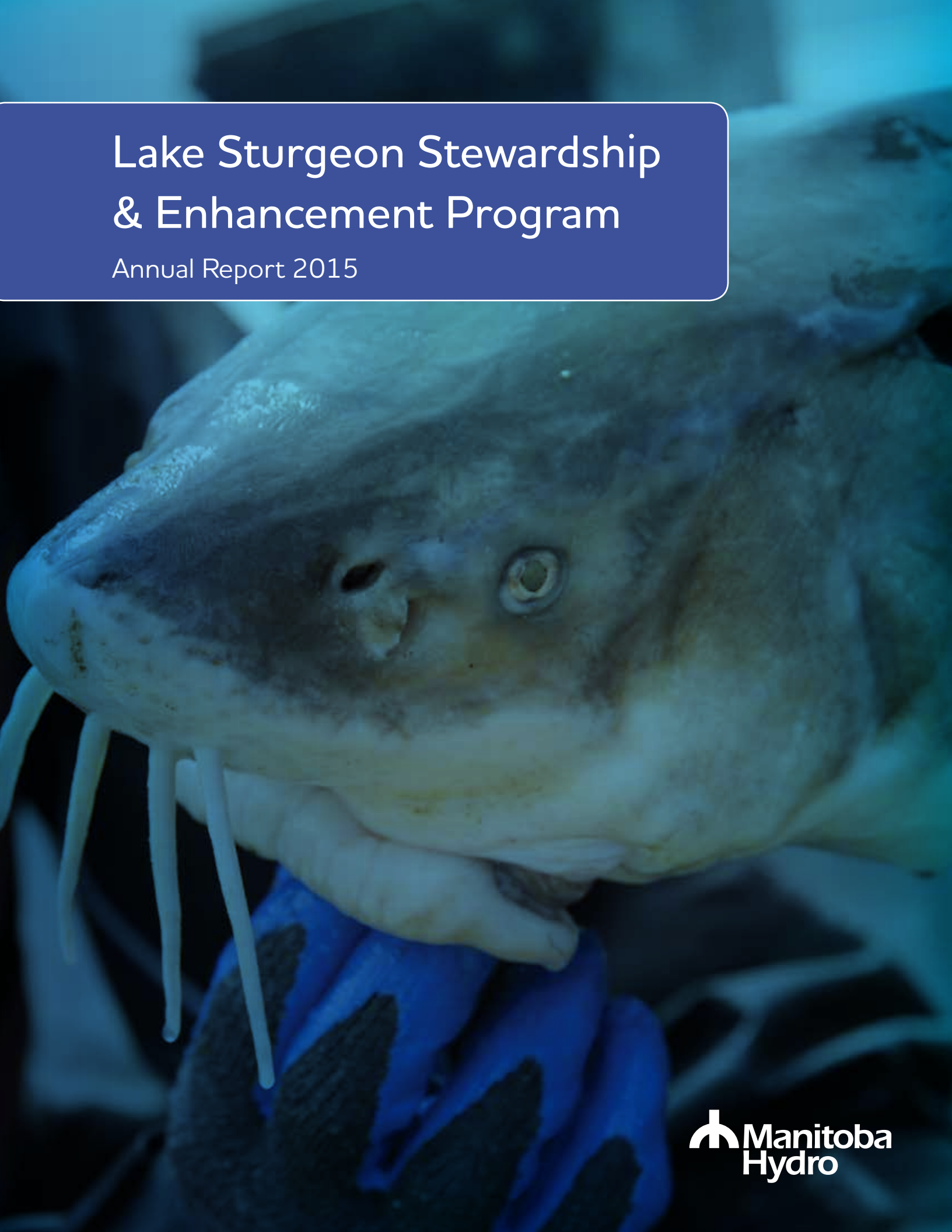
Lake Sturgeon Stewardship & Enhancement Program

Annual Report 2015



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.

Churchill River – Little Churchill River to Swallow Rapids

Despite the diversion of water from the Churchill River, historical commercial harvest, 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. In 2003, the population of Lake Sturgeon in this area was estimated at 2,005 ± 564. Since then, harvest pressure in this area has intensified. To greater understand the current status and trajectory of the population in this area, a three year population study was initiated in 2014. From June 30 to July 10, 2015, 348 adult Lake Sturgeon were captured in large mesh gillnets. Ninety-three of those fish were identified as recaptures from previous tagging efforts. Of these sturgeon, 5 were tagged in 1996/97, 24 were tagged in 2003, 5 were tagged in 2013 and 59 were tagged in 2014 (during the first year of the current population study). A preliminary population estimate using 2014 and 2015 large mesh gillnetting data (all fish included) was calculated to be 1,573 ± 172 Lake Sturgeon. This data helps to estimate contemporary abundance and changes in population levels, and is essential for determination and/or establishment of sustainable harvest levels by provincial regulators or community leaders. [1]

Nelson River – Sipiwesk Lake inlets

Once the location of a large Lake Sturgeon spawning run, little is known about the current status or trajectory of Lake Sturgeon populations in the Bladder Rapids/Sipiwesk Lake area of the upper Nelson River. To gain insight into spawning and recruitment success at Bladder Rapids, a juvenile Lake Sturgeon inventory and habitat mapping was conducted downstream at the two inlets (Redrock Rapids and Duck Lake reaches) to Sipiwesk Lake in fall 2015. A total of 2,669 ha were mapped with the majority of both reaches (35%) determined to be >10 m in depth at the time of the survey. Clay substrate dominated the Redrock Rapids reach while non-clay substrates (i.e. boulder, cobble, gravel and sand) varied in abundance in the Duck Lake outlet. To determine abundance, gillnets were set in known juvenile Lake Sturgeon habitat. Catch rates were low at both sites, with a total capture of 2 Lake Sturgeon in the Redrock Rapids reach and 20 Lake Sturgeon in the Duck Lake outlet reach, 90.9% of which were assigned to the 2013 cohort based on ageing structures. Overall, Lake Sturgeon accounted for 4.4% of the gillnet catch in both study areas. No Lake Sturgeon captured possessed hatchery PIT (Passive Integrated Transponder) tags, and growth chronologies appeared consistent with first winters being spent in the wild, indicating likely in-situ spawning and recruitment. [2]

Nelson River –Jenpeg Generating Station

Although Lake Sturgeon are thought to be nearly extirpated from Cross Lake, they are still observed in the tailrace at Jenpeg Generating Station. Following a comparable study completed in 2014, a spring gillnetting study targeting spawning Lake Sturgeon was completed in spring 2015. A total of 22 Lake Sturgeon were captured in over 4,220 gillnet hours, resulting in a low CPUE (Catch Per Unit Effort, fish per net per night) of 0.06, comparable to that found in the spring spawning study of 2014. Also comparable to results in 2014, juvenile Lake Sturgeon were captured in the large mesh gillnets (12 juveniles), potentially indicating an increase in the spawning stock over the next several years as newly matured Lake Sturgeon are recruited to the spawning population. In fall 2015, a juvenile Lake Sturgeon inventory was conducted in Cross Lake between Jenpeg GS and Whitemud Falls. Despite high numbers of juveniles caught during spring sampling in 2014 and 2015, relatively few juveniles were captured in the fall. In total, 34 Lake Sturgeon were caught in 1,344 gillnet hours, resulting in a CPUE of 0.70. Analysis of ageing structures from the majority of juvenile Lake Sturgeon in this area showed a weak or absent first annuli, indicating the possibility that these fish have immigrated from upstream stocking locations (Sea Falls, Little Playgreen Lake). However, the absence of hatchery PIT tags makes the origin of these fish unclear. Based on both spawning/juvenile population studies and recent genetic analysis, there is evidence of a persisting Lake Sturgeon population

downstream of Jenpeg GS.[3] Subsistence harvest is known to occur in this area, however not knowing the numbers of Lake Sturgeon taken annually makes it difficult to understand potential effects on population recovery.

Nelson River –Pipestone Lake and Sea Falls to Sugar Falls

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 completed in previous years (2012 - 2014) in the Sea Falls and Pipestone Lake reaches, were repeated in 2015.

Pipestone Lake

The first juvenile inventory in Pipestone Lake was conducted to evaluate the success of stocking initiatives in this reach of the Nelson River. In 2015, 99 juvenile Lake Sturgeon were captured, of which 65% were known to be stocked from the Grand Rapids Fish Hatchery based on PIT tags. In the three years of surveys, many Lake Sturgeon found in Pipestone Lake can be linked back to stocking events in the Sea Falls to Sugar Falls reach, indicating a higher age-1 survival rate than indicated by natural recruitment in the Sea Falls to Sugar Falls reach alone. Results suggest that downstream dispersal of stocked Lake Sturgeon occurs shortly after stocking, and that a significant portion of age-1 individuals stocked at Sea Falls are growing rapidly in the Pipestone Lake area. In addition, capture of smaller Lake Sturgeon lacking hatchery PIT tags indicates a modest rate of contribution by age-0 fish native to the Pipestone Lake area. [4]

Sea Falls to Sugar Falls

In fall 2015, the Sea Falls to Sugar Falls reach was surveyed for the 4th year in a row. A total of 406 juvenile Lake Sturgeon were captured. Individuals reared to age-1 prior to stocking (indicated by hatchery PIT tags) were detected in 94.6% of fish captured; however, there were indications of modest contributions of age-0 (or larval) stocked fish from the 2013 cohort. The biggest difference from the results of previous inventories relates to prevalence of fish from the 2013 and 2014 cohorts, stocked at both Sea Falls and Little Playgreen Lake. An experimental release designed to see if retention within the Sea Falls to Sugar Falls reach could be promoted by releasing hatchery age-1s directly into preferred deepwater habitats was evaluated. Both acoustic telemetry and mark-recapture results provided strong evidence that survival/retention was not different between shore (status quo) and deepwater (experimental) releases conducted during spring 2015. [5]

*Saskatchewan River**

A collaborative study was completed with Manitoba Sustainable Development and the Saskatchewan River Sturgeon Management Board to develop and standardize juvenile Lake Sturgeon sampling methods within the Manitoba and Saskatchewan sections of the Saskatchewan River, from EB Campbell Hydro Station to Cedar Lake. Local fishers from Cumberland House Cree Nation and Opaskwayak Cree Nation worked with North South Consultants to set gillnets, capturing a total of 149 Lake Sturgeon. Fish were measured for length and weight, and ageing structures were collected from each for future genetic analysis. In general, there appears to be a healthy population of Lake Sturgeon in this reach of the Saskatchewan River with successful spawning and recruitment of juveniles and abundant rearing habitat.

*Winnipeg River – Lac du Bonnet**

Manitoba Hydro collaborated with Manitoba Sustainable Development to conduct a study to estimate the Lake Sturgeon population in the Lac du Bonnet reach of the Winnipeg River.

A Lake Sturgeon being released back to the Winnipeg River after being weighed, measured and tagged.

Long-term population monitoring has been conducted by the province in the Nutimik/Numao reach of the Winnipeg River since 1983, and 2015 marks the first year of a similar monitoring program in the Lac du Bonnet reach. Gillnets were set in known Lake Sturgeon habitat and a total of 219 Lake Sturgeon were captured. Of these, 11 fish were recaptured from sampling done in previous years and the remaining 208 were uniquely tagged which allows monitoring of fish movements through the river, as well as the development of long-term population estimates and trajectories.

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

Assessment of Lake Sturgeon Spawning Habitat Suitability below the Kettle Generating Station

A Habitat Suitability Index (HSI) was developed for the area downstream of the Kettle Generating Station to evaluate existing habitat suitable for Lake Sturgeon spawning, and identify areas that may be optimal for spawning habitat enhancements. Using a combination of five variables (velocity, depth, substrate, flow direction and distance from a barrier) and variations of flow scenarios and operating conditions from the

GS and spillway, the HSI model was used to delineate and quantify suitable areas for Lake Sturgeon egg deposition. In general, large quantities of habitat are considered suitable when constrained only by velocity, depth and substrate. As flow direction and distance are added, habitat areas decrease substantially, but still appear to be present in sufficient quantities as to not limit the spawning success of a sturgeon population. [6]

RESEARCH ON LAKE STURGEON SUPPORTED BY MANITOBA HYDRO

NSERC-IRC in Conservation Aquaculture

This was the first year of the NSERC/Manitoba Hydro Industrial Research Chair in conservation aquaculture of Lake Sturgeon awarded to Dr. Gary Anderson (Biological Sciences, University of Manitoba). The research is examining the effect of the environment and genotype on the development of juvenile Lake Sturgeon. The aim of the program is to develop rearing practices that result in the improved fitness potential of Lake Sturgeon reared in a hatchery environment that are used for stock enhancement purposes. Graduate and undergraduate students working with Dr. Anderson collected eggs and milt from spawning Lake Sturgeon at Pointe du Bois in May 2015. At the University of Manitoba, the eggs were fertilized and grown under specific environmental abiotic conditions such as the presence or absence of substrate and different water temperatures; and biotic conditions such as the presence or absence of potential predatory and alarm cues. Following hatch, a variety of physiological and behavioural responses were assessed such as metabolic scope (the energy available to newly hatched fish for growth and development) and risk taking behaviour in the presence of alarm and predatory cues. Fish were allowed to grow for the complete year and in early 2016 were subjected to an over-wintering condition where temperature was decreased to approximately 3°C for a minimum of 40 days. Additional physiological parameters were assessed post-winter. Initial data show significant effects of rearing environment on both behavioural and physiological responses.

Eggs from female Lake Sturgeon are fertilized with milt from males to be hatched for Dr. Anderson's research group.

Data have been presented at international conferences such as the North American Society for Sturgeon and Paddlefish and the International Congress on the Biology of Fishes. In addition the Department recently recruited a new position to aid in this research.

Dr. Ken Jeffries will be involved in understanding the links between physiological and behavioural phenotype and the genotype of developing Lake Sturgeon. Finally a second controlled environmental unit was recently installed at Grand Rapids hatchery so with his students, Dr. Anderson will be able to examine similar effects of rearing environments on Lake Sturgeon development between populations on the Winnipeg River and the Nelson River. There are currently one undergraduate, four graduate, one post-doctoral fellow and one technician working on this project.

PUBLISHED ARTICLES & THESES

Barth, C.C. and W.G Anderson (2015).
Factors influencing spatial distribution and growth of juvenile Lake Sturgeon (Acipenser fulvescens Rafinesque, 1817). Can. J. Zool. 93, 823-831

Brandt, C., D.C Burnett, L. Arcinas, V.P. Palace and W.G Anderson (2015).
Effects of Chlorpyrifos on in vitro Sex Steroid Production and Thyroid Follicular Development in adult and larval Lake Sturgeon, Acipenser fulvescens. Chemosphere, 132, 179-187

Carriere, B. (2015).
Validation and Evaluation of the Stable Isotope Marking Technique in the Lake Sturgeon, Acipenser fulvescens. MSc Thesis, University of Manitoba. Winnipeg, MB.

Hare, A.J., A. Waheed, J.F. Hare, and W.G Anderson (2015).
Cortisol and catecholamine responses to social context and alarm pheromones in juvenile Lake Sturgeon, Acipenser fulvescens. Can. J. Zool. 93, 605-613

Lake Sturgeon are checked for the presence of Floy tags which uniquely identify the fish.

REFERENCES

1. Ambrose, K.M. and C.A. McDougall. 2016.
Results of Lake Sturgeon population studies conducted in the lower Churchill River between the Little Churchill River and Swallow Rapids, Summer 2015 – Year 2. A Lake Sturgeon Stewardship and Enhancement Program report prepared for Manitoba Hydro by North/South Consultants, Inc.

2. Henderson, L.M., T.J. Sutton and C.A. McDougall. 2016.
Nelson River juvenile Lake Sturgeon inventories, 2015: Sipiwesk Lake inlets. A Lake Sturgeon Stewardship and Enhancement Program report prepared for Manitoba Hydro by North/South Consultants, Inc.

3. Bell, J., L.M. Henderson and C.A. McDougall. 2016.
Results of Lake Sturgeon investigations below the Jenpeg Generating Station, spring and fall 2015. A Lake Sturgeon Stewardship and Enhancement Program report prepared for Manitoba Hydro by North/South Consultants, Inc.

4. Aiken, J.K. and C.A. McDougall. 2016.
Upper Nelson River juvenile Lake Sturgeon inventories, 2015: Pipestone Lake. A Lake Sturgeon Stewardship and Enhancement Program report prepared for Manitoba Hydro by North/South Consultants, Inc.

5. C.A. McDougall and P.A. Nelson. 2016.
Upper Nelson River juvenile Lake Sturgeon inventories, 2015: Sea Falls – Sugar Falls. A Lake Sturgeon Stewardship and Enhancement Program report prepared for Manitoba Hydro by North/South Consultants, Inc.

6. Sutton, T.J. and C.A. McDougall. 2016.
Assessment of Lake Sturgeon Spawning Habitat Suitability below the Kettle Generating Station. A Lake Sturgeon Stewardship and Enhancement Program report prepared for Manitoba Hydro by North/South Consultants, Inc.

Field crews record weight and length of Lake Sturgeon captured.

Manitoba Hydro

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