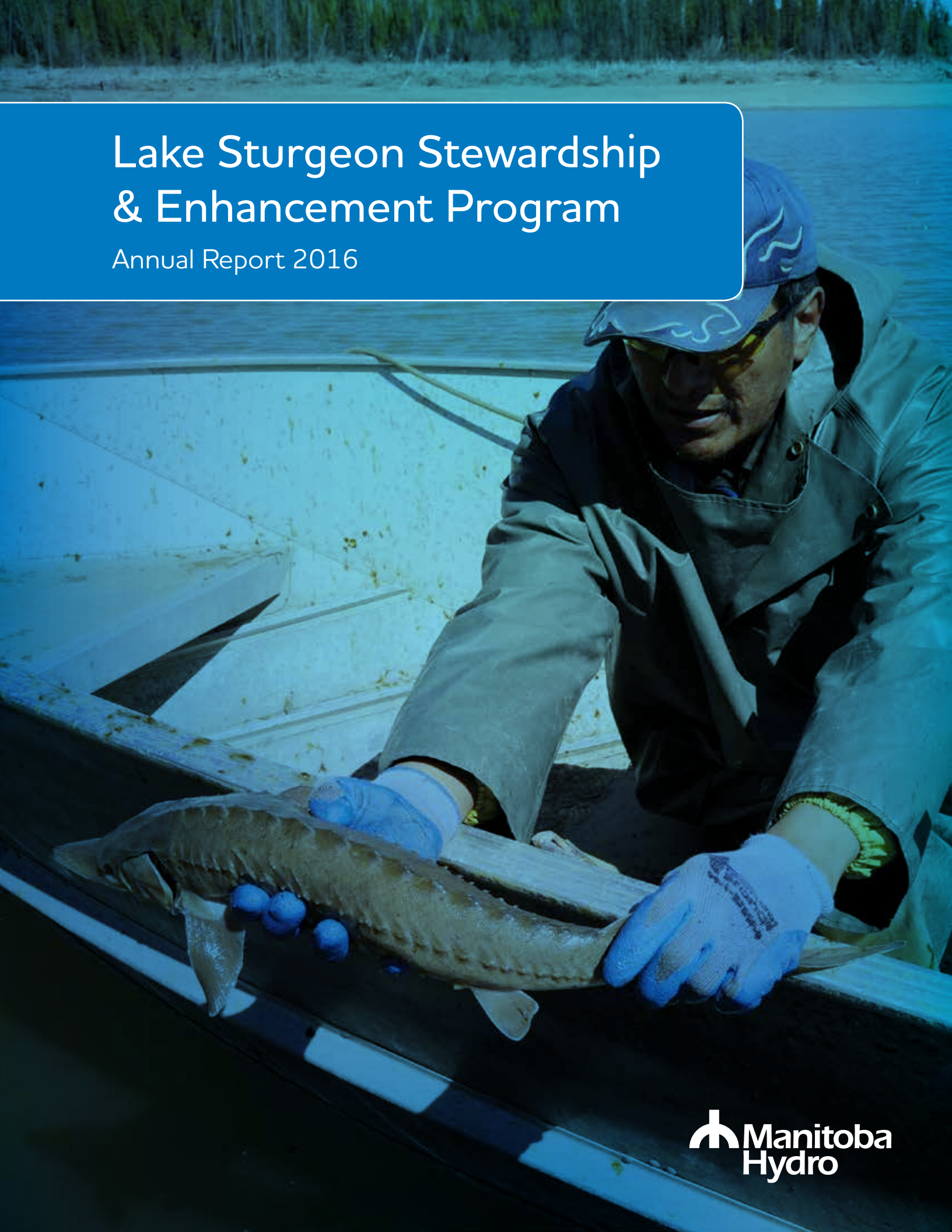
Lake Sturgeon Stewardship & Enhancement Program

Annual Report 2016



Manitoba Hydro

The Lake Sturgeon Stewardship & Enhancement Program (LSSEP) was established in 2008 to consolidate Manitoba Hydro's Lake Sturgeon stewardship efforts. The vision of the program is "to maintain and enhance Lake Sturgeon populations in areas affected by Manitoba Hydro's operations, now and in the future." Manitoba Hydro's LSSEP is contributing to Lake Sturgeon conservation in Manitoba by increasing our knowledge of populations, advancing our understanding of local ecology, supporting stocking programs, and initiating research to improve the effectiveness of conservation efforts.

LSSEP PROJECTS

Churchill River Population Estimate – Little Churchill River to Swallow Rapids

Despite historical commercial harvest, diversion of water from the Churchill River and continuing domestic harvest, the Lake Sturgeon appear to have maintained a self-sustaining population in the Churchill River near the mouth of the Little Churchill River. To greater understand the current status and trajectory of the population in this area, a population study was completed over three years (2014–2016). In spring 2016, 326 Lake Sturgeon were captured, of which 65 were recaptures from 2014 or 2015. Population modeling indicated that more than 700 adults were within the study area in all three sampling years, and provided statistical evidence that fish entered the population in 2014 and 2016. Entry of fish into the population in 2014 was expected (even in the absence of immigration) since juveniles are abundant and eleven years had passed since the previous marking period. The entry of fish into the population could not be explained by an influx of juvenile fish that grew large enough to be susceptible to capture between 2015 and 2016, since the quantity of smaller fish (500–749 mm) was consistent between these years. In addition, the decreasing rate of previous year tagged recaptures in the largest size class (1,250–1,499 mm) in 2016 could not be explained by growth of individuals from the 1,000–1,249 mm size class in previous years because tag saturation in 2014 was similar for both of these size classes. The observed entry of fish into the population would most simply be explained by immigration of previously untagged fish, most of which were larger individuals. This study was not able to accurately evaluate the status and trajectory of the population due to apparent immigration/emigration/redistribution, but based on this study, it does not seem that the sturgeon population is in imminent danger of collapse. The abundance of Lake Sturgeon in this area was estimated to be 1,837 (95% confidence interval: 1,568–2,151) in 2014, 1,647 (95% CI: 1,386–1,958) in 2015 and 2,122 (95% CI: 1,820–2,474) in 2016. These numbers should be interpreted as an abundance estimate rather than a population estimate because an unknown proportion of the population may be present in areas outside the reach. [1]

Winnipeg River Spawning Study & Genetic Sample Collection

To improve understanding of adult abundance and facilitate the collection of genetic samples required for a watershed scale assessment of population structure and contemporary gene flow, a large mesh gillnetting study was conducted in spring 2016 in the Great Falls and Pine Falls reservoirs, and in the reach of the Winnipeg River between Pine Falls and Lake Winnipeg. In the Great Falls Reservoir, 39 individual Lake Sturgeon were captured, with two identified as pre-spawn males, and one fish identified as a recapture that was initially tagged in the Great Falls Reservoir in 2011. In the Pine Falls Reservoir, 67 individual Lake Sturgeon were captured. The highest mean catch-per-unit-effort was downstream of White Mud Falls (3.94 LKST/100m/24h), followed by downstream of Great Falls (1.84 LKST/100m/24h) and then downstream of Silver Falls (0.56 LKST/100m/24h). Of those captured in the Pine Falls Reservoir, eight were identified as pre-spawn males, and one as a ripe male. Three fish were identified as recaptures; one was tagged in the Pine Falls Reservoir in 2011 and two were tagged upstream in the McArthur Reservoir in 2009 and 2010. Between Pine Falls GS and Lake Winnipeg, 18 individual Lake Sturgeon were captured. Between Pine Falls GS and Manitou Rapids, the catch-per-unit-effort was 0.74 LKST/100m/24h, and between Manitou Rapids and Lake Winnipeg the catch-per-unit-effort was 0.8 LKST/100m/24h. Sex and maturity was determined for nine of these sturgeon; five pre-spawn males, one pre-spawn female, and three ripe males. Additional gillnetting completed by Fisheries & Oceans in this reach yielded the capture of an additional 39 Lake Sturgeon. [2]

Sea Falls Juvenile Inventory

Historically this reach of the upper Nelson River supported a large population of Lake Sturgeon, and was targeted for commercial harvest. By the 1990s, it was believed that Lake Sturgeon were extirpated from reaches of the upper Nelson River including the Sea Falls area. In response to this, the Nelson River Sturgeon Board has stocked Lake Sturgeon since 1994. To evaluate the success of the stocking efforts, juvenile inventory studies were completed from 2012 to 2016 in the Sea Falls to Sugar Falls reach of the upper Nelson River. In fall 2016, 605 Lake Sturgeon were captured in juvenile gillnet gangs (Catch-per-unit-Effort of 8.0 LKST/100m/24h), and 28 Lake Sturgeon were captured in large mesh gillnet gangs (CPUE of 1.2 LKST/100m/24h). Hatchery PIT tags were detected in 93% of individuals captured, and 60% of recaptures occurred less than 1 km from the previous capture location. Of the 4,167 individuals released from the hatchery with a PIT tag, 19% have been recaptured. There is some variation in recapture rate between cohorts, with the mean post first winter survival estimates between 2 and 22%. Age-1 to age-2 survival/retention was variable between years (from as low as 0.08 in 2011 cohort to as high as 0.51–0.85 in 2007 cohort), but age-2+ survival/retention was consistently high (estimated at 1.0). Overall, stocking efforts by the Nelson River Sturgeon Board have successfully re-established a juvenile population in this area. In spring 2017, one large sturgeon and four smaller sturgeon were observed in the fast water near Sea Falls, and the following day, a large ripe female was captured (and then released) in the same area. The female would have been too large to have been a stocked sturgeon, so it must have either eluded capture over the past five years or had recently moved into the area. However, it seems likely that the small fish observed with the larger fish were individuals that were stocked by the Nelson River Sturgeon Board.

The five years of study in this location have provided invaluable insight into the survival of sturgeon stocked for the purposes of population recovery. The rates of survival far exceeded initial expectations for the Nelson River Sturgeon Board's stocking program, and the demonstrated success is encouraging for the potential to use stocking to enhance population recovery in other areas. This study has shown that the survival of fish reared to age 1 is substantially greater than survival of fish reared to only the fall (at least in northern Manitoba), and this has shifted the emphasis for this and other stocking programs towards age 1 fish. After release, most individuals settled into a deep hole, and after settling, most individuals stayed in the same general area. The small number of sturgeon that dispersed further downstream from the release location did so immediately after stocking. Finally, there is no evidence to suggest that a deepwater release would result in greater retention of fish within an area, although it may be best to stock Lake Sturgeon into an area where they would be more likely to settle into deep slow water habitat in a short distance downstream. [3]

Bladder Rapids Juvenile Inventory

The Nelson River flows through Cross Lake and through multiple channels into Sipiwesk Lake. Bladder Rapids is located about halfway between these two lakes. Commercial harvest in this area in from 1900s up until 2000 resulted in a major decline of the Lake Sturgeon population. Currently, subsistence harvest is ongoing in the area. Studies completed by NRSB between 2000 and 2008 indicated a declining abundance. This study was designed to evaluate the number of adult Lake Sturgeon spawning at Bladder Rapids, and to mark captured individuals to contribute to a future population estimate in the area. Unfortunately logistical problems prevented the study from being completed, so it will be undertaken in 2017.

*Winnipeg River–Nutimik/Namao Population Monitoring**

The Lake Sturgeon population in this reach of the Winnipeg River has been monitored since the early 1980s, with refinements over time in locations and timing of sampling. Methods have been consistent since 2006, but with sampling reduced from annual to biennial in 2013. Large mesh gillnets were set in established sampling locations in Nutimik and Namao lakes over 20 days in June 2016. All captured sturgeon were measured, weighed, any tags are recorded. Passive Integrated Transponder tags were applied to sturgeon that were not previously tagged. A total of 613 Lake Sturgeon were captured, including 101 adult Lake Sturgeon. Of those captured, 51 were captured in previous years. The population is estimated at 48,985 juvenile and adult fish in these two lakes. The population estimate for adults is 13,649. There were very few fish that moved between Nutimik and Numao lakes since the last study in 2014, but more fish moved downstream than moved upstream.

*Saskatchewan River Adult Inventory**

This study was completed to monitor the adult Lake Sturgeon population in the Manitoba portion of the Saskatchewan River. The population has been studied for many years, and continuing to evaluate the population allows for comparisons between years to examine how the population is changing over time. Consistent with previous years, local fishers from Opaskwayak Cree Nation were contracted and equipped with gill nets to set in assigned reaches of the Saskatchewan River between June 7 and June 21. Over 14 days of netting, 383 Lake Sturgeon were captured, with a catch per unit effort higher than all other years of sampling (1999–2014). Of those captured, 19 were previously captured in Manitoba, and 5 were previously captured in the Saskatchewan portion of the Saskatchewan River.

*Ageing Analysis**

Manitoba Fisheries Branch had approximately 1800 Lake Sturgeon pectoral spines that were collected for the purpose of aging during index netting projects. Pectoral spines from projects on the Winnipeg River, the Saskatchewan River (in partnership with the Saskatchewan River Sturgeon Management Board) and the Nelson River (in partnership with the Nelson River Sturgeon Board) were analyzed to determine age. The age information from this project will contribute to understanding changes in the age distribution of sturgeon stocks as they recover.

**These studies were completed in collaboration with the Province of Manitoba under the Memorandum of Understanding Respecting Lake Sturgeon signed in December 2013.*

Public Awareness & Education Initiatives

LSSEP continues to maintain a sturgeon aquarium in the Customer Contact Centre at 360 Portage Avenue. The aquarium provides an opportunity for the public to see live Lake Sturgeon and to learn about conservation aquaculture and population recovery efforts throughout Manitoba.

The second biennial Manitoba Lake Sturgeon Science Workshop was hosted by LSSEP in January 2017 to provide an opportunity for all those working on Lake Sturgeon in the province to share new research and monitoring results since the last workshop two years ago. The presentations covered research relevant to conservation aquaculture, sturgeon virus distribution and prevalence, population updates, genetic analyses, studies examining movement, and highlighted monitoring results from major projects. Participation included almost 50 representatives from Fisheries & Oceans Canada, Manitoba Sustainable Development, University of Manitoba, North/South Consultants, SaskPower, Ontario Power Generation, and Manitoba Hydro.

RESEARCH ON LAKE STURGEON SUPPORTED BY MANITOBA HYDRO

NSERC-IRC in Conservation Aquaculture

This research program is focused on the influence of genetics and early rearing environment on the development of Lake Sturgeon, with the goal of refining hatchery rearing practices to improve the ability of Lake Sturgeon to survive, grow and reproduce after release into rivers for stock enhancement. Results have shown that environment (temperature, substrate, dissolved oxygen) influence the metabolic scope (energy currency for growth) of larval Lake Sturgeon, and that parentage is an excellent predictor of survival during the first winter of life. Counter to studies completed on other fish species, the peak cortisol production (measure of stress response) in larval Lake Sturgeon occurs just prior to when the fish start to feed. This may be related to a switch in a lipid based diet (absorption of egg yolk) to a carbohydrate/protein food source as they begin to feed exogenously. Results show that the presence of an alarm cue does not have a significant influence on feeding but does influence cover seeking behaviour in Lake Sturgeon. Initial results of a study examining early muscle development and swimming capacity suggest that substrate may have an impact on muscle development in early life which would have implications on escape from predators and cover seeking behaviour.

NCLDV Virus in Manitoba

Namao virus, a sturgeon nucleo-cytoplasmic large DNA virus (sNCLDV), was discovered in the 2009 year class of Manitoba Lake Sturgeon from the Nelson River and the Winnipeg River. Wild Lake Sturgeon populations in the Hudson Bay drainage basin were evaluated to determine the geographic distribution range for this virus. Non-lethal sampling of pectoral fin tissue (n=1,329) was conducted from 2010 to 2015 in partnership with existing lake sturgeon field monitoring programs. A total of 315 (23.7%) Lake Sturgeon from ten rivers in Alberta, Saskatchewan and Manitoba tested positive using a molecular diagnostic assay designed to detect North America isolates of sNCLDV. Virus prevalence in sturgeon populations ranged from 3.3% in the Saskatchewan River to 57.7% in the Nelson River. The majority of Lake Sturgeon testing positive were in their juvenile life stage and had what were considered to be low virus loads in their fin tissue. Genetic typing of the isolates found throughout the Hudson Bay drainage basin indicated that they were most closely related to Namao virus, the isolate first described in Manitoba Lake Sturgeon. The results suggested that sturgeon nucleo-cytoplasmic large DNA viruses are endemic in the region.

PUBLISHED ARTICLES & THESES

Shute, L., E. Huebner and W.G. Anderson (2016)
Microscopic identification of novel cell types in the integument of larval lake sturgeon *Acipenser fulvescens*. Journal of Morphology 277(1): 86-95.

Carriere, B., D. Gillis and G. Anderson (2016)
Strontium metabolism in the juvenile Lake Sturgeon, *Acipenser fulvescens* (Rafinesque, 1817), and further evaluation of the isotope as a marking tool for stock discrimination. Journal of Applied Icthyology 32(2): 258-266.

REFERENCES

1. Ambrose, K.M., C.A. McDougall, M. Blanchard and P.A. Nelson. 2017.
Results of Lake Sturgeon population studies conducted in the lower Churchill River confluence and Swallow Rapids, Summer 2016 – Year 3. A report prepared for Manitoba Hydro by North/South Consultants Inc.

2. Henderson, L.M. and C.A. McDougall. 2016.
Results of Lake Sturgeon investigations in the Winnipeg River from the McArthur Generating Station to Lake Winnipeg – Spring 2016. A report prepared for Manitoba Hydro by North/South Consultants Inc.

3. McDougall, C.M. and P.A. Nelson. 2017.
Upper Nelson River juvenile Lake Sturgeon Inventory 2016: Sea Falls to Sugar Falls. A report prepared for Manitoba Hydro by North/South Consultants Inc.

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