeon in this reach was 2.09 (range: 0.0–9.9) (McDougall and Nelson 2016). In 2016, mean CPUE for Gull Lake (2.31; range: 0.0–8.8) was higher than observed in Sea Falls in 2014. Although mean CPUE was lower in both Stephens Lake (1.14; range: 0.0–3.29) and the Upper Split Lake Area (0.97; range: 0–5.49), values in these locations continue to fall within ranges observed during baseline studies.

As in previous years, the 2008 cohort (8-year-olds) was most prevalent in the catch in both Gull and Stephens lakes, however, overall numbers were lower in 2016 than in previous years. Juvenile sturgeon nets are designed to specifically target sturgeon in the 250–800 mm FL range with both smaller and larger fish caught less frequently (McDougall *et al.* 2014). It is predicted that sturgeon from the 2008 cohort will soon be too large for the gear used during juvenile population monitoring, and will also begin to use other habitats not targeted during the juvenile monitoring program. For these reasons, it is expected that the 2008 cohort will begin to comprise a smaller proportion of the juvenile catch in Gull and Stephens lakes.

Cohort abundance varies from year to year depending on a number of variables such as the number of fish spawning and environmental conditions. In the 2015 study year, a large number of YOY (n = 18) sturgeon were caught in Gull and Stephens lakes and it was predicted the 2015 cohort would be strong and may be prevalent in the catch for the next several years (Burnett *et al.* 2016). In both Gull and Stephens lakes the 2015 cohort was present in the catch but not at the levels observed in 2015. In 2015, this cohort represented 5 and 21% of the catch in Gull and

Stephens Lake, respectively, compared to 4 and 13% in 2016. Despite the decrease, this cohort was still the second most abundant year class captured in Stephens Lake. The 2014 cohort was present in both Gull and Stephens lakes (14 and 13% of catch, respectively). It should be noted that a large portion of this capture was made up of stocked fish. Stocked fish made up 54% (n=7) of the 2014 cohort in Gull Lake, and 62% (n=5) in Stephens Lake. Cohorts not represented in one study year are often captured in subsequent years. Throughout the entire study period (2008 to present) sturgeon from the 1998–2016 cohorts have been captured in Stephens Lake, however, the 2002 cohort is missing from the Gull Lake catch. In the Burntwood River, only the 1998 and 2009 cohorts have not been captured to date.

5.2 AGEING HATCHERY FISH

The Keeyask stocking program started in 2014 with the oldest stocked fish currently at age-3 (2013 cohort from the Burntwood River) (Table 1 in Klassen *et al*. 2017). Stocking studies carried out on the upper Nelson River have provided important insights into the ageing methods of hatchery-reared Lake Sturgeon released into the wild (McDougall and Pisiak 2012; McDougall and Pisiak 2014; Burnett and McDougall 2015; Aiken and McDougall 2016; McDougall and Nelson 2016). Lake Sturgeon ageing structures exhibit well-defined banding patterns characteristic of repeated summer (fast-growth) and winter (slow/non-growth) periods (McDougall and Pisiak 2014). Ageing structures from hatchery-reared Lake Sturgeon have different banding patterns that complicate the ageing process. During the winter period, when the water temperature remains close to 0°C and growth slows, wild Lake Sturgeon develop a well-defined annulus that is easy to recognize. However, hatchery reared sturgeon are often held at considerably higher and more constant temperatures than experienced by wild fish (McDougall and Pisiak 2014). The higher overwinter temperatures over the first winter of growth cause a weak or missing first annulus. To account for this, current ageing methods add one year to the ages of fish with a weak/absent first annulus (McDougall and Pisiak 2012; 2014; Burnett and McDougall 2015).

In fish stocked at age-1, the weak annulus is often followed by the presence of a false annulus, not corresponding to slowed winter growth, but instead to stocking and the subsequent establishment period. The false annuli decrease ageing accuracy because they are difficult to distinguish from true annuli. As a result, hatchery fish younger than 3-years-old are often over-aged by one year, as the false annulus is counted. Ageing accuracy has been found to increase with time spent in the wild (Burnett and McDougall 2015; McDougall and Nelson 2016). Burnett and McDougall (2015) hypothesized the increased accuracy was due to the presence of multiple true annuli which allow the readers to correctly discriminate the false annuli.

Eleven of the thirteen (85%) known hatchery fish recaptured in 2016 were over-aged by one year and all but one were younger than 3-years-old. As the stocking program continues in the Keeyask Study Area, over-ageing of hatchery fish is expected to continue until fish are of a sufficient age where wild growth rings allow for discrimination of the false annulus. Currently,

one-year-old hatchery fish are PIT tagged before release, which allows for age verification. Of the ageing structures identified as having a weak/missing first annulus, three were not PIT tagged and were aged at 2 years old (*i.e.*, 2014 cohort). Based on the banding pattern, it is possible that these fish were reared in the hatchery, released as yearlings, and then lost their PIT tags. Examples of both wild and hatchery-reared ageing structures are provided in Appendix 3.

5.3 KEY QUESTIONS

The AEMP identified key questions for juvenile Lake Sturgeon monitoring, four of which are relevant to the construction period and are addressed in the discussion below.

Does recruitment of wild sturgeon occur upstream and/or downstream of the GS during construction?

Recruitment occurred in Gull Lake and the Burntwood River in 2016 as five YOY were captured in Gull Lake and two were captured in the Burntwood River.

It remains unknown if recruitment due to spawning at Gull Rapids has occurred since studies began in this area in 2001. In 2016, eight adult male Lake Sturgeon were captured in spawning condition at Gull Rapids (Legge *et al.* 2017), however, during the 2016 juvenile monitoring program no YOY were captured in Stephens Lake in the fall. Comparatively, in 2015, 18 YOY were captured (7 in Gull Lake and 11 in Stephens Lake).

Capturing YOY is also made challenging by a number of different factors and therefore a lack of YOY in the catch may not be indicative of unsuccessful recruitment. Juvenile gill nets do not efficiently target the small YOY size-class and, as such, they may not show up in the catch until the following year. In addition, YOY are known to move very little within their habitat further decreasing their likelihood of capture (Benson *et al.* 2005; Caroffino *et al.* 2009).

Is there a biologically meaningful (and statistically significant) change in condition factor and growth of juvenile sturgeon during construction?

A comparison of juvenile Lake Sturgeon condition factor between baseline and construction monitoring studies found significant differences in several age classes, however, there is not a consistent trend by location or age-class. In the Burntwood River, no statistical comparisons could be made due to a lack of baseline data. A qualitative examination of the data suggests no obvious differences in condition factor-at-age or FL-at-age. In Gull Lake, average condition factor was significantly higher for age-4 and age-5 fish captured during construction monitoring and was significantly lower for age-3 fish captured during construction in Stephens Lake. Similarly, analysis of fork-length-at-age for Lake Sturgeon caught during baseline and construction studies revealed no clear trend. Age-7 fish from Gull Lake and age-4 fish from Stephens Lake caught during construction were significantly shorter than fish caught during baseline studies. Differences in fork-length-at-age observed in the 2015 study year (Burnett *et*

al. 2016) were also inconsistent and the trends observed in fork-length-at-age from 2015 were not present in the 2016 data. Continued assessment of fork-length-at-age and condition-factor-at-age during construction and Keeyask operation will determine if any long-term trends emerge.

Two questions related to the stocking program are addressed below:

- *What is the survival rate of stocked sturgeon?; and*
- *What is the proportion of hatchery-reared to wild recruits within a cohort (i.e., how successful is the stocking program)?*

Although only one hatchery-reared Lake Sturgeon was captured in the Burntwood River in 2016, recaptures of hatchery-reared fish in Gull Lake and Stephens Lake are becoming more frequent. In 2015, only six stocked fish (two in Gull Lake and four in Stephens Lake) were recaptured, accounting for 3.1% of all Lake Sturgeon caught in both waterbodies (Burnett *et al.* 2016). Comparatively, in 2016 a total of 12 hatchery fish were recaptured (seven in Gull Lake and five in Stephens Lake) accounting for 7.4% of the Lake Sturgeon caught. Stocked fish made up a large proportion of the 2014 year-class capture in both waterbodies; 54% (n=7) of the 2014 cohort in Gull Lake, and 62% (n=5) in Stephens Lake. As hatchery fish continue to be introduced their proportion within the catch is expected to increase.

Between 2014 and 2015, two hatchery-reared fish released in the Burntwood River were captured in Gull Lake, >90 km downstream of their release sites. This represents a large proportion of the stocking recaptures (50%; n=4). However, no fish stocked into the Burntwood River were captured in Gull or Stephens lakes in 2016.

The successful recapture of a number of stocked fish in Gull and Stephens lakes indicates that some hatchery-reared sturgeon are growing and surviving in the wild. Given that stocked yearlings make up a substantial portion of the 2014 year class in both Gull and Stephens Lakes, future reports will consider their growth rates compared to wild sturgeon of similar age.

6.0 SUMMARY AND CONCLUSIONS

- Forty Lake Sturgeon were caught in the Upper Split Lake Area: 26 in the Burntwood River (594.1 gillnet hours, CPUE of 1.05 Lake Sturgeon/100 m net/24 h), eight near the Kelsey GS (202.7 gillnet hours, CPUE of 0.95 Lake Sturgeon/100 m net/24 h), and six in Split Lake (193.2 gillnet hours, CPUE of 0.75 Lake Sturgeon/100 m net/24 h). One of the three recaptured fish was a hatchery-reared fish released into the Burntwood River in 2014. Fish aged 0–14 years old were captured, with the 2000–2002, 2005, 2009, and 2012 cohorts (ages 16–14, 11, 7 and 4) being absent from the catch.
- In Gull Lake, 96 (including two measuring > 800 mm and considered adults) Lake Sturgeon were captured in 997.4 gillnet hours for a total CPUE of 2.31 Lake Sturgeon/100 m net/24 h. Aged Lake Sturgeon (n = 93) ranged from 0 to 11 years old (only the 2007 cohort not represented), with eight-year-old fish (2008 cohort) the most prevalent in the catch (n = 29; 31.2%). Eighteen Lake Sturgeon tagged in previous years or as part of the stocking program were recaptured. Seven of the recaptured fish were released into Gull Lake as one-year-old hatchery fish in 2015 (three in the spring and four in the fall).
- In Stephens Lake, 66 (including four measuring > 800 mm FL and considered adults) Lake Sturgeon were captured in 1,384.1 gillnet hours for a total CPUE of 1.14 Lake Sturgeon/100 m net/24 h. Lake Sturgeon ages ranged from 1 to 12 with the 2008 cohort (age 8) being captured most frequently (n = 31; 50.0%). Nineteen Lake Sturgeon were recaptures tagged in a previous year, five of which were hatchery-reared fish released as one-year-olds in 2015. Of the five hatchery fish, four were released into Stephens Lake and one was released in Gull Lake.
- The abundance of juvenile Lake Sturgeon in the study area is considered low to moderate.
- The key questions, as described in the AEMP, for juvenile Lake Sturgeon population monitoring during construction of the Keeyask GS are as follows:
    - *Does recruitment of wild sturgeon occur upstream and/or downstream of the GS during construction?*

      Lake Sturgeon recruitment has occurred in the Burntwood River, Gull Lake and Stephens Lake since construction of the Keeyask GS began. In 2016, YOY Lake Sturgeon were captured in Gull Lake and the Burntwood River but not in Stephens Lake. In 2015, YOY were captured in both Gull and Stephens lakes, however, it remains unknown if recruitment due to spawning at Gull Rapids has occurred since studies began in 2001.
    - *Is there a biologically meaningful (and statistically significant) change in condition factor and growth of juvenile sturgeon during construction?*

      A comparison of mean condition factor and FL-at-age from juvenile Lake Sturgeon collected during baseline and construction monitoring studies found

significant differences in several age classes in both Gull and Stephens lakes. However, due to the lack of consistent findings in both FL-at-age and condition factor-at-age across years and waterbodies, the observed differences are not considered biologically meaningful.

- *What is the survival rate of stocked sturgeon? What is the proportion of hatchery-reared to wild recruits within a cohort (i.e., how successful is the stocking program)?*

  It is still too early to make any conclusions regarding the survival rate of stocked sturgeon and the proportion of hatchery reared to wild recruits within a cohort. The proportion of stocked fish in the catch from Gull and Stephens lakes has increased, doubling from six fish (3.1%) in 2015 to twelve fish (7.4%) in 2016. More of the 2014 cohort captured in both Gull and Stephens Lake consisted of hatchery-reared fish (54 and 63%, respectively) than wild recruits. Based on recapture sizes of known hatchery fish it is evident some are able to grow and survive in the wild. It is important to note that, unlike in 2015, no hatchery fish stocked in the Burntwood River were captured in Gull or Stephens lakes.

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TABLES

Table 1: Summary of Lake Sturgeon stocking since 2014 (Klassen *et al.* 2017).

Year	Burntwood River				Gull Lake[a]				Stephens Lake			
	# Stocked			# Captured	# Stocked			# Captured	# Stocked			# Captured
	Larvae	Fingerlings	Age-1		Larvae	Fingerlings	Age-1		Larvae	Fingerlings	Age-1	
2014	-	-	595	4	152,926	4,656	-	N/A	-	-	-	N/A
2015	-	-	-	N/A	-	-	423	10	-	-	418	8
2016	-	-	23	N/A	192,167	782	-	N/A	181,354	9,282	-	N/A
Total	**0**	**0**	**618**	**4**	**345,093**	**5,438**	**423**	**10**	**181,354**	**9,282**	**418**	**8**

a. From Birthday Rapids to Gull Rapids.

Table 2: Start and completion dates of gillnetting studies conducted during fall, 2016.

Location	Start Date	Completion Date	# Sites
Upper Split Lake Area			
Burntwood River	07-Sep-16	18-Sep-16	24
Kelsey GS Area	07-Sep-16	18-Sep-16	9
Split Lake	07-Sep-16	18-Sep-16	7
Gull Lake	12-Sep-16	23-Sep-16	37
Stephens Lake	12-Sep-16	23-Sep-16	37

Table 3: List of fish species captured, including common and scientific names and abbreviations, during gillnetting surveys conducted during fall, 2016. An 'X' signifies species presence in the catch.

Common Name	Scientific Name	Abbreviation	Upper Split Lake Area			Gull Lake	Stephens Lake
			Burntwood River	Kelsey GS Area	Split Lake		
Burbot	*Lota lota*	BURB	X	X	X	X	X
Emerald Shiner	*Notropis atherinoides*	EMSH				X	
Freshwater Drum	*Aplodinotus grunniens*	FRDR		X			
Lake Sturgeon	*Acipenser fulvescens*	LKST	X	X	X	X	X
Lake Whitefish	*Coregonus clupeaformis*	LKWH			X		
Longnose Sucker	*Catostomus catostomus*	LNSC	X	X	X	X	X
Mooneye	*Hiodon tergisus*	MOON			X	X	
Northern Pike	*Esox lucius*	NRPK		X	X	X	X
Sauger	*Sander canadensis*	SAUG		X	X	X	X
Shorthead Redhorse	*Moxostoma macrolepidotum*	SHRD		X	X	X	X
Spottail Shiner	*Notropis hudsonius*	SPSH				X	
Trout-perch	*Percopsis omiscomaycus*	TRPR				X	X
Walleye	*Sander vitreus*	WALL	X	X	X	X	X
White Sucker	*Catostomus commersonii*	WHSC	X	X	X	X	X

Table 4: Number (n) and frequency of occurrence (%), by species and sampling location, of fish captured in gillnets (1–6-inch mesh), fall 2016.

Species	Upper Split Lake Area						Gull Lake		Stephens Lake		Total n	Total %
	Burntwood River		Kelsey GS		Split Lake							
	n	%	n	%	n	%	n	%	n	%		
Burbot	7	8.3	1	0.6	1	0.8	2	0.7	13	4.6	24	2.6
Emerald Shiner	0	0.0	0	0.0	0	0.0	3	1.1	0	0.0	3	0.3
Freshwater Drum	0	0.0	1	0.6	0	0.0	0	0.0	0	0.0	1	0.1
Lake Sturgeon	***26***	***31.0***	***8***	***4.9***	***6***	***4.6***	***96***	***34.2***	***66***	***23.3***	***202***	***21.5***
Lake Whitefish	0	0.0	0	0.0	8	6.2	0	0.0	0	0.0	8	0.9
Longnose Sucker	27	32.1	45	27.8	15	11.5	94	33.5	149	52.7	330	35.1
Mooneye	0	0.0	0	0.0	6	4.6	1	0.4	0	0.0	7	0.7
Northern Pike	0	0.0	1	0.6	2	1.5	5	1.8	1	0.4	9	1.0
Sauger	0	0.0	16	9.9	28	21.5	10	3.6	13	4.6	67	7.1
Shorthead Redhorse	0	0.0	8	4.9	5	3.8	2	0.7	1	0.4	16	1.7
Spottail Shiner	0	0.0	0	0.0	0	0.0	1	0.4	0	0.0	1	0.1
Trout-perch	0	0.0	0	0.0	0	0.0	7	2.5	12	4.2	19	2.0
Walleye	6	7.1	48	29.6	28	21.5	18	6.4	15	5.3	115	12.2
White Sucker	18	21.4	34	21.0	31	23.8	42	14.9	13	4.6	138	14.7
Total	**84**	100	**162**	100	**130**	100	**281**	100	**283**	100	**940**	100

Table 5: Lake Sturgeon catch-per-unit effort (CPUE; # fish/100 m net/24 h) by zone, for gillnets set during fall, 2016.

Location	Zone	# Sites	Effort (gillnet hours)	# of Lake Sturgeon	CPUE (#LKST/100m/24h)
Burntwood River	BWR-A	8	171.82	4	0.56
	BWR-B	6	196.04	6	0.73
	BWR-C	10	226.20	16	1.70
Total		**24**	**594.05**	**26**	**1.05**
Kelsey GS Area	KGS-A	1	20.83	0	0.00
	KGS-B	3	61.89	1	0.39
	KGS-C	3	69.73	5	1.72
	KGS-D	2	50.27	2	0.95
Total		**9**	**202.73**	**8**	**0.95**
Split Lake	SPL-A	7	193.17	6	0.75
Total		**7**	**193.17**	**6**	**0.75**
Gull Lake	BR-D	4	119.65	5	1.00
	GL-A	11	320.31	14	1.05
	GL-B	11	290.32	43	3.55
	GL-C	11	267.14	34	3.05
Total		**37**	**997.43**	**96**	**2.31**
Stephens Lake	STL-A	22	819.71	38	1.11
	STL-B	15	564.39	28	1.19
Total		**37**	**1384.10**	**66**	**1.14**

Table 6: Lake Sturgeon catch-per-unit-effort (CPUE; #fish/100 m net/24 h) for gillnets set between 2007 and 2016. Grey highlighted rows indicate construction monitoring.

Location	Year	Start Date	Completion date	Mesh Size	# Sites	Effort (gillnet hrs[a])	# Lake Sturgeon[b]	CPUE
Upper Split Lake Area								
Burntwood River	2012	29-Aug	08-Sep	1" - 6"	37	767	33	1.03
	2014	08-Sep	16-Sep	1" - 6"	28	734	42	1.37
	2015	29-Aug	04-Oct	1" - 6"	28	858	35	0.78
	2016	07-Sep	18-Sep	1" - 6"	24	594	26	1.05
Kelsey GS Area	2015	29-Aug	04-Oct	1" - 6"	7	248	7	0.68
	2016	07-Sep	18-Sep	1" - 6"	9	203	8	0.95
Split Lake	2015	29-Aug	04-Oct	1" - 6"	9	192	9	1.13
	2016	07-Sep	18-Sep	1" - 6"	7	193	6	0.75
Gull Lake[c]	2007	28-Sep	03-Oct	8mm - 5"	26	165	0	0.00
	2008	12-Sep	27-Sep	1.5"- 8"	15	3072	126	0.98
	2010	21-Sep	29-Sep	1" - 5"	27	851	69	1.95
	2011	18-Sep	24-Sep	1" - 5"	25	662	121	4.39
	2012	29-Aug	09-Sep	1" - 6"	30	745	101	3.25
	2014	08-Sep	16-Sep	1" - 6"	30	765	112	3.51
	2015	11-Sep	20-Sep	1" - 6"	34	912	139	3.66
	2016	12-Sep	23-Sep	1" - 6"	37	997	96	2.31
Stephens Lake	2007	19-Sep	23-Sep	2" - 5"	15	48	0	0.00
	2008	11-Sep	18-Sep	3.75"-8"	12	295	8	0.65
	2009	14-Sep	20-Sep	1.5" - 5"	18	634	23	0.87
	2010	22-Sep	29-Sep	1" - 5"	18	611	32	1.26
	2011	21-Sep	01-Oct	1" - 5"	30	974	37	0.91
	2012	11-Sep	23-Sep	1" - 6"	19	1193	87	1.75
	2014	18-Sep	28-Sep	1" - 6"	94	921	47	1.23
	2015	22-Sep	02-Oct	1" - 6"	44	1154	54	1.12
	2016	12-Sep	23-Sep	1" - 6"	37	1384	66	1.14

a. Gillnet set durations were standardized to 100 m of net and then summed to calculate the total gillnet hours for each study.

b. Does not include Lake Sturgeon recaptured more than once in the same study.

c. Birthday Rapids to Gull Rapids.

Table 7: Number of Lake Sturgeon from which ages were determined captured by cohort year from 2008 to 2016. Grey highlighted rows indicate construction monitoring and red values indicate cohorts not present in the corresponding study year.

Location	Cohort Year																		
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Upper Split Lake Area																			
2011 Study Year	0	2	5	3	5	15	6	0	2	1	4	0	0	0	-	-	-	-	-
2012 Study Year	0	2	1	4	0	4	0	1	5	3	1	0	3	7	1	-	-	-	-
2015 Study Year	0	0	0	1	0	2	1	1	3	1	3	0	2	9	4	8	1	0	-
2016 Study Year	0	1	0	0	0	2	2	0	1	1	2	0	5	6	0	9	3	1	1
Total	**0**	**5**	**6**	**8**	**5**	**23**	**9**	**2**	**11**	**6**	**10**	**0**	**10**	**22**	**5**	**17**	**4**	**1**	**1**
Present in the Catch	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Gull Lake																			
2008 Study Year	0	0	0	0	0	0	0	0	12	2	14	-	-	-	-	-	-	-	-
2010 Study Year	1	0	1	0	0	6	3	1	3	5	18	0	0	-	-	-	-	-	-
2011 Study Year	0	1	0	0	0	5	2	2	7	5	94	1	2	0	-	-	-	-	-
2012 Study Year	0	0	0	0	0	2	2	2	12	6	60	3	1	4	0	-	-	-	-
2014 Study Year	0	0	0	1	0	1	0	1	6	2	58	3	4	7	3	10	0	-	-
2015 Study Year	0	0	0	0	0	0	1	3	10	7	71	1	1	3	6	12	5	4	-
2016 Study Year	0	0	0	0	0	0	0	1	15	0	29	2	1	5	6	13	13	4	4
Total	**1**	**1**	**1**	**1**	**0**	**14**	**8**	**10**	**65**	**27**	**344**	**10**	**9**	**19**	**15**	**35**	**18**	**8**	**4**
Present in the Catch	**Yes**	**Yes**	**Yes**	**Yes**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
Stephens Lake																			
2009 Study Year	0	0	1	1	0	0	1	3	1	0	2	0	-	-	-	-	-	-	-
2010 Study Year	0	0	0	0	1	3	0	1	5	7	14	0	0	-	-	-	-	-	-
2011 Study Year	0	0	0	0	0	1	0	0	0	2	28	2	0	1	-	-	-	-	-
2012 Study Year	0	0	0	0	0	0	0	0	7	4	49	1	2	2	0	-	-	-	-
2014 Study Year	0	0	0	0	0	1	1	0	5	4	25	1	4	5	0	0	0	-	-
2015 Study Year	0	0	0	0	0	0	0	0	4	3	19	1	1	3	0	4	6	11	-
2016 Study Year	0	0	0	0	0	0	1	0	4	4	31	0	0	2	1	3	8	8	0
Total	**0**	**0**	**1**	**1**	**1**	**5**	**3**	**4**	**26**	**24**	**168**	**5**	**7**	**13**	**1**	**7**	**14**	**19**	**0**
Present in the Catch	**No**	**No**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**	**No**

Table 8: Mean length, weight, and condition factor (K) of Lake Sturgeon captured during gillnetting investigations, fall 2016.

Waterbody	Fork Length (mm)				Weight (g)				K			
	n[a]	Mean	Std[b]	Range	n	Mean	Std	Range	n	Mean	Std	Range
Upper Split Lake Area												
Burntwood River	26	421	159	98–836	24	737	821	110–3760	24	0.63	0.07	0.50–0.77
Kelsey GS Area	8	729	181	384–925	8	3510	2234	420–7180	8	0.77	0.07	0.68–0.91
Split Lake	6	536	257	165–805	5	1509	1621	23–3942	5	0.69	0.12	0.51–0.79
Gull Lake	96	522	179	98–836	93	1506	1181	8–4560	93	0.75	0.11	0.42–1.10
Stephens Lake	66	591	184	233–1000	66	2091	1545	80–8400	66	0.75	0.13	0.47–1.12

a. Number of fish measured.

b. Standard deviation.

Table 9: Original capture date and biological data for fish recaptured in gillnets, fall 2016. Grey highlighted cells indicate stocked hatchery fish.

Location	Floy-tag #	Pit-tag No.	Zone	Date	Fork Length (mm)	Total Length (mm)	Weight (g)	Age	Distance (km)	Days Between Capture
Gull Lake	112505	900 067000055347	GL-C	14-Sep-16	396	466	325	2	4.59	364
	-	-	GL-B	16-Sep-15	330	389	186	1		
				Growth	**66**	**77**	**139**			
Gull Lake	87867	900 226000893560	GL-C	14-Sep-16	700	812	2880	8	0.95	2181
	-	-	GL-C	25-Sep-10	320	364	200	-		
				Growth	**380**	**448**	**2680**			
Gull Lake	89821	900 226000768842	GL-C	14-Sep-16	692	779	2940	10	1.77	1476
	-	-	GL-B	30-Aug-12	560	624	1300	-	-	342
	-	-	-	23-Sep-11	525	593	1050	-	-	-
				Growth	**167**	**186**	**1890**			
Gull Lake	87897	900 226000893535	GL-C	16-Sep-16	614	695	1840	8	1.93	2180
	-	-	GL-C	28-Sep-10	320	365	250	-		
				Growth	**294**	**330**	**1590**			
Gull Lake	112516	900 067000058464	GL-C	16-Sep-16	376	434	360	2*	7.27	452
	-	-	GL-B	30-Jun-15	230	267	63	1		
				Growth	**146**	**167**	**297**			
Gull Lake	103647	900 226000629147	GL-C	16-Sep-16	765	878	2980	10	3.35	804
	-	-	GL-C	5-Jul-14	659	736	1850	-		
				Growth	**106**	**142**	**1130**			
Gull Lake	112546	900 067000055036	GL-B	17-Sep-16	349	409	280	2*	0.91	453
	-	-	GL-B	30-Jun-15	194	230	44	1		
				Growth	**155**	**179**	**236**			
Gull Lake	112545	900 067000055197	GL-B	17-Sep-16	366	425	360	2*	5.91	367
	-	-	GL-A	16-Sep-15	280	321	105	1		
				Growth	**86**	**104**	**255**			

a. Measurement discrepancies due to errors in measurement at release or recapture.

* Assigned age changed to reflect known age or known stocking cohort.

Table 9: Original capture date and biological data for fish recaptured in gillnets, fall 2016. Grey highlighted cells indicate stocked hatchery fish (continued).

Location	Floy-tag #	Pit-tag No.	Zone	Date	Fork Length (mm)	Total Length (mm)	Weight (g)	Age	Distance (km)	Days Between Capture
Gull Lake	112544	900 067000055050	GL-B	17-Sep-16	320	367	280	2*	0.91	453
	-	-	GL-B	30-Jun-15	176	202	34	1		
				Growth	**144**	**165**	**246**			
Gull Lake	112543	900 226000629452	GL-B	17-Sep-16	510	582	860	5	0.56	365
	-	-	GL-B	18-Sep-15	446	512	539	4	0.2	372
	-	-	GL-B	11-Sep-14	399	457	425	3	-	-
				Growth	**111**	**125**	**435**			
Gull Lake	89988	900 226000629293	GL-A	18-Sep-16	580	667	1320	8	0.22	370
	-	-	GL-A	14-Sep-15	559	640	1260	7	0.11	363
	-	-	GL-A	16-Sep-14	549	631	1100	6	-	-
				Growth	**31**	**36**	**220**			
Gull Lake	103125	900 226000893538	GL-B	18-Sep-16	670	771	1940	8	-	1116
	-	-	-	29-Aug-13	518	607	875	-	-	
				Growth	**152**	**164**	**1065**			
Gull Lake	112530	900 067000055302	GL-B	18-Sep-16	371	432	340	2*	1.24	368
	-	-	GL-B	16-Sep-15	299	348	136	1		
				Growth	**72**	**84**	**204**			
Gull Lake	94010	900 226000893733	BR-D	21-Sep-16	836	948	4520	-	16.56	2290
	-	-	GL-B	15-Jun-10	590	675	1500	-		
				Growth	**246**	**273**	**3020**			
Gull Lake	107722	900 226000153819	GL-B	21-Sep-16	681	775	2460	10	3.08	94
	-	-	GL-B	19-Jun-16	571	761	2722	-		
				Growth	**110[a]**	**14**	**-262[a]**			
Gull Lake	82833	900 226000629417	GL-B	21-Sep-16	625	725	1980	8	1.4	740
	-	-	GL-B	12-Sep-14	565	655	1400	6		
				Growth	**60**	**70**	**580**			

a. Measurement discrepancies due to errors in measurement at release or recapture.

* Assigned age changed to reflect known age or known stocking cohort.

Table 9: Original capture date and biological data for fish recaptured in gillnets, fall 2016. Grey highlighted cells indicate stocked hatchery fish (continued).

Location	Floy-tag #	Pit-tag No.	Zone	Date	Fork Length (mm)	Total Length (mm)	Weight (g)	Age	Distance (km)	Days Between Capture
Gull Lake	111009	900 067000055441	GL-B	21-Sep-16	381	437	400	2*	0.12	371
	-	-	GL-B	16-Sep-15	322	369	176	1		
				Growth	**59**	**68**	**224**			
Gull Lake	103545	900 226000893646	GL-A	22-Sep-16	610	698	1760	8	2.37	1475
	-	-	GL-A	8-Sep-12	432	501	450	4		
				Growth	**178**	**197**	**1310**			
Stephens Lake	94242	900 226000767108	STL-A	14-Sep-16	640	721	2120	9*	0.31	1458
	-	-	STL-A	17-Sep-12	423	481	-	5	2.53	719
	-	-	STL-B	29-Sep-10	307	345	220	3	-	-
				Growth	**333**	**376**	**1900**			
Stephens Lake	101042	900 226000629370	STL-A	15-Sep-16	650	735	2280	8	2.25	727
	-	-	STL-B	19-Sep-14	578	645	1750	6		
				Growth	**72**	**90**	**530**			
Stephens Lake	101996	900 226000703426	STL-A	15-Sep-16	683	766	2720	8	2.78	356
	-	-	STL-B	25-Sep-15	632	684	2000	7		
				Growth	**51**	**82**	**720**			
Stephens Lake	94230	900 226000767130	STL-A	16-Sep-16	721	829	3450	9*	0.25	1460
	-	-	STL-A	17-Sep-12	468	545	850	5	2.66	720
	-	-	STL-B	28-Sep-10	332	389	260	3		-
				Growth	**389**	**440**	**3190**			
Stephens Lake	69873	900 226000768819	STL-A	16-Sep-16	612	696	1850	8	2.76	1817
	-	-	STL-B	26-Sep-11	402	456	600	3		
				Growth	**210**	**240**	**1250**			
Stephens Lake	94964	900 226000768809	STL-A	16-Sep-16	705	796	2950	8	0.1	1459
	-	-	STL-A	18-Sep-12	451	519	700	4		
				Growth	**254**	**277**	**2250**			

a. Measurement discrepancies due to errors in measurement at release or recapture.

* Assigned age changed to reflect known age or known stocking cohort.

Table 9: Original capture date and biological data for fish recaptured in gillnets, fall 2016. Grey highlighted cells indicate stocked hatchery fish (continued).

Location	Floy-tag #	Pit-tag #	Zone	Date	Fork Length (mm)	Total Length (mm)	Weight (g)	Age	Distance (km)	Days Between Capture
Stephens Lake	110582	900 067000055566	STL-B	17-Sep-16	416	471	440	2*	3.01	369
	-	-	STL-A	14-Sep-15	335	395	224	1		
				Growth	**81**	**76**	**216**			
Stephens Lake	93924	900 226000577243	STL-A	17-Sep-16	1000	1099	8400	-	2.41	1557
	-	-	STL-B	13-Jun-12	884	976	5216	-		
				Growth	**116**	**123**	**3184**			
Stephens Lake	101498	900 226000628221	STL-A	17-Sep-16	652	686	1880	8	2.74	351
	-	-	STL-B	2-Oct-15	624	656	1450	-		
				Growth	**28**	**30**	**430**			
Stephens Lake	110558	900 067000055326	STL-A	18-Sep-16	380	436	260	2*	3.22	454
	-	-	STL-B	22-Jun-15	198	231	46	1		
				Growth	**182**	**205**	**214**			
Stephens Lake	110559	900 067000055361	STL-A	18-Sep-16	418	492	440	2*	3.22	454
	-	-	STL-B	22-Jun-15	236	279	75	1		
				Growth	**182**	**213**	**365**			
Stephens Lake	103609	900 226000768858	STL-B	19-Sep-16	824	890	4560	12*	0.23	1465
	-	-		15-Sep-12	595	693	3000	7		
				Growth	**229**	**197**	**1560**			
Stephens Lake	101998	900 226000548920	STL-B	19-Sep-16	700	788	2960	9	0.54	360
	-	-	STL-B	25-Sep-15	691	760	2400	8		
				Growth	**9**	**28**	**560**			
Stephens Lake	110566	900 067000055559	STL-B	21-Sep-16	392	453	320	2*	14.43	373
	-	-	GL-C	14-Sep-15	324	368	155	1		
				Growth	**68**	**85**	**165**			
Stephens Lake	101040	900 226000629322	STL-B	21-Sep-16	712	862	2970	8	3.27	733
	-	-	STL-A	19-Sep-14	641	731	2100	6		
				Growth	**71**	**131**	**870**			

a. Measurement discrepancies due to errors in measurement at release or recapture.

* Assigned age changed to reflect known age or known stocking cohort.

Table 9: Original capture date and biological data for fish recaptured in gillnets, fall 2016. Grey highlighted cells indicate stocked hatchery fish (continued).

Location	Floy-tag #	Pit-tag #	Zone	Date	Fork Length (mm)	Total Length (mm)	Weight (g)	Age	Distance (km)	Days Between Capture
Stephens Lake	110464	900 226000628725	STL-B	21-Sep-16	791	882	3790	-	4.85	94
	-	-	STL-A	19-Jun-16	770	853	3629	-		
				Growth	**21**	**29**	**161**			
Stephens Lake	100165	900 226000153445	STL-A	21-Sep-16	810	910	4640	10	0.34	1459
	-	-	STL-A	23-Sep-12	640	725	2000	6		
				Growth	**170**	**185**	**2640**			
Stephens Lake	103621	900 226000768866	STL-A	23-Sep-16	652	735	2010	8	3.09	1467
	-	-	STL-B	17-Sep-12	443	505	650	4		
				Growth	**209**	**230**	**1360**			
Stephens Lake	109995	900 067000055344	STL-A	23-Sep-16	363	418	280	2	0.11	375
	-	-	STL-A	14-Sep-15	285	335	130	1		
				Growth	**78**	**83**	**150**			
Upper Split Lake Area	103849	1380347913	SPL-A	8-Sep-16	755	840	-	8	0.96	1170
	-	-	SPL-A	26-Jun-13	556	626	1247	5		
				Growth	**199**	**214**	**-**			
Upper Split Lake Area	56578	900 226000629318	KGS-C	9-Sep-16	925	1015	7180	-	4.48	759
	-	-	SPL-A	12-Aug-14	894	1015	4370	-		
				Growth	**31**	**0**	**2810**			
Upper Split Lake Area	103830	900 043000119453	BWR-B	14-Sep-16	339	381	300	3*	10.32	852
	-	-	BWR-A	16-May-14	214	247	65	1		
				Growth	**125**	**134**	**235**			

a. Measurement discrepancies due to errors in measurement at release or recapture.

* Assigned age changed to reflect known age or known stocking cohort.

FIGURES

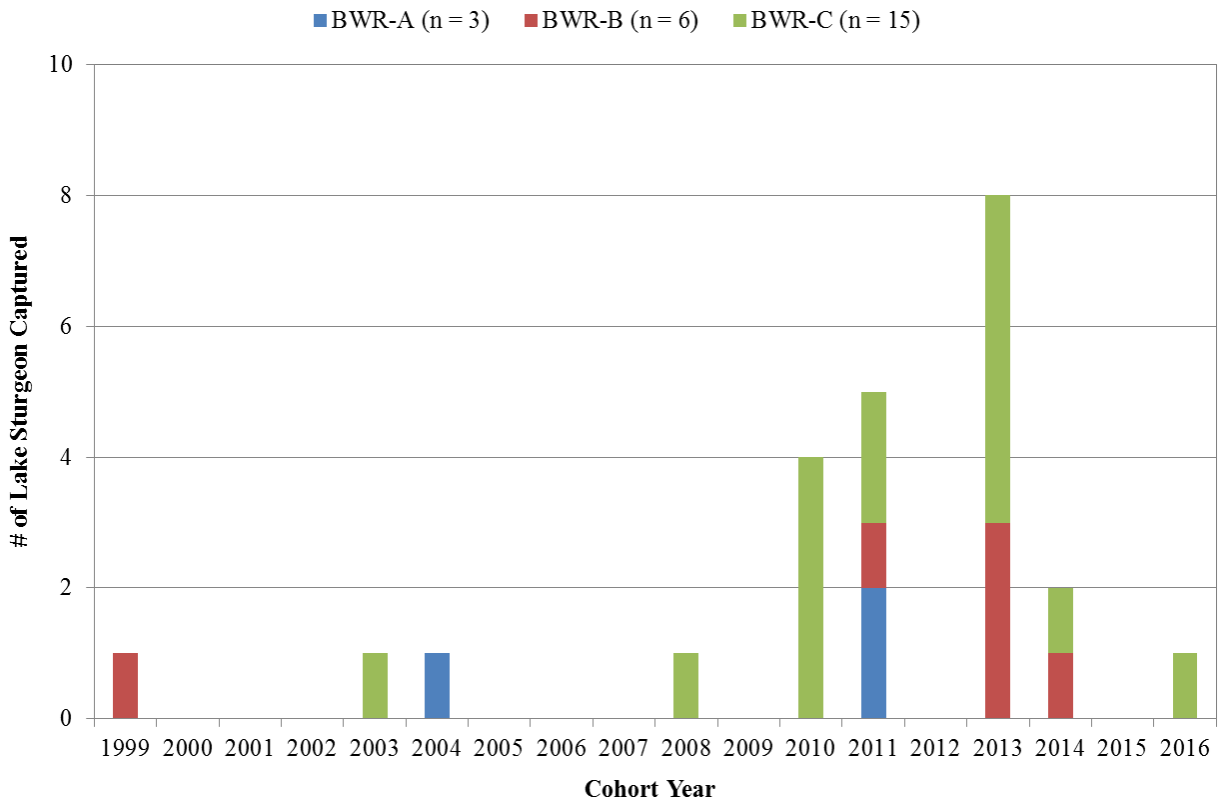


Figure 1: Cohort frequency distributions by zone, for all aged Lake Sturgeon captured in the Burntwood River, fall 2016.

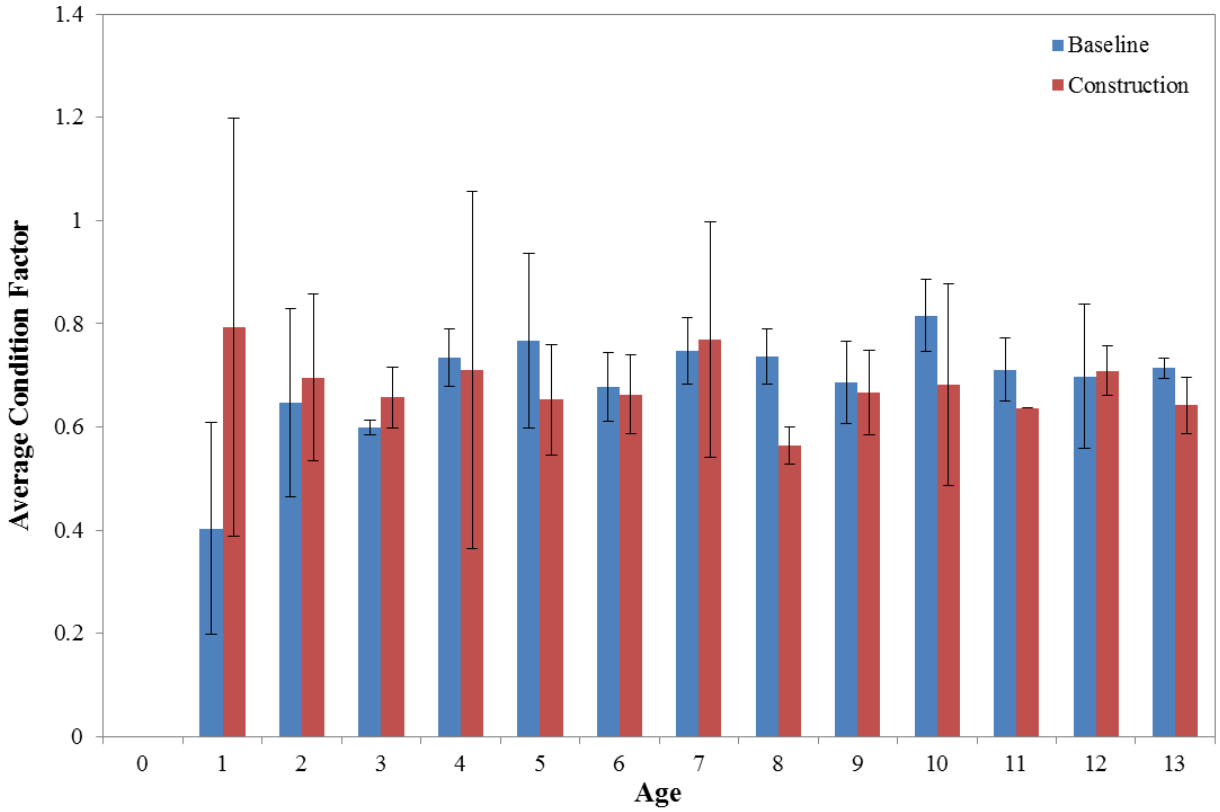


Figure 2: **Mean condition factor-at-age for Lake Sturgeon captured in the Burntwood River during baseline studies (red bars) and during the construction period (blue bars). Error bars represent standard deviations. There were not enough baseline or construction data to allow for significance testing.**

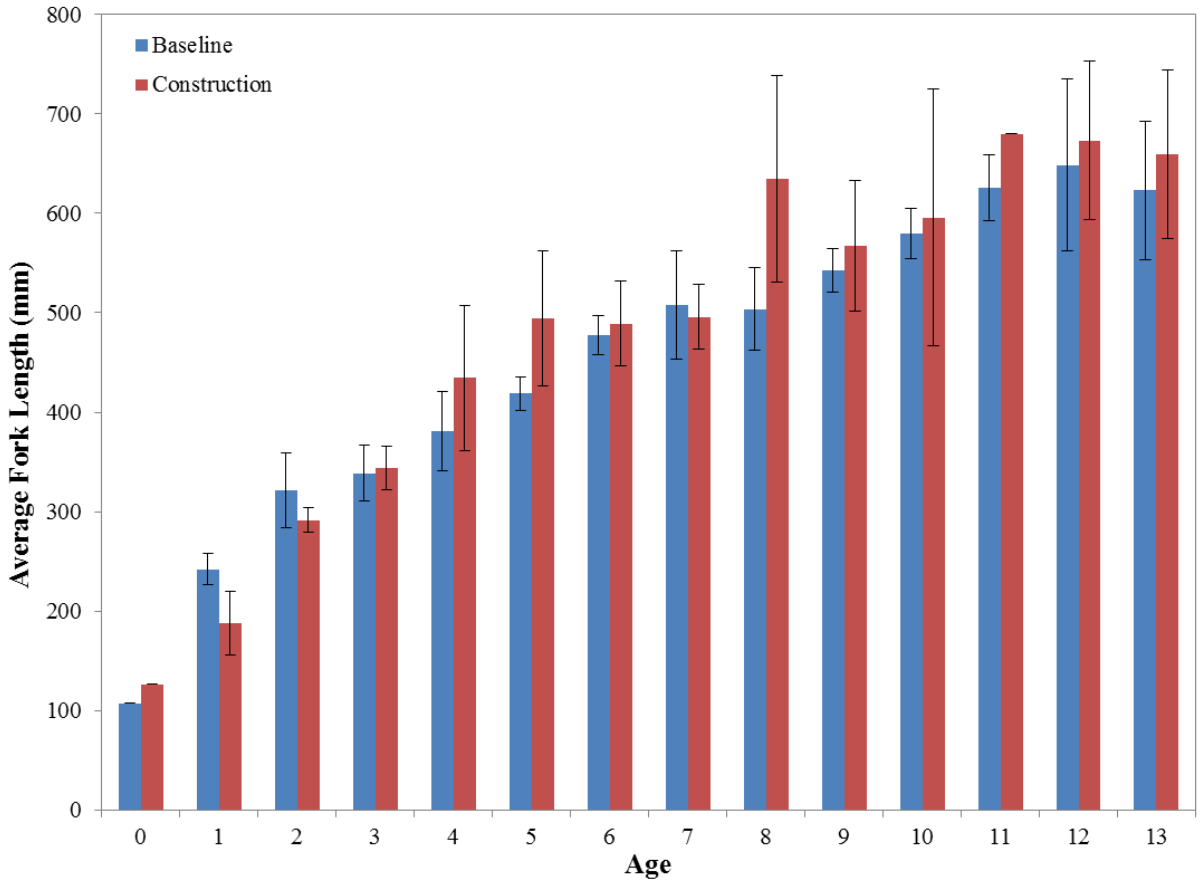


Figure 3: Mean fork length-at-age for Lake Sturgeon captured in the Burntwood River during baseline studies (red bars) and the construction period (blue bars). Error bars represent standard deviations. There were not enough baseline or construction data to allow for significance testing.

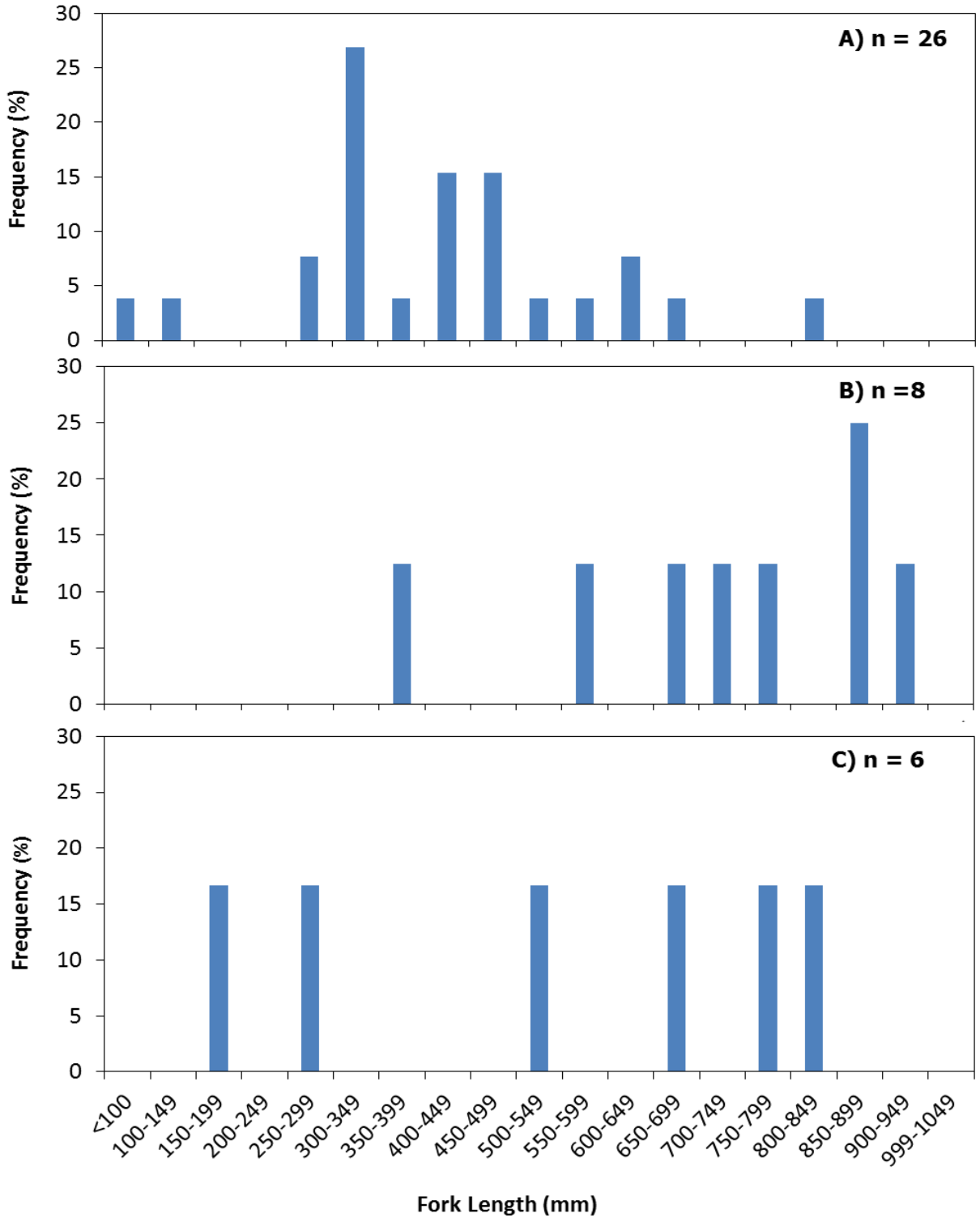


Figure 4: **Length-frequency distributions for Lake Sturgeon captured in gillnets set in the Upper Split Lake Area: A) the Burntwood River, B) the Kelsey GS Area, and C) Split Lake, fall 2016.**

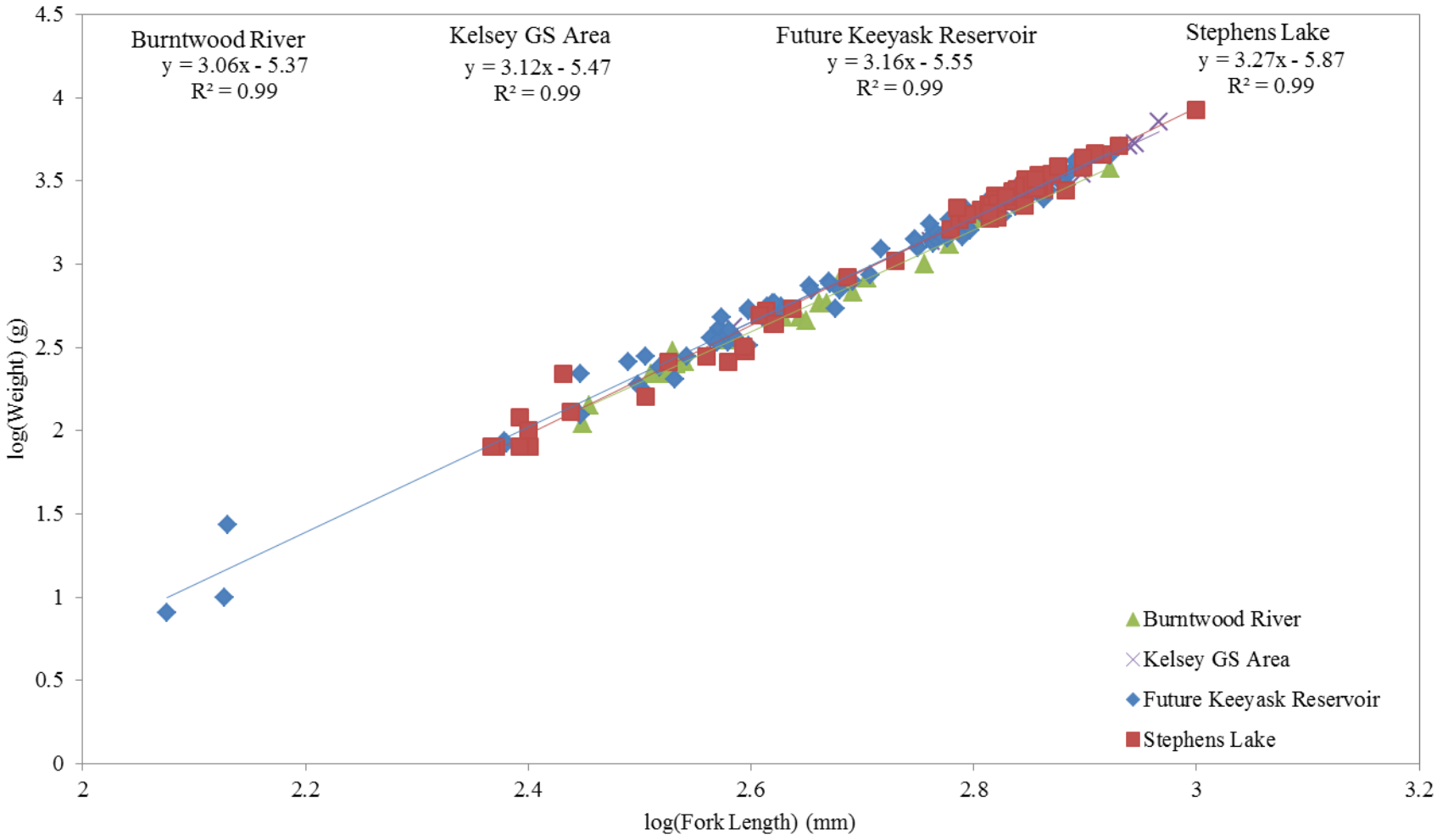


Figure 5: **Comparison of weight (g) at fork length (mm) (log transformed) for Lake Sturgeon captured in the vicinity of the Kelsey Generating Station, the Burntwood River, the future Keeyask reservoir, and Stephens Lake, fall 2016. Split Lake is not included in the regression due to low numbers of Lake Sturgeon captured.**

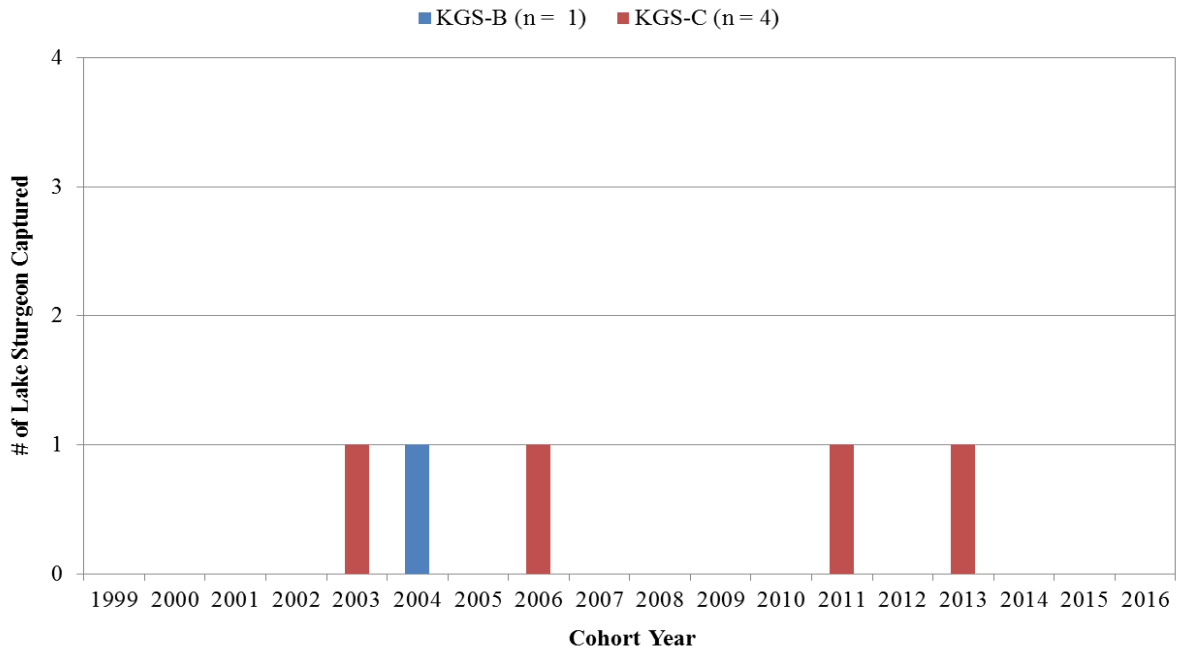


Figure 6: Cohort frequency distributions by zone, for all aged Lake Sturgeon captured in the Kelsey GS Area, fall 2016.

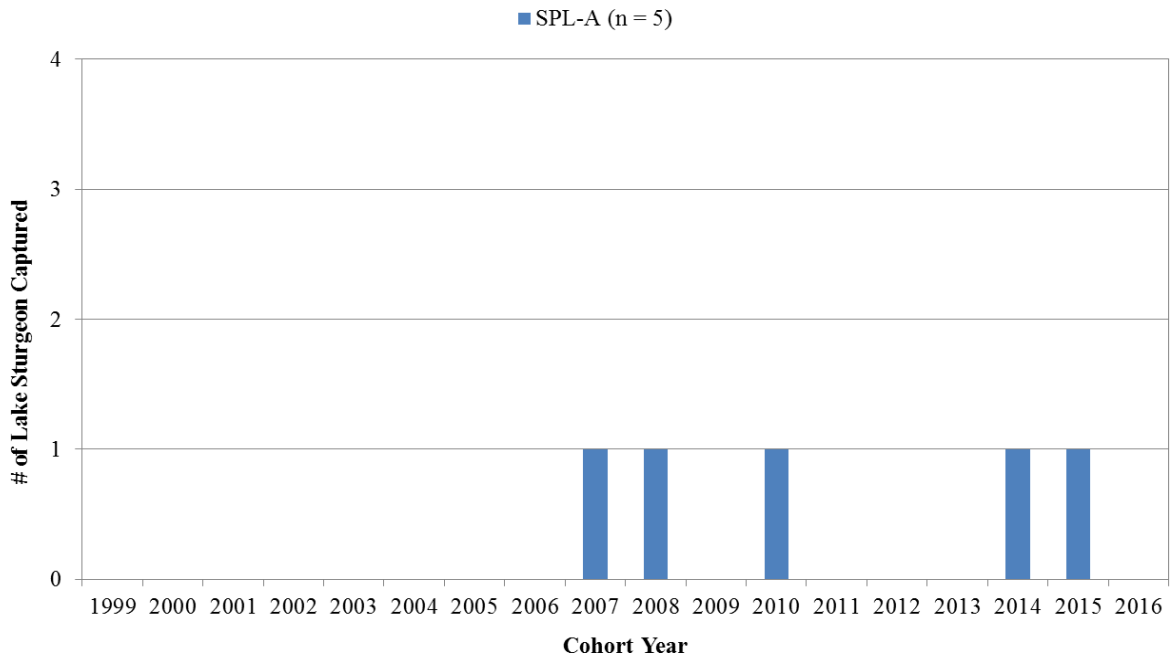


Figure 7: Cohort frequency distributions for all aged Lake Sturgeon captured in zone SPL-A of Split Lake, fall 2016.

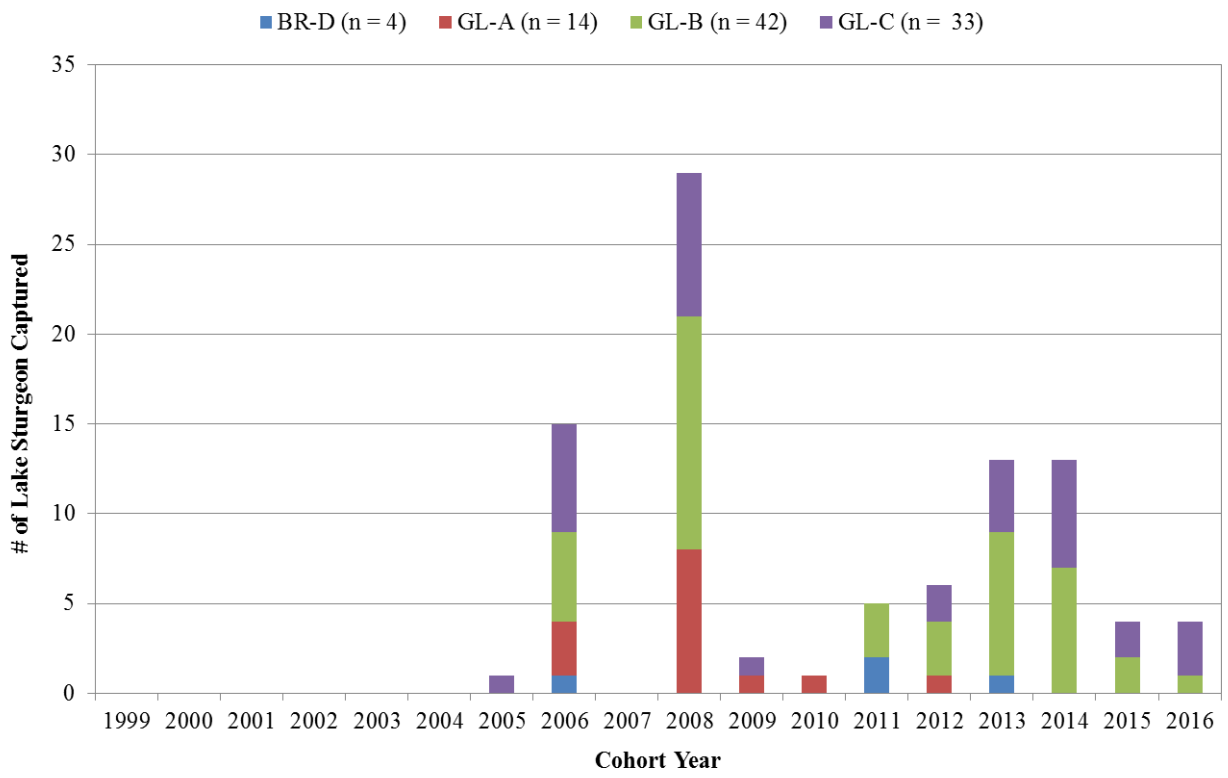


Figure 8: Cohort frequency distributions by zone, for all aged Lake Sturgeon captured in the future Keeyask reservoir, fall 2016.

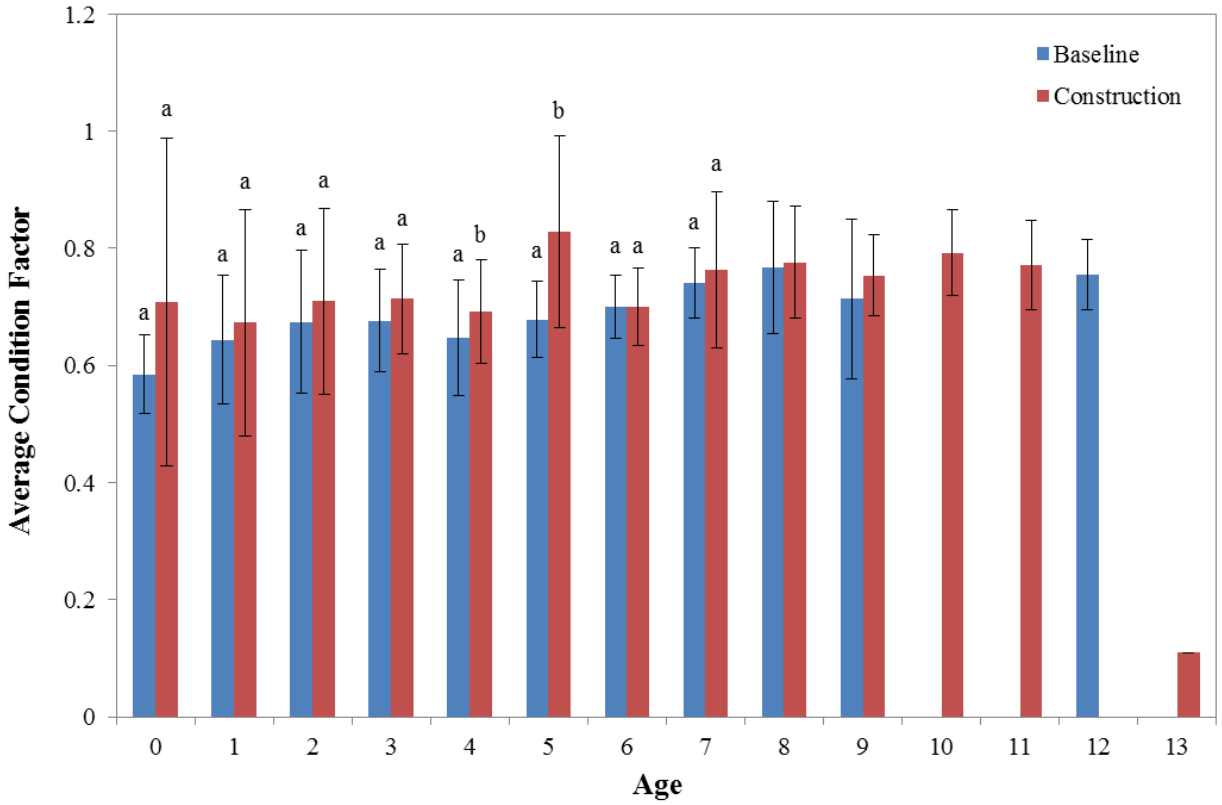


Figure 9: **Mean condition factor-at-age for Lake Sturgeon captured in the future Keeyask reservoir during baseline studies (red bars) and the construction period (blue bars). Letters denote significant differences between groups (Mann Whitney U test, $p < 0.05$). Statistical comparisons only conducted where sample sizes were greater than eight individuals. Error bars represent standard deviations.**

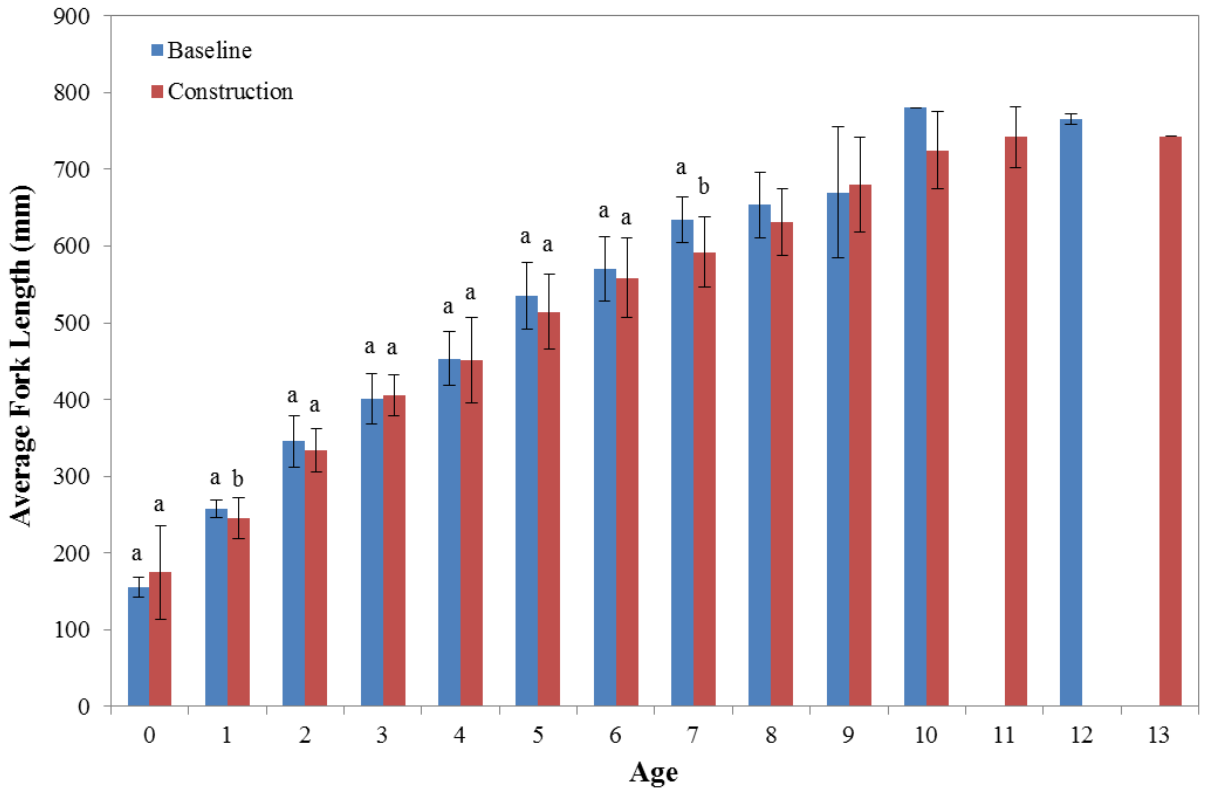


Figure 10: **Mean fork length-at-age for Lake Sturgeon captured in the future Keeyask reservoir during baseline studies (red bars) and the construction period (blue bars). Letters denote significant differences between groups (Mann Whitney U test, $p < 0.05$). Statistical comparisons only conducted where sample sizes were greater than eight individuals. Error bars represent standard deviations.**

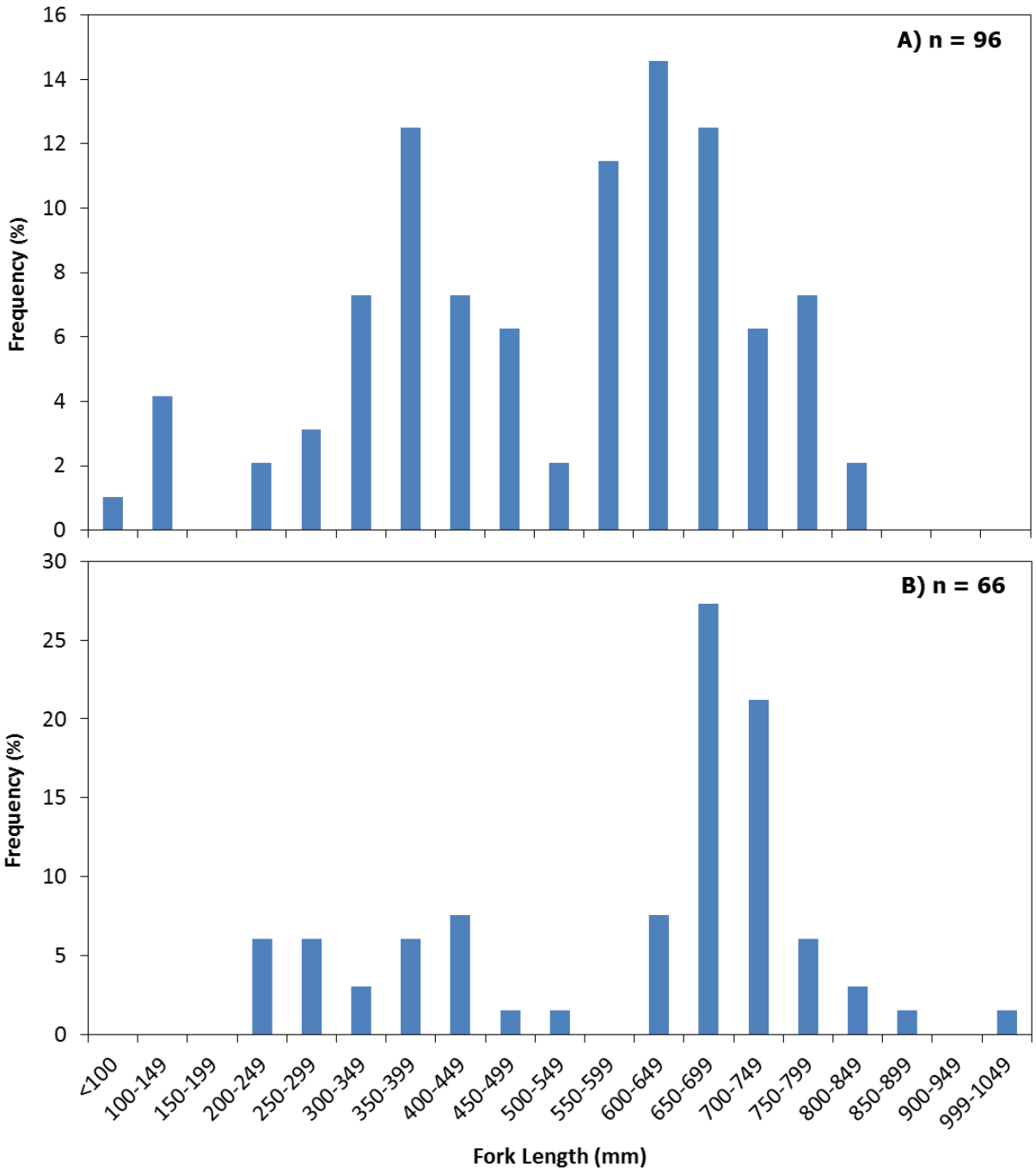


Figure 11: Length-frequency distributions for Lake Sturgeon captured in gillnets set in: A) the future Keeyask reservoir and B) Stephens Lake, fall 2016.

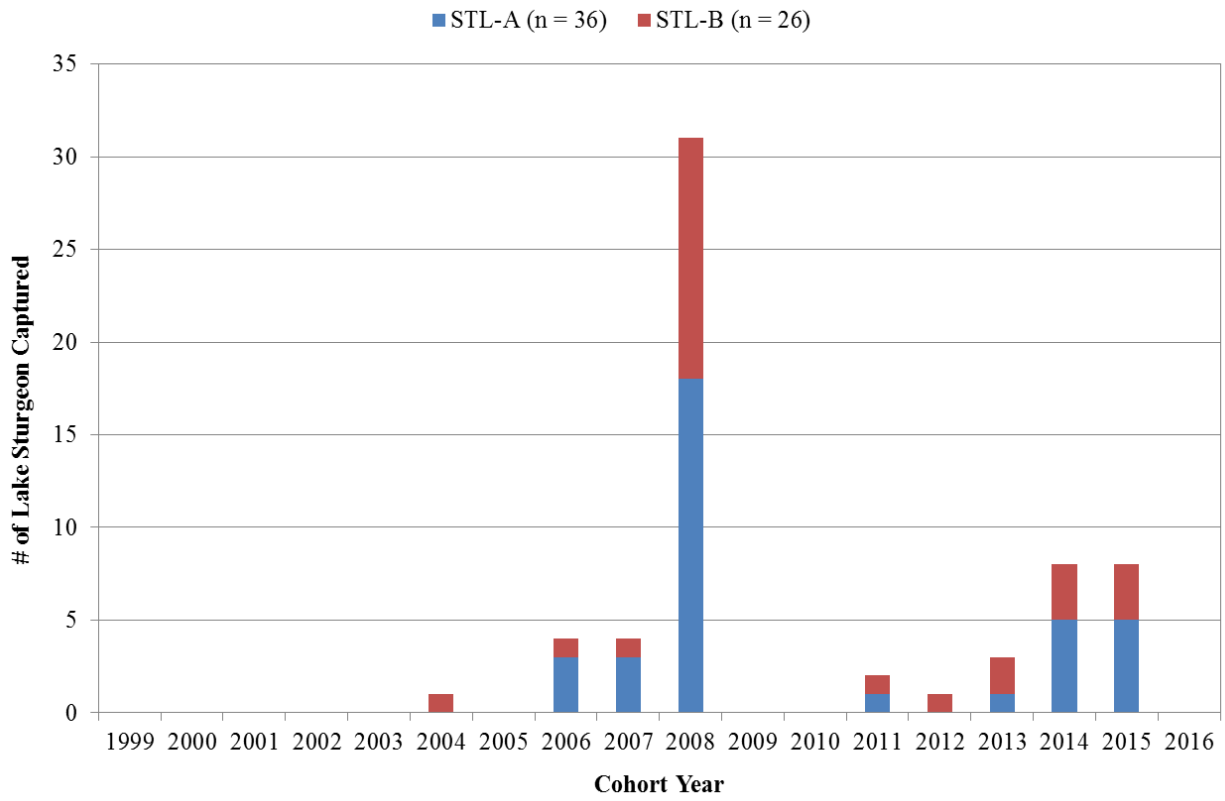


Figure 12: Cohort frequency distributions by zone, for all aged Lake Sturgeon captured in Stephens Lake, fall 2016.

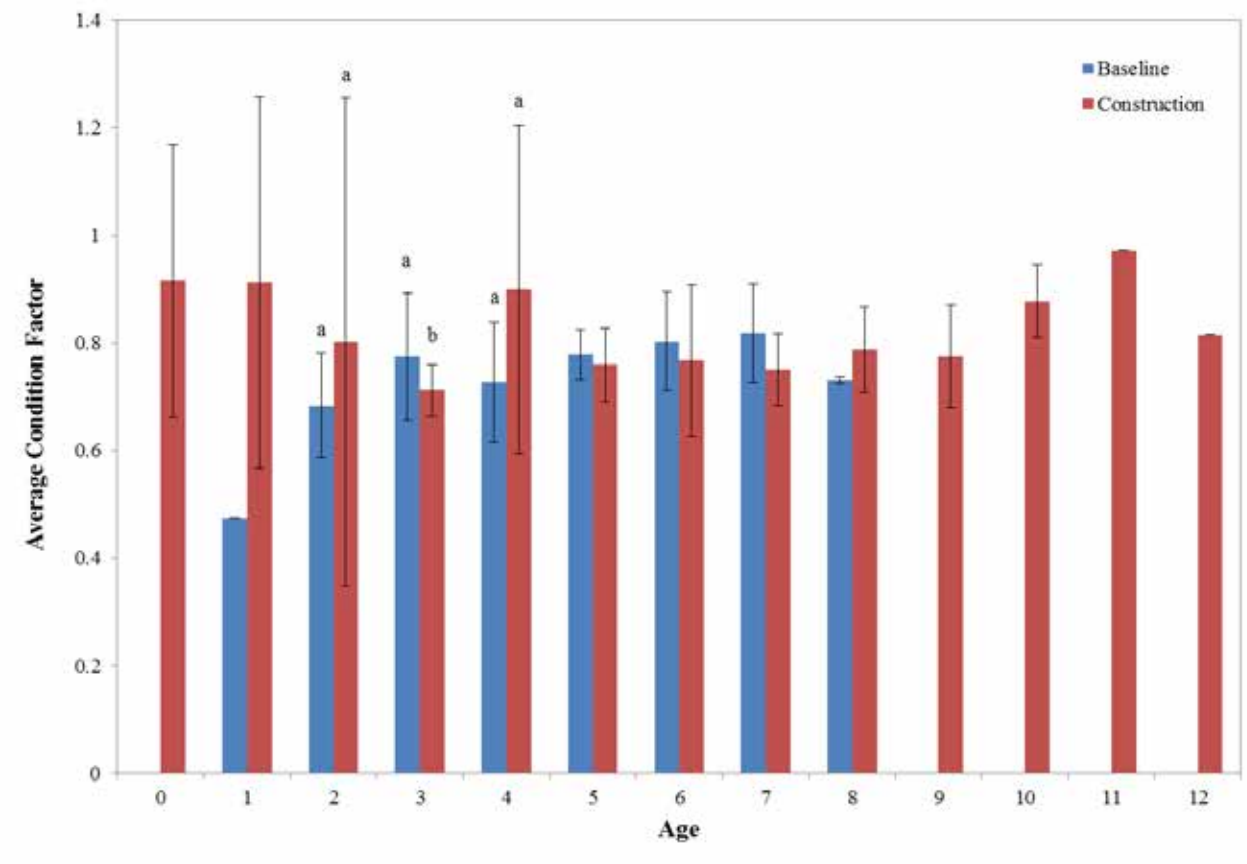


Figure 13: **Mean condition factor-at-age for Lake Sturgeon captured in Stephens Lake during baseline studies (red bars) and the construction period (blue bars).Letters denote significant differences between groups (Mann Whitney U test, $p < 0.05$). Statistical comparisons only conducted where sample sizes were greater than eight individuals. Error bars represent standard deviations.**

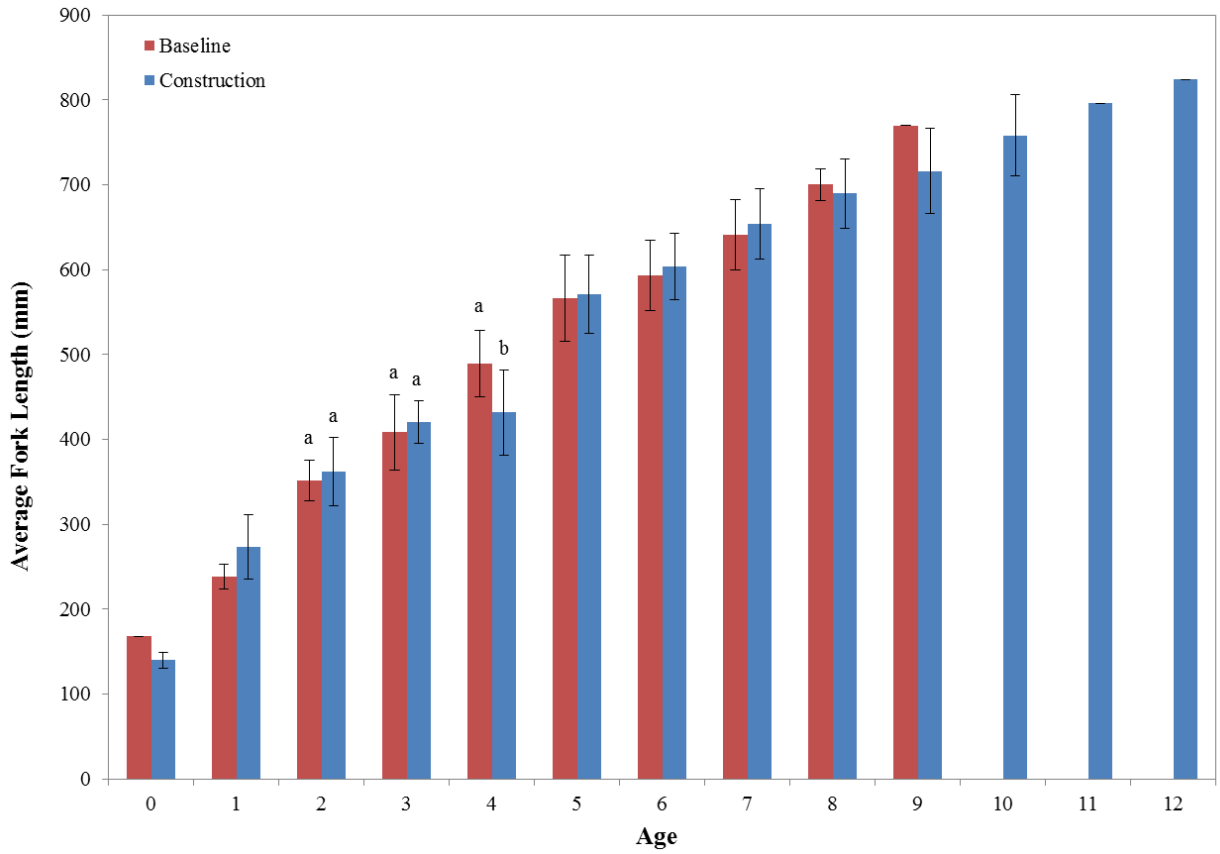


Figure 14: **Mean fork length-at-age for Lake Sturgeon captured Stephens Lake during baseline studies (red bars) and the construction period (blue bars). Letters denote significant differences between groups (Mann Whitney U test, $p < 0.05$). Statistical comparisons only conducted where sample sizes were greater than eight individuals. Error bars represent standard deviations.**

Figure 15: Sea Falls to Sugar Falls reach of the Nelson River (from McDougall and Nelson 2016).

MAPS

KEEYASK

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	07-JUN-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

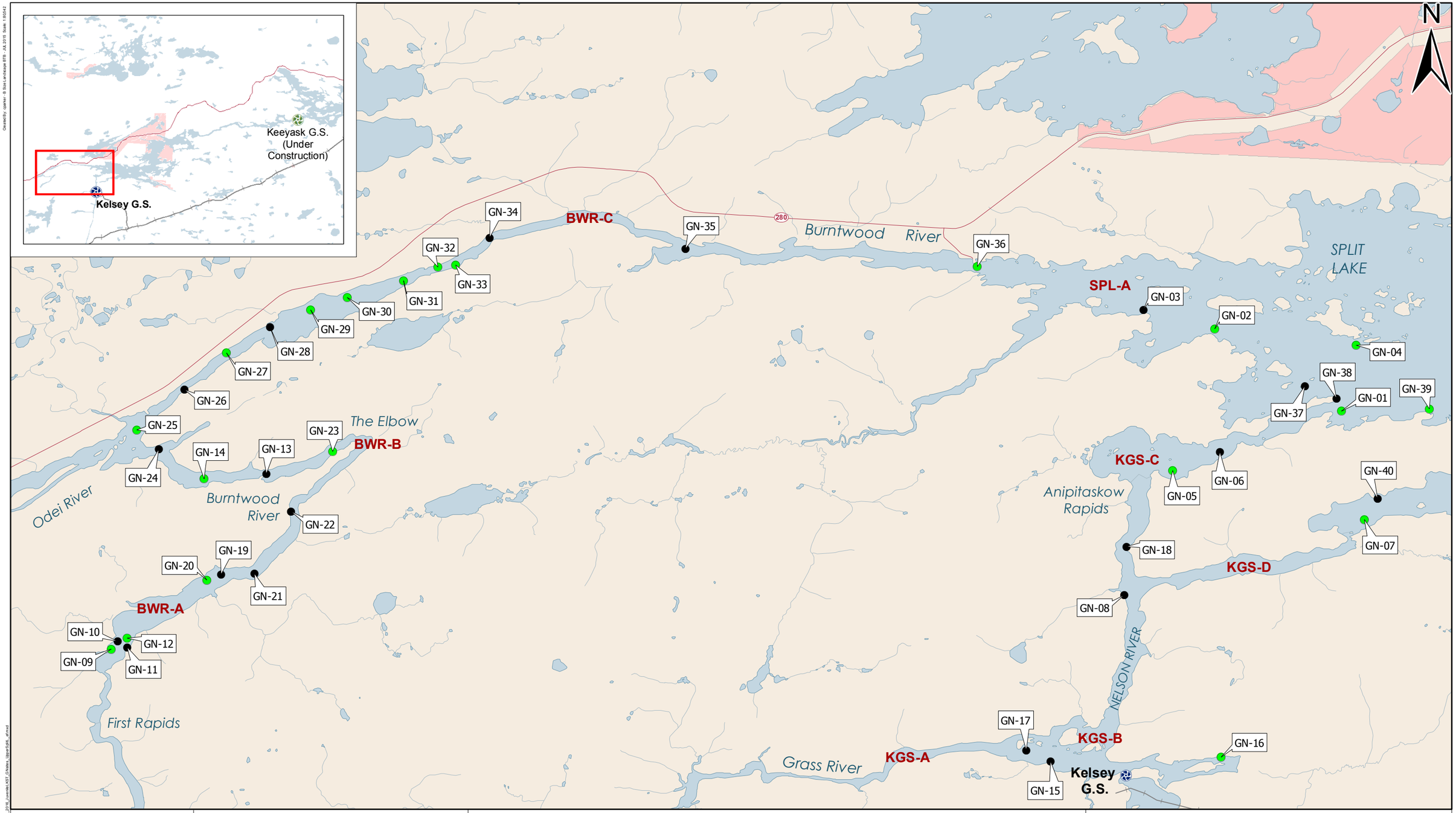
Keeyask G.S. Site and Juvenile Lake Sturgeon Population Monitoring Study Setting

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

DATA SOURCE: Orthophoto: Manitoba Hydro - Sep 2016		
CREATED BY: North/South Consultants		
COORDINATE SYSTEM: UTM NAD 1983 Z15N	DATE CREATED: 17-MAR-17	REVISION DATE: 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 2: **Map of intream structures at the Keeyask Generating Station site, September 2016.**



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	31-OCT-16
0 0.45 0.9 Kilometres 0 0.35 0.7 Miles	VERSION NO: 1.0	QA/QC: CMP/YYY/ZZZ

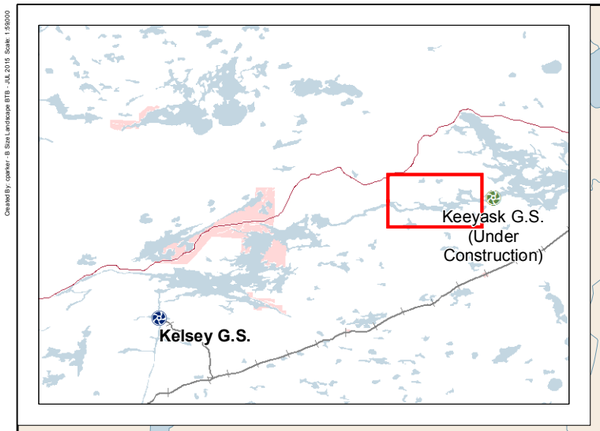
Legend

- Capture Site
- Non-capture Site
- Generating Station (Existing)
- Generating Station (Under Construction)
- Zones
- Highway
- Rail
- First Nation Reserve

2016 Juvenile Lake Sturgeon Gillnetting Sites

Upper Split Lake Area

Map 3: Sites fished with gill nets in the Upper Split Lake Area (Burntwood River, Kelsey GS Area, and Split Lake), fall 2016.



N

North Access Road

Effie Creek

Hidden Creek

Trickle Creek

Caribou Island

Portage Creek

Rabbit Creek

Seebeesis Creek

GL-A

GL-B

GL-C

BR-D

GN-01
GN-02
GN-03
GN-04
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GN-32
GN-33
GN-34
GN-35
GN-36
GN-37

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

CREATED BY:
North/South Consultants

COORDINATE SYSTEM: UTM NAD 1983 Z14N

DATE CREATED: 09-FEB-15

REVISION DATE: 31-OCT-16

0 0.55 1.1 Kilometres
0 0.5 1 Miles

VERSION NO: 1.0

QA/QC: CMP/YYY/ZZZ

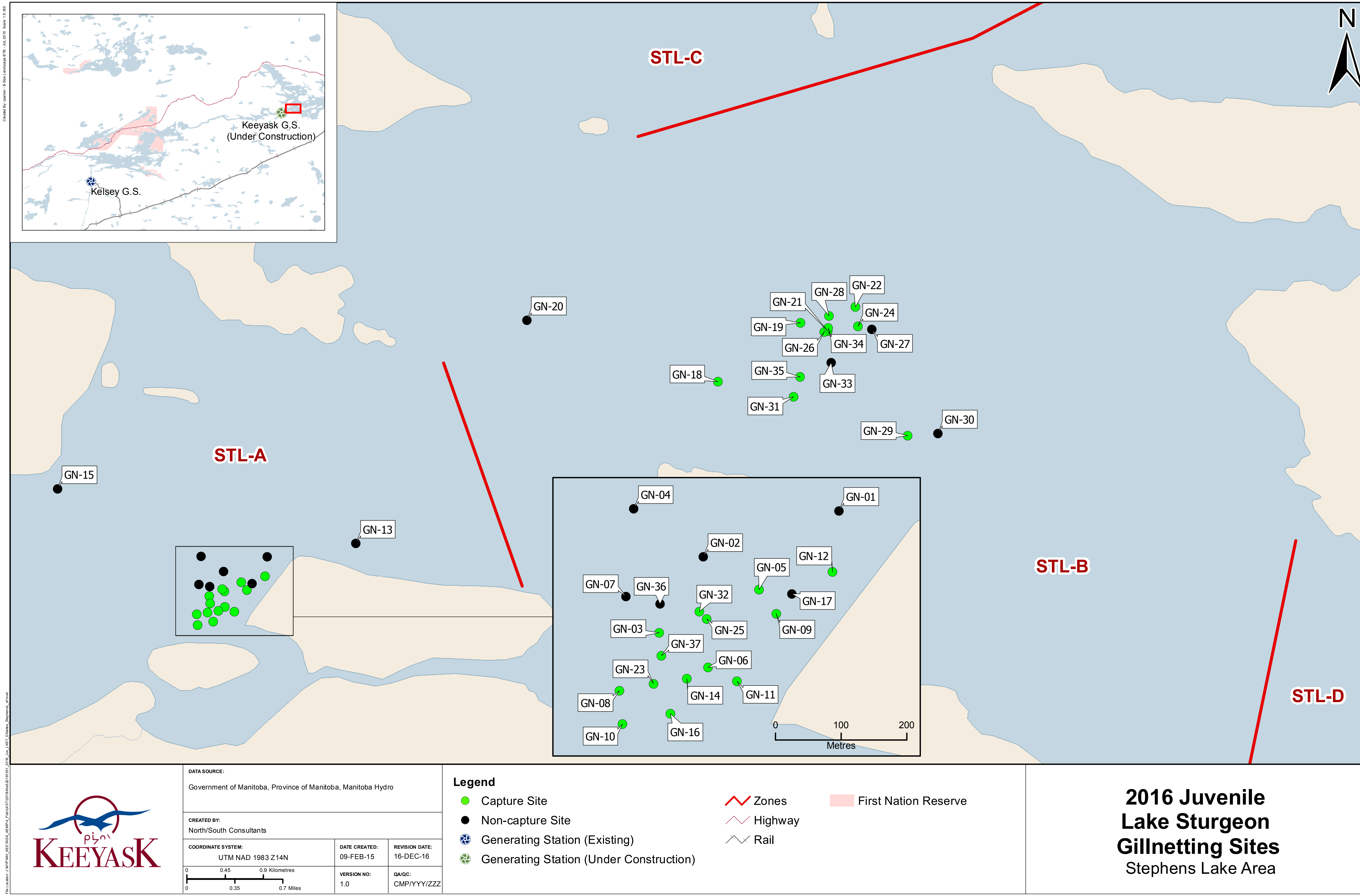
Legend

- Capture Site
- Non-capture Site
- Generating Station (Existing)
- Generating Station (Under Construction)
- Zones
- Highway
- First Nation Reserve

2016 Juvenile Lake Sturgeon Gillnetting Sites

Gull Lake

Map 4: Sites fished with gill nets upstream of Gull Rapids, fall 2016.



Map 5: **Sites fished with gill nets in Stephens Lake, fall 2016.**

PHOTOS

Photo 1: PIT tag is applied under the third dorsal scute using an injector needle dipped in Polysporin®.

Photo 2: PIT tag is injected into the muscle tissue, parallel to the horizontal axis of the fish.

Photo 3: Injection site following tag application

APPENDICES

APPENDIX 1:
LOCATIONS AND SITE SPECIFIC PHYSICAL MEASUREMENTS COLLECTED AT GILLNETTING SITES, FALL 2016.

Table A1-1: Location and site-specific physical measurements collected at gillnetting sites during juvenile Lake Sturgeon investigations conducted in the Upper Split Lake Area, fall, 2016. Sites set in each region are indicated as follows Burntwood River (BWR), Kelsey GS Area (KGS), and Split Lake (SPL).

Site	Reach	UTM Location		Set Date & Time	Set Water Temp (°C)	Pull Date & Time	Pull Water Temp (°C)	Duration (dec.hrs)	Water Depth (m)	
		Easting	Northing						Start	End
GN-01	SPL	657498	6221840	7-Sep-16	17	8-Sep-16	16.5	18.35	12.2	13.3
GN-02	SPL	654516	6223430	7-Sep-16	17	8-Sep-16	16.5	18.92	3.8	3.7
GN-03	SPL	652891	6223711	7-Sep-16	17	8-Sep-16	16.5	19.7	5.2	5.2
GN-04	SPL	657691	6223336	7-Sep-16	17	9-Sep-16	16	50.9	4.7	5.3
GN-05	KGS	653853	6220191	8-Sep-16	16.5	9-Sep-16	16	22.15	16	15.5
GN-06	KGS	654869	6220699	8-Sep-16	16.5	9-Sep-16	16	22.58	14.9	14.4
GN-07	KGS	658219	6219467	8-Sep-16	16.5	9-Sep-16	16	18.75	9.9	8.3
GN-08	KGS	653010	6217321	8-Sep-16	16.5	9-Sep-16	16	19.17	5.2	5.5
GN-09	BWR	630555	6214154	9-Sep-16	16	10-Sep-16	15.5	17.15	3.7	10.1
GN-10	BWR	630687	6214333	9-Sep-16	16	10-Sep-16	15.5	17.5	8.7	10.3
GN-11	BWR	630909	6214229	9-Sep-16	16	10-Sep-16	15.5	18.03	6.8	4.6
GN-12	BWR	630896	6214425	9-Sep-16	16	10-Sep-16	15.5	18.37	14.2	12.1
GN-13	BWR	633669	6218356	10-Sep-16	15.5	12-Sep-16	15	43.53	11.5	11.5
GN-14	BWR	632302	6218125	10-Sep-16	15.5	12-Sep-16	15	42.75	9.7	10.2
GN-15	KGS	651693	6213482	10-Sep-16	15.5	11-Sep-16	16	17.93	-	23.4
GN-16	KGS	655488	6213903	10-Sep-16	15.5	11-Sep-16	16	17.05	11.1	3.1
GN-17	KGS	651136	6213675	11-Sep-16	16	12-Sep-16	15	18.22	3.7	5.7
GN-18	KGS	652974	6218405	11-Sep-16	16	12-Sep-16	15	18.37	7.3	5.1
GN-19	BWR	632859	6216030	12-Sep-16	15	13-Sep-16	14.5	19.9	4.2	13
GN-20	BWR	632552	6215877	12-Sep-16	15	13-Sep-16	14.5	19.32	11.8	13.4
GN-21	BWR	633607	6216107	12-Sep-16	15	13-Sep-16	14.5	19.97	5.7	5.5
GN-22	BWR	634295	6217567	12-Sep-16	15	13-Sep-16	14.5	20.08	8.7	8.7
GN-23	BWR	635110	6218988	13-Sep-16	14.5	14-Sep-16	14	22.97	9.8	7.7

Table A1-1: Location and site-specific physical measurements collected at gillnetting sites during juvenile Lake Sturgeon investigations conducted in the Upper Split Lake Area, fall, 2016. Sites set in each region are indicated as follows Burntwood River (BWR), Kelsey GS Area (KGS), and Split Lake (SPL) (continued).

Site	Reach	UTM Location		Set Date & Time	Set Water Temp (°C)	Pull Date & Time	Pull Water Temp (°C)	Duration (dec.hrs)	Water Depth (m)	
		Easting	Northing						Start	End
GN-24	BWR	631229	6218698	13-Sep-16	14.5	14-Sep-16	14	21.28	6.9	15.1
GN-25	BWR	630700	6219086	13-Sep-16	14.5	14-Sep-16	14	20.68	10.5	8.5
GN-26	BWR	631690	6220075	13-Sep-16	14.5	14-Sep-16	14	20.3	7.6	12.6
GN-27	BWR	632555	6220963	14-Sep-16	14	15-Sep-16	14	24.3	7.6	7.2
GN-28	BWR	633474	6221634	14-Sep-16	14	15-Sep-16	14	18.48	6.7	7.4
GN-29	BWR	634347	6222093	14-Sep-16	14	15-Sep-16	14	18.67	5.1	11.5
GN-30	BWR	635139	6222436	14-Sep-16	14	15-Sep-16	14	19.12	14	12.5
GN-31	BWR	636357	6222919	15-Sep-16	14	16-Sep-16	13.5	20.32	13.1	13.2
GN-32	BWR	637096	6223295	15-Sep-16	14	16-Sep-16	13.5	19.87	10.5	11.2
GN-33	BWR	637488	6223374	15-Sep-16	14	16-Sep-16	13.5	19.18	3.5	13.6
GN-34	BWR	638183	6224045	15-Sep-16	14	16-Sep-16	13.5	18.58	12.7	9.1
GN-35	BWR	642565	6224181	16-Sep-16	13.5	17-Sep-16	14	19.48	11.4	11.5
GN-36	BWR	649109	6224348	16-Sep-16	13.5	17-Sep-16	14	19.9	9.2	11.4
GN-37	SPL	656634	6222328	16-Sep-16	13.5	17-Sep-16	14	20.2	5.3	9.7
GN-38	SPL	657359	6222119	16-Sep-16	13.5	17-Sep-16	14	21	5.2	11.5
GN-39	SPL	659447	6222059	17-Sep-16	-	18-Sep-16	14.5	19.93	13.8	8.6
GN-40	KGS	658475	6219961	17-Sep-16	-	18-Sep-16	14.5	19.1	8.7	10.9

Table A1-2: Location and site-specific physical measurements collected at gillnetting sites during juvenile Lake Sturgeon investigations conducted in Gull Lake, fall, 2016.

Site	UTM Location		Set Date & Time	Set Water Temp (°C)	Pull Date & Time	Pull Water Temp (°C)	Duration (dec.hrs)	Water Depth (m)	
	Easting	Northing						Start	End
GN-01	355533	6247267	12-Sep-16	15	13-Sep-16	15	22.02	10	8.8
GN-02	355151	6248056	12-Sep-16	15	13-Sep-16	15	23.28	11.9	11
GN-03	356843	6248218	12-Sep-16	15	13-Sep-16	15	23.9	15.2	12
GN-04	355247	6247164	13-Sep-16	15	14-Sep-16	14	22.65	10.1	9.5
GN-05	356102	6247865	13-Sep-16	15	14-Sep-16	14	22.97	9.2	8.4
GN-06	356696	6248033	13-Sep-16	15	14-Sep-16	14	23.48	7.7	8.2
GN-07	354475	6244849	14-Sep-16	14	15-Sep-16	14	27.3	12.8	16.1
GN-08	356161	6247839	14-Sep-16	14	15-Sep-16	14	27.87	8.5	7.8
GN-09	355189	6247074	14-Sep-16	14	15-Sep-16	14	25.98	11.8	10.8
GN-10	354697	6244512	15-Sep-16	14	16-Sep-16	14	24.08	12.1	10.2
GN-11	354428	6244776	15-Sep-16	14	16-Sep-16	14	24	12.2	14.4
GN-12	355276	6246668	15-Sep-16	14	16-Sep-16	14	19.87	11.5	9.6
GN-13	356514	6248201	15-Sep-16	14	16-Sep-16	14	17.97	11.7	11.6
GN-14	348479	6244352	16-Sep-16	14	17-Sep-16	14	23.58	12	12.7
GN-15	338316	6245106	16-Sep-16	14	17-Sep-16	14	22	10.1	7.6
GN-16	354472	6244338	16-Sep-16	14	17-Sep-16	14	23.87	11.5	13.3
GN-17	353483	6244299	16-Sep-16	14	17-Sep-16	14	21.25	9.5	9.9
GN-18	338090	6245020	17-Sep-16	14	18-Sep-16	14	23.67	6.7	6.3
GN-19	348683	6244376	17-Sep-16	14	18-Sep-16	14	24.42	13.6	12.2
GN-20	353461	6244071	17-Sep-16	14	18-Sep-16	14	24.42	12.9	11.2
GN-21	354088	6244453	17-Sep-16	14	18-Sep-16	14	24.25	16.2	8.5
GN-22	338310	6245103	18-Sep-16	14	19-Sep-16	14	23.08	10.1	6.7
GN-23	348619	6244339	18-Sep-16	14	19-Sep-16	14	23	12.8	12.1

Table A1-2: Location and site-specific physical measurements collected at gillnetting sites during juvenile Lake Sturgeon investigations conducted in Gull Lake, fall, 2016 (continued).

Site	UTM Location		Set Date & Time	Set Water Temp (°C)	Pull Date & Time	Pull Water Temp (°C)	Duration (dec.hrs)	Water Depth (m)	
	Easting	Northing						Start	End
GN-24	353237	6243993	18-Sep-16	14	19-Sep-16	14	18.92	11.8	10.1
GN-25	354033	6244396	18-Sep-16	14	19-Sep-16	14	22.33	14.8	14.9
GN-26	346559	6243830	19-Sep-16	14	21-Sep-16	13	48.67	8.2	7
GN-27	338319	6245172	19-Sep-16	14	21-Sep-16	13	46.33	9.5	10.5
GN-28	349144	6244412	19-Sep-16	14	21-Sep-16	13	47.83	11	12.7
GN-29	354570	6244849	19-Sep-16	14	21-Sep-16	13	47.5	13.8	16.2
GN-30	345337	6243800	21-Sep-16	13	22-Sep-16	13	22.75	9.5	9.1
GN-31	347853	6243726	21-Sep-16	13	22-Sep-16	13	22.42	13.7	13.1
GN-32	349240	6244381	21-Sep-16	13	22-Sep-16	13	22.08	13.2	12.9
GN-33	354567	6244716	21-Sep-16	13	22-Sep-16	13	19.83	13.5	14.1
GN-34	346937	6244460	22-Sep-16	13	23-Sep-16	13	24.33	10.7	10.3
GN-35	347900	6243717	22-Sep-16	13	23-Sep-16	13	24.33	11.7	12.7
GN-36	349325	6244373	22-Sep-16	13	23-Sep-16	13	24.33	13.6	13.5
GN-37	355769	6246145	22-Sep-16	13	23-Sep-16	13	24.58	11.1	11.3

Table A1-3: Location and site-specific physical measurements collected at gillnetting sites during juvenile Lake Sturgeon investigations conducted in Stephens Lake, fall, 2016.

Site	UTM Location		Set Date & Time	Set Water Temp (°C)	Pull Date & Time	Pull Water Temp (°C)	Duration (dec.hrs)	Water Depth (m)	
	Easting	Northing						Start	End
GN-01	366808	6247508	12-Sep-16	15	13-Sep-16	15	23.58	15.5	14.4
GN-02	366601	6247438	12-Sep-16	15	13-Sep-16	15	24.42	16	16
GN-03	366534	6247322	12-Sep-16	15	13-Sep-16	15	23.75	16	18.4
GN-04	366495	6247511	13-Sep-16	15	14-Sep-16	15	23.17	17	17
GN-05	366686	6247388	13-Sep-16	15	14-Sep-16	15	24.88	21	19
GN-06	366608	6247269	13-Sep-16	15	14-Sep-16	14	22.3	20	20
GN-07	366483	6247377	13-Sep-16	15	14-Sep-16	14	23.17	19	19
GN-08	366473	6247234	14-Sep-16	14	15-Sep-16	14	26.28	16	22
GN-09	366712	6247351	14-Sep-16	14	15-Sep-16	14	24.13	17	16
GN-10	366478	6247183	14-Sep-16	14	15-Sep-16	14	25.55	15	19
GN-11	366652	6247248	14-Sep-16	14	15-Sep-16	14	23.42	20	21
GN-12	366798	6247415	15-Sep-16	14	16-Sep-16	14	23.95	18	18
GN-13	367231	6247572	15-Sep-16	14	16-Sep-16	14	23.75	17	17
GN-14	366576	6247252	15-Sep-16	14	16-Sep-16	14	20.35	20	18
GN-15	365810	6247832	15-Sep-16	14	16-Sep-16	14	22.6	15	16
GN-16	366551	6247199	16-Sep-16	14	17-Sep-16	14	25.88	16	20
GN-17	366736	6247381	16-Sep-16	14	17-Sep-16	14	24.4	21	15
GN-18	368956	6248341	16-Sep-16	14	17-Sep-16	14	21.4	15	16
GN-19	369349	6248622	16-Sep-16	14	17-Sep-16	14	21.92	20	21
GN-20	368045	6248635	16-Sep-16	14	17-Sep-16	14	22.02	19	19
GN-21	369478	6248583	17-Sep-16	14	18-Sep-16	14	24.58	19	25
GN-22	369610	6248699	17-Sep-16	14	18-Sep-16	14	23.82	21	21
GN-23	366525	6247244	17-Sep-16	14	18-Sep-16	14	24.48	17	23

Table A1-3: Location and site-specific physical measurements collected at gillnetting sites during juvenile Lake Sturgeon investigations conducted in Stephens Lake, fall, 2016 (continued).

Site	UTM Location		Set Date & Time	Set Water Temp (°C)	Pull Date & Time	Pull Water Temp (°C)	Duration (dec.hrs)	Water Depth (m)	
	Easting	Northing						Start	End
GN-24	369623	6248605	18-Sep-16	14	19-Sep-16	14	22.33	25	22
GN-25	366606	6247343	18-Sep-16	14	19-Sep-16	14	23.85	20	21
GN-26	369461	6248579	19-Sep-16	14	21-Sep-16	13	48.03	22	16.7
GN-27	369688	6248592	19-Sep-16	14	21-Sep-16	13	48.75	25	19.5
GN-28	369484	6248655	19-Sep-16	14	21-Sep-16	13	49.43	21	17
GN-29	369858	6248085	21-Sep-16	13	22-Sep-16	13	22.33	21	23
GN-30	370002	6248096	21-Sep-16	13	22-Sep-16	13	21.53	21	20
GN-31	369315	6248269	21-Sep-16	13	22-Sep-16	13	20.07	19	17
GN-32	366595	6247354	21-Sep-16	13	22-Sep-16	13	20.58	19	19
GN-33	369494	6248432	22-Sep-16	13	23-Sep-16	13	25.75	18	22
GN-34	369480	6248597	22-Sep-16	13	23-Sep-16	13	24.68	21	24
GN-35	369346	6248365	22-Sep-16	13	23-Sep-16	13	24.83	17	22
GN-36	366535	6247366	22-Sep-16	13	23-Sep-16	13	24.5	19	22
GN-37	366537	6247287	22-Sep-16	13	23-Sep-16	13	24	17	22

APPENDIX 2:
BIOLOGICAL AND TAG INFORMATION FOR LAKE STURGEON CAPTURED IN FALL 2016.

Table A2-1: Biological and tag information for Lake Sturgeon captured in the Upper Split Lake Area (Burntwood River, Kelsey GS, and Split Lake), fall 2016.

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Upper Split Lake Area	GN-01	SPL-A	8-Sep-16	103850	900 226000153816	805	892	3942	-
Upper Split Lake Area	GN-01	SPL-A	8-Sep-16	103849	1380347913	755	840	-	8
Upper Split Lake Area	GN-02	SPL-A	8-Sep-16	103848	1380348316	165	181	23	1
Upper Split Lake Area	GN-07	KGS-C	9-Sep-16	103847	900 226000153852	870	963	5139	-
Upper Split Lake Area	GN-07	KGS-C	9-Sep-16	103846	900 226000768573	880	980	5262	-
Upper Split Lake Area	GN-05	KGS-C	9-Sep-16	56578	900 226000629318	925	1015	7180	-
Upper Split Lake Area	GN-05	KGS-C	9-Sep-16	103845	900 226000153868	687	771	2658	10
Upper Split Lake Area	GN-05	KGS-C	9-Sep-16	103844	900 226000768594	384	439	420	3
Upper Split Lake Area	GN-05	KGS-C	9-Sep-16	103842	900 226000768430	720	811	2540	13
Upper Split Lake Area	GN-05	KGS-C	9-Sep-16	103841	900 226000153841	578	656	1379	5
Upper Split Lake Area	GN-04	SPL-A	9-Sep-16	103840	900 043000103747	293	326	160	2
Upper Split Lake Area	GN-09	BWR-A	10-Sep-16	103839	900 226000768529	659	720	2059	12
Upper Split Lake Area	GN-09	BWR-A	10-Sep-16	103838	900 226000768426	836	943	3760	-
Upper Split Lake Area	GN-12	BWR-A	10-Sep-16	103837	900 226000768517	440	500	480	5
Upper Split Lake Area	GN-16	KGS-B	11-Sep-16	103836	900 226000768522	790	882	3502	12
Upper Split Lake Area	GN-14	BWR-B	12-Sep-16	103835	900 226000768538	634	720	1878	17
Upper Split Lake Area	GN-14	BWR-B	12-Sep-16	103834	900 226000768526	331	376	220	3
Upper Split Lake Area	GN-14	BWR-B	12-Sep-16	103833	900 226000768578	446	497	460	5
Upper Split Lake Area	GN-14	BWR-B	12-Sep-16	103832	1380347898	281	322	110	2
Upper Split Lake Area	GN-20	BWR-A	13-Sep-16	103831	900 226000768539	459	511	580	5
Upper Split Lake Area	GN-25	BWR-B	14-Sep-16	103830	900 043000119453	339	381	300	3
Upper Split Lake Area	GN-23	BWR-B	14-Sep-16	103829	900 226000153881	380	434	350	3
Upper Split Lake Area	GN-27	BWR-C	15-Sep-16	103828	900 226000768548	466	522	580	5
Upper Split Lake Area	GN-29	BWR-C	15-Sep-16	103827	900 226000768462	491	561	680	6
Upper Split Lake Area	GN-29	BWR-C	15-Sep-16	103826	900 226000768515	422	480	500	5
Upper Split Lake Area	GN-29	BWR-C	15-Sep-16	103925	900 043000103416	330	374	230	3
Upper Split Lake Area	GN-30	BWR-C	15-Sep-16	103924	900 226000768509	479	531	800	6

Table A2-1: Biological and tag information for Lake Sturgeon captured in the Upper Split Lake Area (Burntwood River, Kelsey GS, and Split Lake), fall 2016 (continued).

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Upper Split Lake Area	GN-30	BWR-C	15-Sep-16	103923	900 226000768556	506	572	820	6
Upper Split Lake Area	GN-30	BWR-C	15-Sep-16	103922	900 226000768572	426	482	480	6
Upper Split Lake Area	GN-30	BWR-C	15-Sep-16	103921	900 226000768513	347	402	260	3
Upper Split Lake Area	GN-30	BWR-C	15-Sep-16	103920	900 226000768547	341	390	250	3
Upper Split Lake Area	GN-33	BWR-C	16-Sep-16	-	-	98	111	-	-
Upper Split Lake Area	GN-33	BWR-C	16-Sep-16	103919	1380347887	285	321	142	2
Upper Split Lake Area	GN-32	BWR-C	16-Sep-16	103918	900 226000153952	570	652	998	8
Upper Split Lake Area	GN-31	BWR-C	16-Sep-16	103917	900 226000153919	600	681	1302	13
Upper Split Lake Area	GN-31	BWR-C	16-Sep-16	103916	900 226000153938	324	362	220	3
Upper Split Lake Area	GN-31	BWR-C	16-Sep-16	-	900 067000121614	126	135	-	0
Upper Split Lake Area	GN-36	BWR-C	17-Sep-16	103915	900 226000153916	333	364	240	3
Upper Split Lake Area	GN-39	SPL-A	18-Sep-16	103914	900 226000153926	544	612	1220	6
Upper Split Lake Area	GN-39	SPL-A	18-Sep-16	103913	900 226000768554	654	731	2200	9

Table A2-2: Biological and tag information for Lake Sturgeon captured in Gull Lake, fall 2016.

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Gull Lake	GN-01	GL-C	13-Sep-16	112501	900 226000548855	745	841	3380	10
Gull Lake	GN-01	GL-C	13-Sep-16	-	900 043000103707	239	265	86	1
Gull Lake	GN-01	GL-C	13-Sep-16	112502	900 226000893677	622	710	2120	7
Gull Lake	GN-02	GL-C	13-Sep-16	-	900 067000121428	258	299	-	1
Gull Lake	GN-02	GL-C	13-Sep-16	-	900 226000893670	340	380	202	2
Gull Lake	GN-05	GL-C	14-Sep-16	-	1380344598	134	152	10	0
Gull Lake	GN-05	GL-C	14-Sep-16	112503	900 226000548936	396	447	520	3
Gull Lake	GN-05	GL-C	14-Sep-16	112504	900 226000893614	772	874	3580	10
Gull Lake	GN-06	GL-C	14-Sep-16	-	900 067000121458	135	154	27	0
Gull Lake	GN-06	GL-C	14-Sep-16	112505	900 067000055347	396	466	325	2
Gull Lake	GN-06	GL-C	14-Sep-16	112506	900 226000893656	424	492	560	4
Gull Lake	GN-06	GL-C	14-Sep-16	112507	900 226000629729	752	843	3280	10
Gull Lake	GN-06	GL-C	14-Sep-16	112508	900 226000893697	729	825	2460	8
Gull Lake	GN-06	GL-C	14-Sep-16	87867	900 226000893560	700	812	2880	8
Gull Lake	GN-06	GL-C	14-Sep-16	89821	900 226000768842	692	779	2940	10
Gull Lake	GN-06	GL-C	14-Sep-16	112509	900 226000893543	694	798	2840	8
Gull Lake	GN-06	GL-C	14-Sep-16	-	900 067000121384	98	110	-	0
Gull Lake	GN-07	GL-B	15-Sep-16	112510	900 226000548895	616	700	1820	10
Gull Lake	GN-07	GL-B	15-Sep-16	112511	900 226000893597	373	427	409	3
Gull Lake	GN-07	GL-B	15-Sep-16	-	900 067000121480	240	276	84	1
Gull Lake	GN-09	GL-C	15-Sep-16	-	Mortality	699	781	2940	10
Gull Lake	GN-09	GL-C	15-Sep-16	-	900 226000893737	318	366	177	2
Gull Lake	GN-08	GL-C	15-Sep-16	112512	900 226000548674	658	751	2120	8
Gull Lake	GN-08	GL-C	15-Sep-16	112513	900 226000628614	660	743	2300	8
Gull Lake	GN-13	GL-C	16-Sep-16	-	-	122	140	-	-

Table A2-2: Biological and tag information for Lake Sturgeon captured in Gull Lake, fall 2016 (continued).

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Gull Lake	GN-13	GL-C	16-Sep-16	87897	900 226000893535	614	695	1840	8
Gull Lake	GN-13	GL-C	16-Sep-16	112514	900 226000893659	738	836	3420	11
Gull Lake	GN-13	GL-C	16-Sep-16	112515	900 226000893728	660	750	2280	8
Gull Lake	GN-13	GL-C	16-Sep-16	112516	900 067000058464	376	434	360	2
Gull Lake	GN-13	GL-C	16-Sep-16	112517	900 226000893569	412	466	560	3
Gull Lake	GN-13	GL-C	16-Sep-16	-	900 067000121479	280	322	220	2
Gull Lake	GN-12	GL-C	16-Sep-16	112518	900 226000628522	468	534	780	4
Gull Lake	GN-12	GL-C	16-Sep-16	-	900 226000893504	309	358	260	2
Gull Lake	GN-12	GL-C	16-Sep-16	112519	900 067000055411	377	440	360	3
Gull Lake	GN-12	GL-C	16-Sep-16	112520	900 226000893717	416	484	580	3
Gull Lake	GN-12	GL-C	16-Sep-16	103647	900 226000629147	765	878	2980	10
Gull Lake	GN-10	GL-B	16-Sep-16	112521	900 226000893668	585	677	1440	8
Gull Lake	GN-10	GL-B	16-Sep-16	112522	900 226000893555	611	700	1740	8
Gull Lake	GN-10	GL-B	16-Sep-16	112523	900 226000548759	492	555	780	4
Gull Lake	GN-11	GL-B	16-Sep-16	112524	900 226000893561	736	831	2780	10
Gull Lake	GN-11	GL-B	16-Sep-16	112525	900 226000893650	577	654	1440	8
Gull Lake	GN-11	GL-B	16-Sep-16	112526	900 226000893683	647	726	1900	8
Gull Lake	GN-11	GL-B	16-Sep-16	112527	900 226000548594	315	355	188	2
Gull Lake	GN-11	GL-B	16-Sep-16	112528	900 226000893567	380	434	337	3
Gull Lake	GN-15	BR-D	17-Sep-16	112550	900 226000548933	778	871	4180	10
Gull Lake	GN-14	GL-A	17-Sep-16	112549	900 226000893749	600	692	1860	8
Gull Lake	GN-14	GL-A	17-Sep-16	112548	900 226000548960	650	719	2180	8
Gull Lake	GN-17	GL-B	17-Sep-16	112547	900 226000893702	474	538	540	4
Gull Lake	GN-17	GL-B	17-Sep-16	112546	900 067000055036	349	409	280	2
Gull Lake	GN-17	GL-B	17-Sep-16	112545	900 067000055197	366	425	360	2
Gull Lake	GN-17	GL-B	17-Sep-16	112544	900 067000055050	320	367	280	2
Gull Lake	GN-16	GL-B	17-Sep-16	112543	900 226000629452	510	582	860	5
Gull Lake	GN-16	GL-B	17-Sep-16	112542	900 226000548973	760	856	2980	10
Gull Lake	GN-16	GL-B	17-Sep-16	112529	900 226000893638	598	674	1440	8

Table A2-2: Biological and tag information for Lake Sturgeon captured in Gull Lake, fall 2016 (continued).

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Gull Lake	GN-19	GL-A	18-Sep-16	89988	900 226000629293	580	667	1320	8
Gull Lake	GN-20	GL-B	18-Sep-16	103125	900 226000893538	670	771	1940	8
Gull Lake	GN-20	GL-B	18-Sep-16	112530	900 067000055302	371	432	340	2
Gull Lake	GN-21	GL-B	18-Sep-16	112531	900 226000893500	720	825	3100	10
Gull Lake	GN-24	GL-B	19-Sep-16	112530	900 226000893579	330	380	240	2
Gull Lake	GN-24	GL-B	19-Sep-16	112533	900 226000893653	385	434	361	3
Gull Lake	GN-23	GL-A	19-Sep-16	112534	900 226000628468	621	700	1680	10
Gull Lake	GN-23	GL-A	19-Sep-16	112535	900 226000893651	563	655	1260	7
Gull Lake	GN-23	GL-A	19-Sep-16	112541	900 226000893512	478	550	700	4
Gull Lake	GN-25	GL-B	19-Sep-16	112536	900 226000893680	422	487	540	3
Gull Lake	GN-25	GL-B	19-Sep-16	112537	900 226000893536	558	641	1420	8
Gull Lake	GN-27	BR-D	21-Sep-16	94010	900 226000893733	836	948	4520	-
Gull Lake	GN-27	BR-D	21-Sep-16	112538	900 226000893690	584	664	1420	5
Gull Lake	GN-27	BR-D	21-Sep-16	112539	900 226000893590	582	662	1600	5
Gull Lake	GN-27	BR-D	21-Sep-16	112520	900 226000893647	449	511	740	3
Gull Lake	GN-26	GL-A	21-Sep-16	111001	900 226000893712	758	847	3700	10
Gull Lake	GN-28	GL-A	21-Sep-16	111002	900 226000893741	626	705	1600	8
Gull Lake	GN-28	GL-A	21-Sep-16	111003	900 226000628557	591	675	1480	6
Gull Lake	GN-28	GL-A	21-Sep-16	111004	900 226000893684	617	698	1460	8
Gull Lake	GN-29	GL-B	21-Sep-16	111005	900 226000893729	809	920	4560	-
Gull Lake	GN-29	GL-B	21-Sep-16	107722	900 226000153819	681	775	2460	10
Gull Lake	GN-29	GL-B	21-Sep-16	111006	900 226000893634	560	640	1400	8
Gull Lake	GN-29	GL-B	21-Sep-16	111007	900 226000893577	521	592	1240	5
Gull Lake	GN-29	GL-B	21-Sep-16	111008	900 226000893506	622	710	1900	8
Gull Lake	GN-29	GL-B	21-Sep-16	82833	900 226000629417	625	725	1980	8
Gull Lake	GN-29	GL-B	21-Sep-16	111009	900 067000055441	381	437	400	2
Gull Lake	GN-29	GL-B	21-Sep-16	111010	900 226000893628	408	469	480	3
Gull Lake	GN-29	GL-B	21-Sep-16	111011	900 226000893738	652	741	2460	8
Gull Lake	GN-29	GL-B	21-Sep-16	111012	900 226000893521	576	660	1740	8

Table A2-2: Biological and tag information for Lake Sturgeon captured in Gull Lake, fall 2016 (continued)

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Gull Lake	GN-29	GL-B	21-Sep-16	111013	900 226000893552	469	548	760	5
Gull Lake	GN-29	GL-B	21-Sep-16	-	900 067000121391	280	315	123	1
Gull Lake	GN-29	GL-B	21-Sep-16	-	900 067000121452	119	133	8	0
Gull Lake	GN-31	GL-A	22-Sep-16	111014	900 226000893635	688	775	2220	8
Gull Lake	GN-32	GL-A	22-Sep-16	103545	900 226000893646	610	698	1760	8
Gull Lake	GN-33	GL-B	22-Sep-16	111015	900 226000768787	418	470	580	3
Gull Lake	GN-33	GL-B	22-Sep-16	111016	900 226000548922	610	680	1740	8
Gull Lake	GN-33	GL-B	22-Sep-16	111017	900 226000893574	396	467	540	3
Gull Lake	GN-33	GL-B	22-Sep-16	111019	900 226000893708	375	429	480	3
Gull Lake	GN-33	GL-B	22-Sep-16	111020	900 226000893518	451	523	700	4
Gull Lake	GN-36	GL-A	22-Sep-16	111021	900 226000893608	794	913	4300	10
Gull Lake	GN-36	GL-A	23-Sep-16	111022	900 226000893629	664	747	2380	8
Gull Lake	GN-37	GL-C	23-Sep-16	111024	900 226000893570	644	739	2140	8

Table A2-3: Biological and tag information for Lake Sturgeon captured in Stephens Lake, fall 2016.

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Stephens Lake	GN-03	STL-A	13-Sep-16	110600	900 226000767144	336	381	260	2
Stephens Lake	GN-03	STL-A	13-Sep-16	110599	900 226000767172	411	470	520	3
Stephens Lake	GN-06	STL-A	14-Sep-16	94242	900 226000767108	640	721	2120	9
Stephens Lake	GN-06	STL-A	14-Sep-16	110598	900 226000767182	660	751	2560	8
Stephens Lake	GN-06	STL-A	14-Sep-16	110597	1380347852	252	288	80	1
Stephens Lake	GN-05	STL-A	14-Sep-16	110596	900 226000767136	730	821	2800	8
Stephens Lake	GN-09	STL-A	15-Sep-16	110595	900 226000768851	684	791	2460	10
Stephens Lake	GN-09	STL-A	15-Sep-16	101042	900 226000629370	650	735	2280	8
Stephens Lake	GN-09	STL-A	15-Sep-16	110594	900 226000767125	673	774	2420	8
Stephens Lake	GN-08	STL-A	15-Sep-16	110593	900 226000768872	690	782	2560	8
Stephens Lake	GN-08	STL-A	15-Sep-16	110592	900 226000768848	662	749	1960	8
Stephens Lake	GN-10	STL-A	15-Sep-16	110591	900 226000767177	852	980	5100	-
Stephens Lake	GN-10	STL-A	15-Sep-16	101996	900 226000703426	683	766	2720	8
Stephens Lake	GN-10	STL-A	15-Sep-16	110590	900 226000767128	665	760	2420	8
Stephens Lake	GN-10	STL-A	15-Sep-16	110589	900 226000767189	602	675	1620	5
Stephens Lake	GN-14	STL-A	16-Sep-16	110588	900 226000768805	660	756	2450	8
Stephens Lake	GN-14	STL-A	16-Sep-16	94230	900 226000767130	721	829	3450	9
Stephens Lake	GN-12	STL-A	16-Sep-16	69873	900 226000768819	612	696	1850	8
Stephens Lake	GN-12	STL-A	16-Sep-16	110587	900 226000548889	655	765	2250	8
Stephens Lake	GN-12	STL-A	16-Sep-16	94964	900 226000768809	705	796	2950	8
Stephens Lake	GN-18	STL-B	17-Sep-16	110586	900 226000768816	702	804	3240	8
Stephens Lake	GN-18	STL-B	17-Sep-16	110585	900 043000103452	247	268	120	1
Stephens Lake	GN-19	STL-B	17-Sep-16	110584	900 043000103858	622	715	1980	8
Stephens Lake	GN-19	STL-B	17-Sep-16	110583	900 226000768883	694	782	2820	8
Stephens Lake	GN-19	STL-B	17-Sep-16	110582	900 067000055566	416	471	440	2
Stephens Lake	GN-19	STL-B	17-Sep-16	110580	900 067000121406	247	280	80	1

Table A2-3: Biological and tag information for Lake Sturgeon captured in Stephens Lake, fall 2016 (continued).

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Stephens Lake	GN-16	STL-A	17-Sep-16	93924	900 226000577243	1000	1099	8400	-
Stephens Lake	GN-16	STL-A	17-Sep-16	110579	-	662	740	1900	9
Stephens Lake	GN-16	STL-A	17-Sep-16	101498	900 226000628221	652	686	1880	8
Stephens Lake	GN-16	STL-A	17-Sep-16	110577	900 226000767180	700	802	2360	8
Stephens Lake	GN-21	STL-B	18-Sep-16	110576	900 226000767155	680	761	2380	-
Stephens Lake	GN-21	STL-B	18-Sep-16	110551	900 226000768825	486	533	840	4
Stephens Lake	GN-21	STL-B	18-Sep-16	110552	900 226000768822	405	466	490	3
Stephens Lake	GN-21	STL-B	18-Sep-16	110553	900 043000103583	251	286	100	1
Stephens Lake	GN-19	STL-B	18-Sep-16	110554	900 226000768824	663	750	2320	8
Stephens Lake	GN-19	STL-B	18-Sep-16	110555	900 226000768014	610	690	2180	8
Stephens Lake	GN-22	STL-B	18-Sep-16	110556	900 226000767140	722	814	2860	8
Stephens Lake	GN-23	STL-A	18-Sep-16	110557	900 067000121675	235	265	80	1
Stephens Lake	GN-16	STL-A	18-Sep-16	110558	900 067000055326	380	436	260	2
Stephens Lake	GN-16	STL-A	18-Sep-16	110559	900 067000055361	418	492	440	2
Stephens Lake	GN-24	STL-B	19-Sep-16	-	Mortality	433	485	540	3
Stephens Lake	GN-21	STL-B	19-Sep-16	103609	900 226000768858	824	890	4560	12
Stephens Lake	GN-19	STL-B	19-Sep-16	101998	900 226000548920	700	788	2960	9
Stephens Lake	GN-19	STL-B	19-Sep-16	110560	900 067000121616	320	367	160	2
Stephens Lake	GN-16	STL-A	19-Sep-16	110561	900 226000153416	700	725	2240	8
Stephens Lake	GN-25	STL-B	19-Sep-16	110563	900 067000055435	394	447	300	2
Stephens Lake	GN-25	STL-B	19-Sep-16	110564	900 043000103645	233	275	80	1
Stephens Lake	GN-26	STL-B	21-Sep-16	110565	900 226000767117	690	776	2830	8
Stephens Lake	GN-26	STL-B	21-Sep-16	110566	900 067000055559	392	453	320	2
Stephens Lake	GN-28	STL-B	21-Sep-16	110567	900 226000768645	701	785	2930	8
Stephens Lake	GN-28	STL-B	21-Sep-16	101040	900 226000629322	712	862	2970	8
Stephens Lake	GN-28	STL-B	21-Sep-16	110568	900 226000153471	720	825	2860	8
Stephens Lake	GN-28	STL-B	21-Sep-16	110464	900 226000628725	791	882	3790	-

Table A2-3: Biological and tag information for Lake Sturgeon captured in Stephens Lake, fall 2016 (continued).

Waterbody	Site	Zone	Date	Floy-tag #	Pit-tag #	Fork Length (mm)	Total Length (mm)	Weight (g)	Age
Stephens Lake	GN-25	STL-B	21-Sep-16	110570	900 043000103816	274	315	130	1
Stephens Lake	GN-16	STL-A	21-Sep-16	110571	900 043000103532	741	835	3470	8
Stephens Lake	GN-16	STL-A	21-Sep-16	110572	900 226000153404	763	797	2780	8
Stephens Lake	GN-16	STL-A	21-Sep-16	100165	900 226000153445	810	910	4640	10
Stephens Lake	GN-29	STL-B	22-Sep-16	110573	900 226000153409	536	604	1040	5
Stephens Lake	GN-31	STL-B	22-Sep-16	110574	900 226000768870	752	845	3890	10
Stephens Lake	GN-32	STL-A	22-Sep-16	110000	900 043000103855	270	305	220	1
Stephens Lake	GN-34	STL-B	23-Sep-16	109999	900 226000768861	674	772	2530	8
Stephens Lake	GN-35	STL-B	23-Sep-16	109998	900 226000767186	718	811	2870	8
Stephens Lake	GN-35	STL-B	23-Sep-16	109997	900 226000153448	717	810	3230	8
Stephens Lake	GN-37	STL-A	23-Sep-16	109996	900 226000768847	791	870	4360	10
Stephens Lake	GN-37	STL-A	23-Sep-16	103621	900 226000768866	652	735	2010	8
Stephens Lake	GN-37	STL-A	23-Sep-16	109995	900 067000055344	363	418	280	2

APPENDIX 3:
AGEING STRUCTURES OF JUVENILE LAKE STURGEON CAUGHT IN FALL 2016.

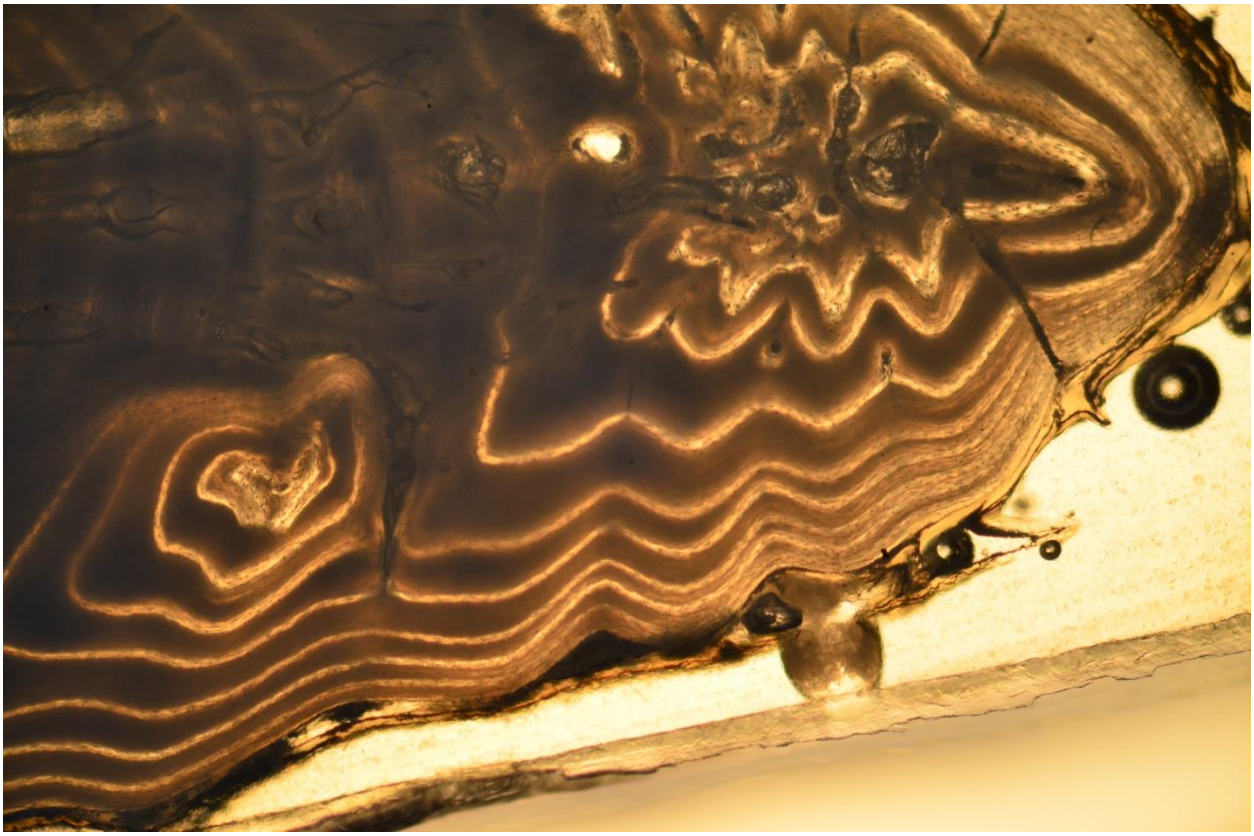


Figure A3-1: Ageing Structure from a wild juvenile Lake Sturgeon caught in Gull Lake, fall 2016 (Fish #41; FL = 577 mm; Wt = 1440 g; age 8).

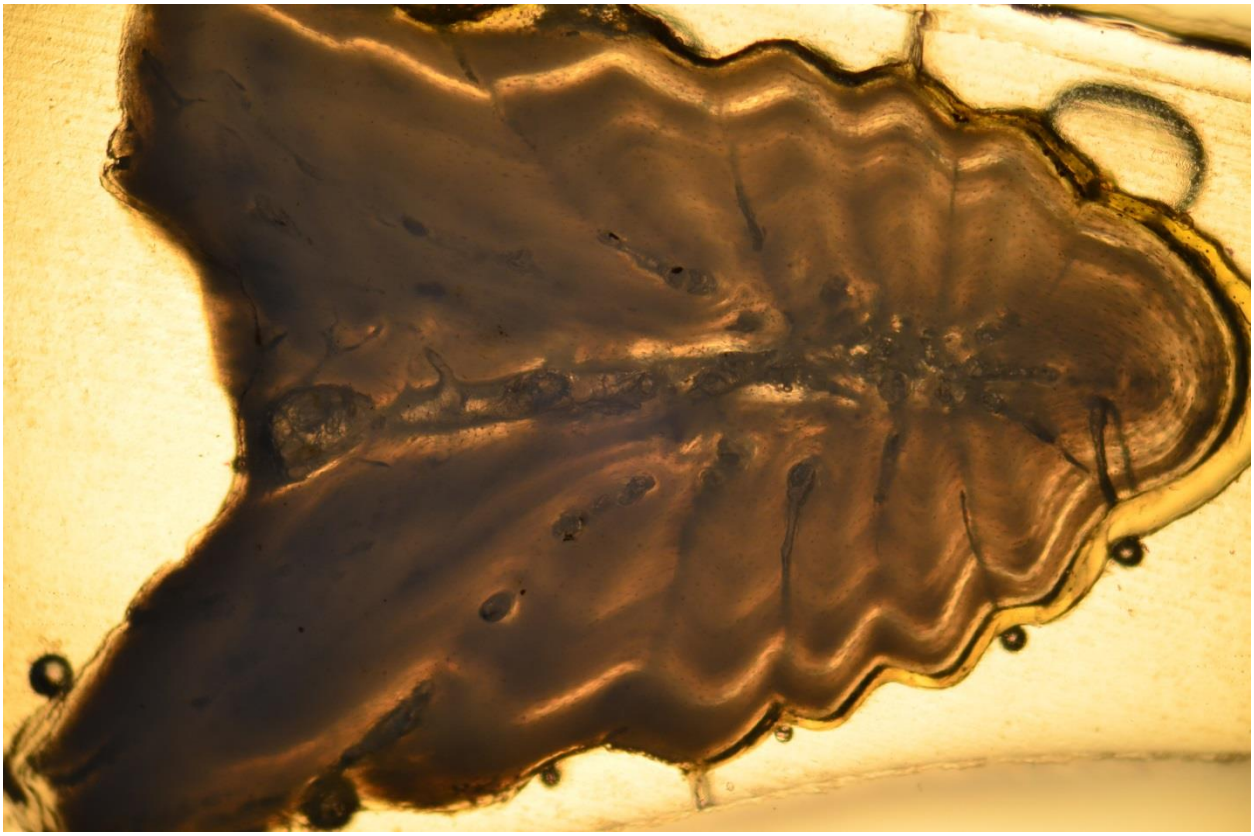


Figure A3-2: Ageing Structure from a hatchery reared juvenile Lake Sturgeon caught in Stephens Lake, Fall 2016 (Fish #25; FL = 416 mm; Wt = 440 g; age 2). Agers noted the presence of a weak first annulus and false annuli typically observed in hatchery reared Lake Surgeon.