Fisheries Branch Report

Winnipeg River
Lake Sturgeon Stock Assessment

Manitoba Natural Resources and
Indigenous Futures

Manitoba

Winnipeg River Lake Sturgeon Stock Assessment 2025

Introduction

The Winnipeg River has historically supported abundant populations of lake sturgeon (*Acipenser fulvescens*) and continues to contain appropriate habitat to sustain healthy populations. Indigenous harvest of lake sturgeon (hereafter sturgeon) for food and materials has taken place in Manitoba for thousands of years, and these fish hold cultural, traditional, and ceremonial significance to Indigenous Peoples to this day. Recreational harvest of sturgeon in Manitoba has been prohibited for decades; however, catch-and-release angling of sturgeon provides important recreational opportunities where available. Since the late 1800s, sturgeon stocks in Manitoba were threatened with excessive commercial fishing harvest, which in addition to domestic harvest, habitat degradation, and pollution, quickly led to a precipitous decline in some populations.

Due to their unique biological characteristics (e.g. late age at maturity, intermittent spawning, extended longevity), sturgeon are susceptible to over-harvest causing rapid population declines, particularly when the largest individuals are removed. In response to dwindling commercial returns and the observation of depleted stocks by provincial surveying efforts, a conservation closure was implemented in 1994, which prohibited harvest and fishing for sturgeon in the Winnipeg River for all users; this closure remains in place as of 2025. Given their slow rate of replacement, particularly in depressed stocks, the recovery of sturgeon even under protection is prolonged, and requires substantial effort to measure for management purposes.

Stewart (2009) reported that over 250,000 kg of sturgeon were harvested by commercial fishers on the Winnipeg River between 1910 and 1959. The report indicated that the 78,835 kg of sturgeon harvested in the Winnipeg River in 1910/11 were likely taken from the Lac du Bonnet area and the next reported harvest for the Winnipeg River was in 1939. In Lake Winnipeg, commercial production of sturgeon was far higher than that reported for the Winnipeg River, peaking at 445,110 kg in 1900 (Stewart, 2009). However, the locations of the catch for Lake Winnipeg are broadly described, and variably include fish caught in the Saskatchewan, Red, Assiniboine, and Bloodvein tributaries.

Hinks (1943) explained that most of the sturgeon in Lake Winnipeg were historically found associating with tributaries, and that fish in the main lake appeared to favour the granite lined basins of the east side with its numerous tributaries and deep water, while being mostly absent from the western portions of the lake. It is likely that many of the sturgeon reportedly harvested in Lake Winnipeg were taken near tributaries, and included fish caught in the vicinity of Winnipeg River outflow into Traverse Bay, where an abundance of historically suitable habitat exists. While exploitation impacted sturgeon populations on the Winnipeg River, the river was also being extensively developed with hydroelectric stations starting in the early 1900s. Six

generating stations (GS hereafter; upstream to downstream: Pointe du Bois, Slave Falls, Seven Sisters, McArthur, Great Falls, and Pine Falls; Figure 1) were constructed in the Manitoba portion of the Winnipeg River, which shifted the structure of the habitat available to sturgeon.

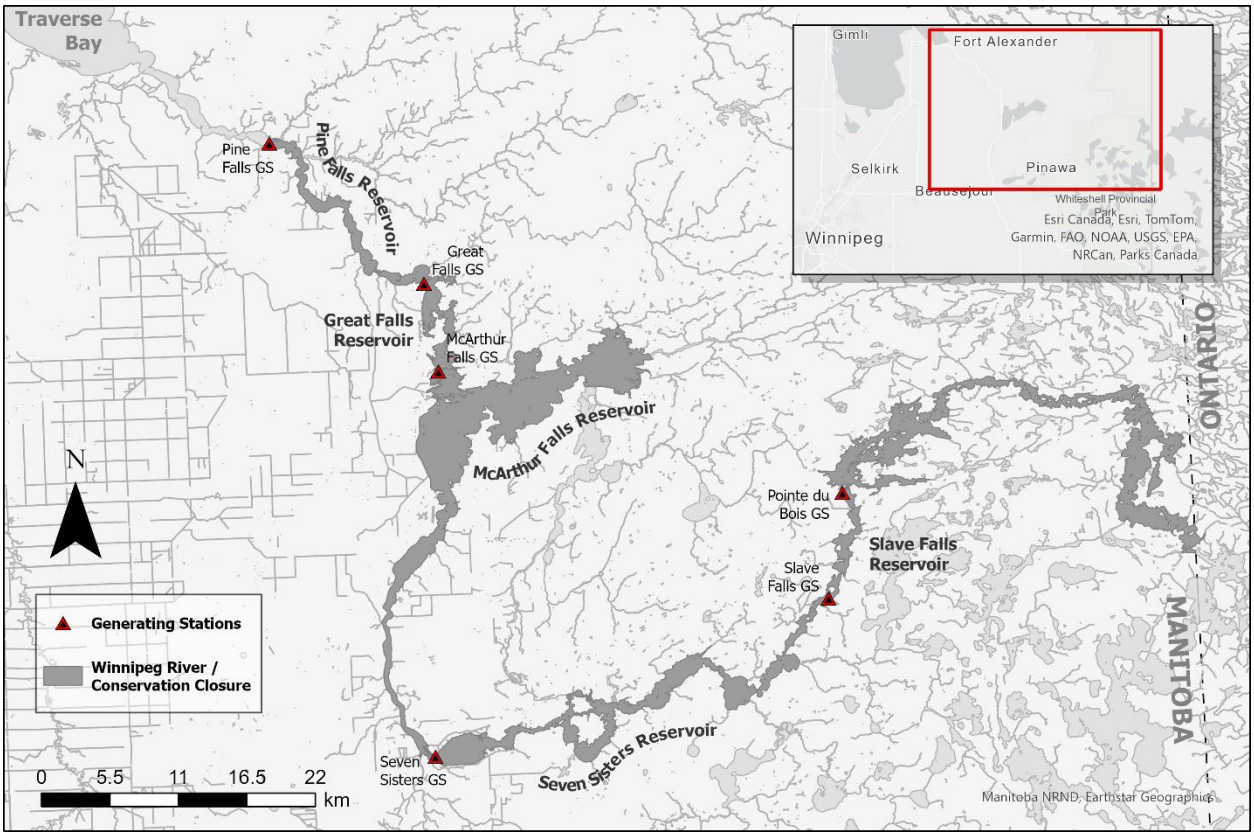

Figure 1: Map outlining the Manitoba portion of the Winnipeg River. The portion shaded in dark grey represents the boundaries of the conservation closure.

In the 31 years since the implementation of the conservation closure between Pine Falls GS and the Manitoba-Ontario border, the Winnipeg River has become one of the most studied lake sturgeon populations in the world. Intense monitoring and research efforts on behalf of government, industry, and academia have increased the resolution of our understanding of sturgeon biology and the structure of their populations. Though the Winnipeg River has been subject to intensive hydroelectric development, recent evidence suggests that sturgeon genetics are uniquely structured in several reservoirs separated by dams. This structuring would pre-date the existence of hydroelectric development, indicating that sturgeon were likely historically separated by natural barriers where hydroelectric stations were built (McDougall, Welsh, et al., 2017; McDougall et al., 2023), and that these reservoirs can support viable populations in the long-term despite their small size (McDougall, Nelson, et al., 2017).

For this reason, monitoring and management efforts are best completed by targeting individual reservoirs of the Winnipeg River as these demonstrate unique habitat and sturgeon recovery potential, densities, growth rates, genetics, and age/size demographics. Table 1 outlines basic

population characteristics of these reservoirs to frame the current sturgeon situation on the Winnipeg River (Figure 1). This stock assessment aims to provide the contemporary status of sturgeon populations in each reservoir of the Winnipeg River.

Table 1: Overview of sturgeon population status by reservoir from the Ontario border to Traverse Bay. Population status was assessed based on interpretation of the overall results of sturgeon monitoring projects and research reviewed in this document. More detailed information on the specific data collected to monitor population health is summarised below and can be found in original citations for more detail.

Reach	Population status
ON Border to Pointe du Bois GS	Low density, signs of population increase upstream in Ontario and successful recruitment near Manitoba waters.
Slave Falls Reservoir – Pointe du Bois GS to Slave Falls GS	High abundance and density, at carrying capacity. Population dominated by slow-growing juveniles.
Seven Sisters Reservoir - Upper Slave Falls GS to Nutimik Lake	High abundance and density, at or surpassing carrying capacity. Population dominated by slow-growing, low body condition juveniles.
Seven Sisters Reservoir - Lower Dorothy Lake to Seven Sisters GS	Moderate adult and juvenile densities. High body condition and growth.
McArthur Reservoir - Seven Sisters GS to McArthur GS	High adult and moderate juvenile densities. High body condition and growth. Optimal population size structure.
Great Falls Reservoir – McArthur GS to Great Falls GS	Moderate densities of juveniles and low densities of adults, abundance fluctuates strongly by year due to high rates of immigration and emigration.
Pine Falls Reservoir – Great Falls GS to Pine Falls GS	High abundance of juveniles and moderate densities of adults. Evidence that population is approaching carrying capacity.
Pine Falls GS to Traverse Bay	Low juvenile and adult densities. This area is not protected under the 1994 Conservation Closure.

Table 2: Summary table showing Catch-per-Unit-Effort (CPUE; # of LKST/100m/24h) and mean condition factor for all reaches of the Winnipeg River from the most recent year they were inventoried. Juvenile CPUE was calculated based on the isolation of 5, 5.5, and 6" mesh from all studies. Adult CPUE was calculated based on isolation of 9 and 12" mesh sizes from all studies. Where no reliable data exists, cells are denoted with 'NA'. CPUE is conditionally formatted in red scale, where darker red cells indicate higher values. Body condition is conditionally formatted in green scale, where darker shades of green indicate higher body condition.

River Reach	Most Recent Study Year	Catch per Unit Effort		Body Condition	
		Juvenile	Adult	Juvenile	Adult
ON Border to Pointe du Bois GS*	2014	0.27	0.44	0.80	0.94
Slave Falls Reservoir	2020	23.8	2.90	0.80	0.76
Slave Falls GS to Numao Lake (Seven Sisters Reservoir)	2024	31.3	3.07	0.68	0.70
Numao Lake (Seven Sisters Reservoir)	2024	51.1	3.83	0.69	0.68
Nutimik Lake (Seven Sisters Reservoir)	2024	21.5	3.54	0.74	0.70
Dorothy Lake (Seven Sisters Reservoir)	2024	7.33	7.02	0.81	0.80
Margaret Lake (Seven Sisters Reservoir)	2024	7.35	2.71	0.81	0.79
Eleanor Lake (Seven Sisters Reservoir)	2024	3.79	2.85	0.86	0.85
Sylvia Lake (Seven Sisters Reservoir)	2024	2.88	1.56	0.85	0.87
Natalie Lake (Seven Sisters Reservoir)	2024	0.77	0.98	NA	0.90
McArthur Reservoir (Lac du Bonnet)	2025	5.96	4.96	0.83	0.81
Great Falls Reservoir	2022	2.70	1.59	0.77	1.02
Pine Falls Reservoir	2022	3.77	0.39	0.70	0.75
Pine Falls GS to Traverse Bay	2025	1.23	1.12	0.78	0.83

*CPUE and body condition presented based on total sturgeon catch from juvenile gang (1-6-inch) and adult gang (8-12-inch) used in Henderson and McDougall (2015).

Ontario Border to Pointe du Bois GS

This reach encompasses portions of the Winnipeg River in Manitoba and Ontario. The Manitoba portion is ~46 Rkm (River kilometre) in length between the provincial border and the Pointe du Bois GS. Flows in this reach and farther downstream are controlled via the Lake of the Woods Control Board by Whitedog GS on the Winnipeg River and Caribou Falls GS on the lower English River (a tributary to the Winnipeg River). Most of this reach has undeveloped shorelines, except at Pointe du Bois, and three angling lodges in the upstream portion of the river. Spawning has been previously documented below the Ontario GSs. This reach is protected under the 1994 conservation closure. Upstream in Ontario, the harvest of sturgeon is permitted by Indigenous people for subsistence purposes.

This area reportedly supported considerable sturgeon harvest in the early 1900s, and Eaglenest Lake was once considered "the best sturgeon fishing ground in the southern portion of Manitoba" (McLeod, 1943). Over-exploitation and habitat impacts may have suppressed historical populations in this reach, yet information on the status of the contemporary population is sparse. In 2014, Manitoba Hydro's Lake Sturgeon Stewardship and Enhancement Program (LSSEP) funded a study targeting juvenile sturgeon downstream from Whitedog and Caribou GSs in Ontario to Pointe du Bois GS. In that study, a total of 19 juveniles and six subadult/adult sturgeon were captured representing an overall CPUE of 0.27 LKST/100m/24h in juvenile gangs (1-6-inch mesh) and 0.44 LKST/100m/24h in adult gangs (8-12-inch mesh; Henderson & McDougall, 2015). This study concluded that sturgeon in this reach grew fast, existed at low densities, and suggested that low abundance could be the result of larval drift from reproduction occurring intermittently in Ontario and that adults may tend to move upstream out of Manitoba in search of appropriate spawning habitat (Henderson & McDougall, 2015).

More recently, a 2023 iteration of a tri-annual juvenile sturgeon monitoring program funded by Ontario Power Generation conducted in the Winnipeg and English Rivers upstream of the Manitoba border have indicated promising results for contemporary recruitment and range expansion (Gartshore et al., 2024). In past studies, juvenile sturgeon monitoring programs have been conducted on the Winnipeg River upstream of the Manitoba border leading up to Whitedog Falls GS and Caribou Falls GS (English River) in 2014, 2017, 2020, and 2023.

Recent evidence suggests successful recruitment in the reach as 2021 - 2023 cohorts were observed from spawning events below Caribou Falls GS, Whitedog Falls GS, and Boundary Falls just upstream of Eaglenest Lake on the Manitoba border (Gartshore et al., 2024). Notably, a substantial number of all 2023 cohort sturgeon were captured in the Boundary Falls vicinity, providing the first record of spawning in this area. Presumably, given these falls' proximity to Eaglenest Lake in Manitoba, this may indicate improvements for sturgeon populations on the Manitoba side of this reach. Future investigations in the Manitoba portion of the Winnipeg River from the Ontario border to Pointe du Bois GS should determine whether similar improvements in recruitment and sturgeon abundance in this area follow the trends observed further upstream.

Slave Falls Reservoir

The Slave Falls Reservoir comprises 9.8 Rkm between the Pointe du Bois GS and the Slave Falls GS. This reservoir is composed of three deep-water basins separated by high-velocity shallow constrictions which act as natural barriers to the movement of juvenile sturgeon (McDougall et al., 2013). This reservoir is the most studied reach of the Winnipeg River and has seen significant research and monitoring efforts regarding sturgeon habitat and populations at all life stages (eggs and larvae, to adults) since the early 2000s. Relative to its size, this reservoir contains high abundances of sturgeon (Table 2). This reach is protected under the 1994 conservation closure.

Contemporary biomass analysis suggests the Slave Falls Reservoir can support between 35,000 to 37,000 kg of sturgeon on average, essentially defining carrying capacity, which was likely reached in the early 2000s (McDougall et al., 2024a). Since then, the reservoir has exceeded 39,000 kg on several occasions and serves as an informative case study on the effects of density dependence on sturgeon at or exceeding carrying capacity. For example, McDougall et al. (2024a) reports that sturgeon in this reservoir have shown signs of malnourishment, cohort suppression, and growth stunting since carrying capacity was reached. The total population estimate (POPAN model) for this reservoir is based on the sum of 2020 juvenile (under 800 mm fork length (FL)) estimates and a 2021 adult (over 800 mm FL), providing a total estimate of 9,464 individual sturgeon, of which 2,332 (95% confidence interval; 2,035 –2,672) are adults (McDougall et al., 2024a). Based on the average weight of juvenile and adult sturgeon, there are an estimated 39,233 kg of sturgeon in the Slave Falls Reservoir as of 2020, exceeding the carrying capacity suggested by McDougall et al. (2024a).

The Slave Falls reservoir has been subject to intensive research over several decades and has become a model for the performance of sturgeon populations in small, isolated river systems. Previously, sturgeon were considered a species that required vast ranges of connected habitats, leading to concern over the loss of connectivity caused by hydroelectric development. Self-sustaining populations have persisted in this small reservoir as evidenced by recruitment and abundance in a system without access upstream through the Pointe du Bois GS (McDougall, Nelson, et al., 2017). While genetic analysis suggests that historical barriers in the form of impassable natural features (e.g. falls, rapids) likely isolated sturgeon populations within the reaches now separated by generating stations (McDougall, Welsh, et al., 2017), there is also evidence to suggest some individuals may still display downstream movements.

Research in the Slave Falls reservoir indicated the susceptibility of sturgeon to entrainment through hydroelectric stations, particularly for juveniles that inhabit within close proximity to the downstream station (McDougall et al., 2013). McDougall et al. (2014) reported that most sturgeon entrained through Slave Falls (91%) survived passage. Similarly, entrained sturgeon are regularly recorded in downstream studies, suggesting that those that survive may contribute to downstream populations to some extent. Entrainment risk appears to increase for sturgeon using the lowermost habitats of a reservoir (McDougall et al., 2013, 2014); however, studies in the Winnipeg River have also recorded a general habitat preference of sturgeon to the upper reaches of reservoirs (Barth et al., 2011; Barth & Anderson, 2015; Henderson & McDougall, 2015, 2024; McDougall et al., 2014).

Seven Sisters Reservoir

The Seven Sisters Reservoir comprises 41 Rkm between the Slave Falls GS and the Seven Sisters GS. This reservoir is composed of a mixture of riverine habitat and within-reservoir lakes that are separated by constrictions with high water velocity, which act as natural barriers limiting the movement of juvenile sturgeon (Barth et al., 2011). This reach of the river flows through a series of lakes and riverine sections characterized by moderate to steep shorelines and numerous islands and reefs. Flow regulation in this reach is through the Slave Falls GS, which is operated as a run-of-the-river facility. Human development is extensive from Nutimik Lake downstream, in the form of provincial campgrounds, cottages, and the townsites of Pinawa and Seven Sisters. This reach is protected under the 1994 conservation closure.

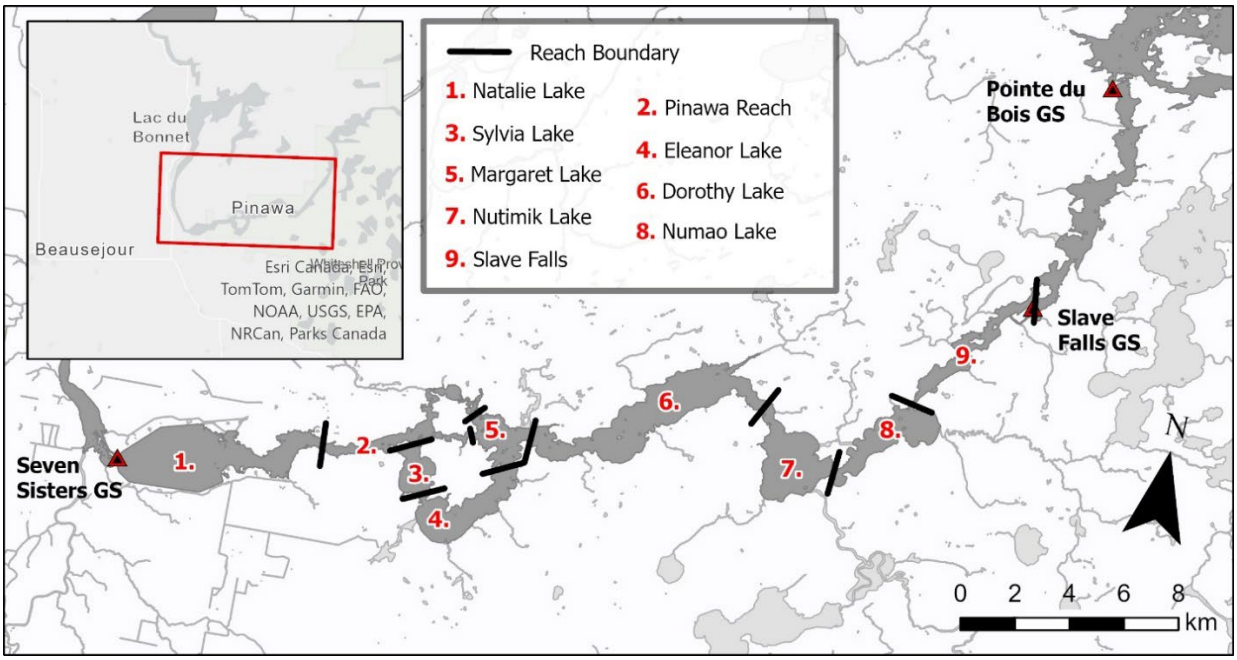

Figure 2: Map illustrating the Seven Sisters Reservoir on the Winnipeg River and identifying sampling sites used for comparison of population metrics. Each black line indicates a natural barrier in the form of rapids, neck-downs, or other high-velocity constrictions which have been shown to inhibit the movement of juvenile, and to a lesser extent, adult sturgeon in the Winnipeg River.

Studies conducted in the Seven Sisters and Slave Falls Reservoirs found that juvenile sturgeon rarely move between within-reservoir basins through areas of constriction in high water velocity and occupy spatially-limited home ranges, finding year-round habitat in these relatively small river sections (Barth et al., 2011; McDougall et al., 2013). Prior to 2024, based on the results of studies across the Winnipeg River system, it was evident that sturgeon displayed high site fidelity within reaches of a reservoir despite the lack of physical barriers obstructing passage (Barth et al., 2011; McDougall et al., 2013). In Numao or Nutimik Lake, sturgeon were not commonly recorded shifting to lower-density, downstream reaches; it appeared that site fidelity in these populations, even in the face of starvation, was very high.

However, in 2024[1], 49% of recaptured sturgeon were caught in a reach outside of their original tagging location and of those that moved, 41% were adults. This result suggests that re-distribution does occur, though the mechanism that instigates this phenomenon is not confirmed. It is possible that the movement is the result of a delayed density-driven search for better food and habitat conditions, although there was not a clear trend of fish moving from high-density to low-density reaches. Environmental conditions may provide a potential explanation for re-distribution, as in 2022, when historic extreme high-water and flood conditions led to the cancellation of tagging programs that year. Historic flooding may have caused an abnormal re-distribution of sturgeon across the reservoir. Given this, whole-reservoir population estimates will be required to capture the potential bias of emigration and immigration across reaches, as was conducted in 2024.

In 2024, preliminary population estimates were generated for the entire Seven Sisters Reservoir for the first time. 2024 PIT tag recapture rates averaged 7.9% for the entire reservoir after introducing PIT tags from the 2020 Lady Lakes LSSEP program to the model, excluding juveniles that would not have otherwise been caught in a 5.5-inch mesh for consistency. This 2024 estimate should be interpreted with caution, given the bias introduced to the POPAN model by large shifts in spatial distribution of sampling and effort. However, model fit improved when capture probability was grouped according to large variations in effort and catch between iterations of the program. This 2024 POPAN model produced an estimate of 18,745 (95% CI; 13,597 – 25,842) juveniles and 11,046 (95% CI; 6,971 – 17,505) adults. Similarly structured sampling efforts in 2026 will refine this estimate, but given previous estimates for Nutimik and Numao lakes, as well as the density, size, and condition metrics collected from the remainder of the reservoir, the estimate is biologically plausible.

The Seven Sisters Reservoir offers a fascinating model for the unique biological structuring of sturgeon populations separated only by high-velocity constrictions that are theoretically passable to sturgeon. Though research has shown that adults are more likely to traverse these natural barriers than juveniles (McDougall et al., 2013), each section of this reservoir appears to present unique population characteristics in terms of abundance, size structure, body condition, and growth. In 2024, the highest densities of juveniles were observed in the upper three sections of the reservoir from Slave Falls GS to Nutimik Lake. Densities gradually declined from Dorothy to Natalie Lakes, while body condition appeared to inversely rise as densities decreased (Figure 3), suggesting density dependent food suppression leading to malnourishment in high density areas. Adult densities were relatively stable across the reservoir, but adult body condition also increased gradually from the upper to lower sections. Given sturgeon are benthic generalists, and

[1] The following un-cited information accounted in the Seven Sisters Reservoir section is sourced from unpublished Manitoba Fisheries Branch data from various datasets resulting from ongoing mark-recapture datasets and reporting maintained by the province on lake sturgeon in the Seven Sisters Reservoir. Additional datasets from external sources on the same Reservoir will be cited by author.

that diet does not dramatically vary from juvenile to adult life stages, it is plausible that adult body condition is also moderated by competition with high densities of juveniles.

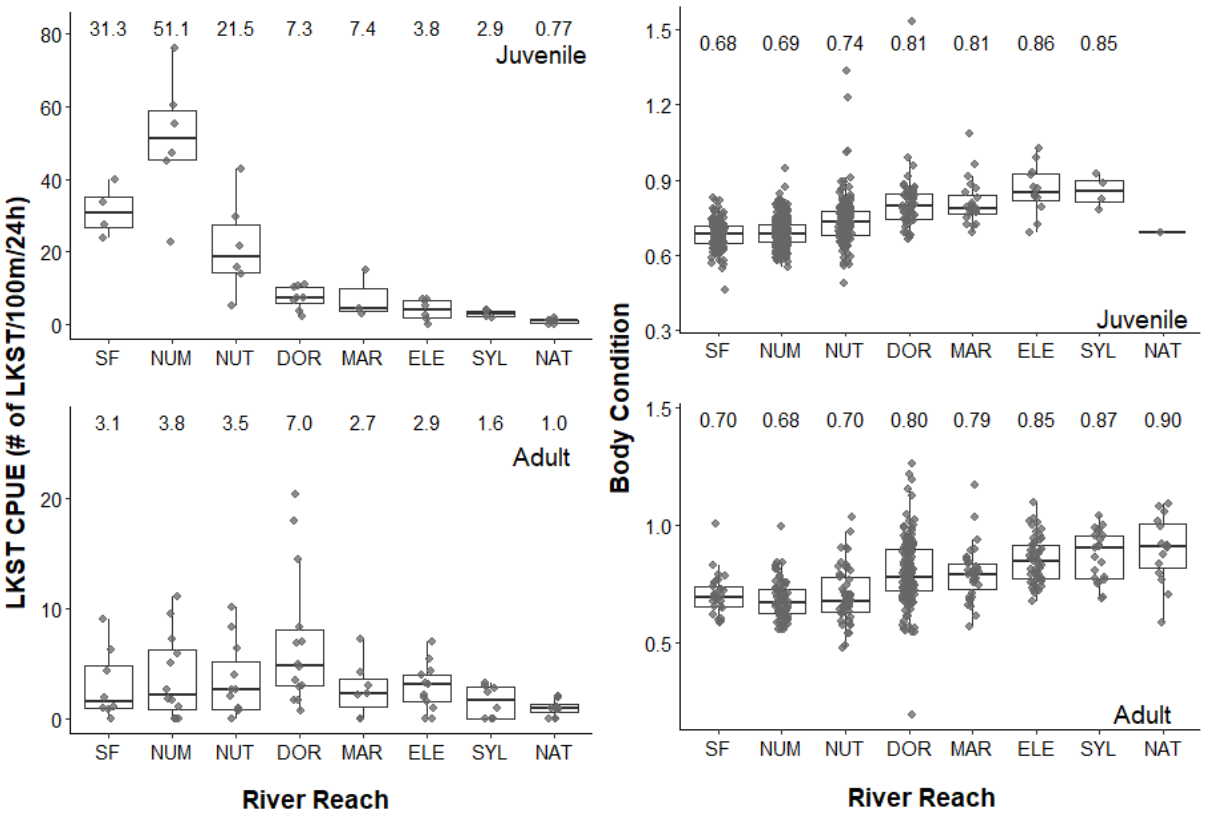

Figure 3: Boxplots illustrating sturgeon Catch-per-Unit-Effort (CPUE; left) and body condition factor (right) for juvenile (Fork Length < 800mm) and adult/subadult (Fork Length > 800 mm) sturgeon by River Reach in the Seven Sisters Reservoir based on results from a 2024 population assessment.

When examining the size structure of sturgeon in this reach from the 2024 assessment, it is apparent that the proportional representation of adults generally increases from upstream to downstream (Figure 4). Visual inspection of the size demographics across sampling sites could suggest that recruitment favours high juvenile densities in the upper reaches and that adults possibly move downstream as they mature. However, this theory conflicts with the site fidelity and biological structuring traditionally observed across these sites. It is also plausible that in cases of density dependent growth suppression, which is more prevalent in the upstream sections, juveniles are less likely to grow past the 800mm FL benchmark. This is substantiated by size data on recaptured fish that sometimes, in high density reaches, display insignificant growth over substantial periods of time.

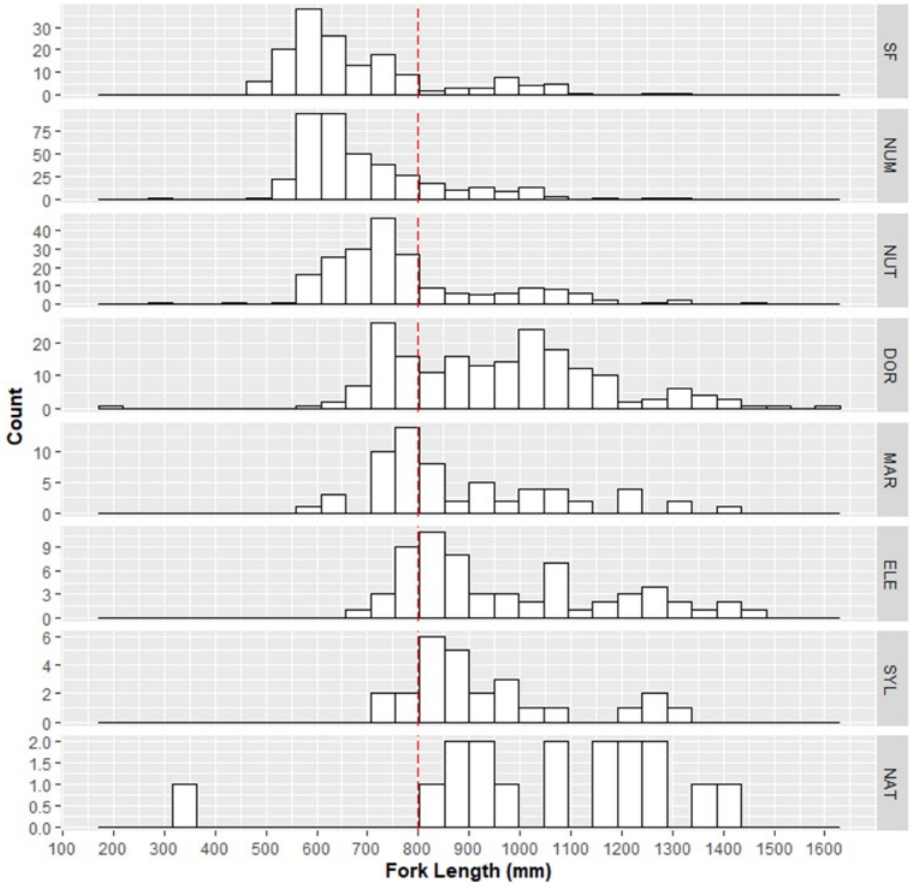

Figure 4: Fork length (mm) frequencies for river reaches in the Seven Sisters Reservoir. Length frequencies shown are from 2024 and from top to bottom (upstream to downstream) show the Slave Falls (SF; from GS to Numao Lake), Numao Lake (NUM), Nutimik Lake (NUT), Dorothy Lake (DOR), Margaret Lake (MAR), Eleanor Lake (ELE), Sylvia Lake (SYL), and Natalie Lake (NAT) which encompasses the area from Pinawa townsite to Seven Sisters GS. Dashed red line at 800 mm FL separating juvenile and adult/subadult life stages.

The updated whole-reservoir protocol employed in 2024 is useful to standardize methods and minimize the bias of future populations modelling efforts. However, past efforts from multiple studies and variable methodologies offer an important glimpse into the unique circumstances of the various sections of the reservoir. From upstream to downstream, the results of some these studies are summarized below for additional context to the above description.

Slave Falls GS to Numao Lake (upper reservoir)

Prior to 2024, the most recent sampling efforts of the riverine habitat separating the Slave Falls GS and Numao Lake were in 2015, where 25 adult sturgeon were captured (CPUE= 1.4 LKST/100 m/24 h) with a mean condition factor of 0.87. Between 2006 and 2008, Barth and Anderson (2015) conducted a juvenile sturgeon study across the Seven Sisters Reservoir. They found juvenile abundances in the furthest upstream reach from Slave Falls GS to Numao Lake to be high (CPUE = 19.9 LKST/100 m/24 h) and condition factor to be the lowest in the reservoir. In 2024, CPUE in this stretch of the reservoir had increased from the 2015 values for both adults

(3.1 LKST/100 m/24 h) and juveniles (31.3 LKST/100 m/24 h). Length frequency histograms from 2024 appear to indicate that the Slave Falls area is heavily dominated by juveniles with adults only representing 18% of the total sturgeon catch. The tailrace of the Slave Falls GS is the closest likely spawning habitat for sturgeon upstream of Sturgeon Falls (directly upstream of Nutimik Lake).

Numao and Nutimik Lakes (upper reservoir)

Extensive Manitoba Fisheries Branch (MFB) tagging efforts in the Numao and Nutimik Lakes section of the Seven Sisters Reservoir began in 1984. Early tagging efforts from 1984 to 2003 provided insight into the state of the population but due to the techniques used in mark-recapture (inconsistent methods, external tag loss), failed to provide reliable population estimates. For this reason, MFB developed a new protocol in 2006 based on the use of internal tags (PIT tags) and replicable methods and timing to develop more reliable population estimates. From 2007 to 2024, 5,173 unique sturgeon have been tagged, and recapture rates have gradually increased (10 and 12% for Numao and Nutimik, respectively in 2024). Prior to 2024, POPAN estimates presented a total Numao/Nutimik Lakes population fluctuating between 18,000 – 25,000 sturgeon over ~500 mm FL.

Current evidence suggests that like the Slave Falls Reservoir, the sturgeon populations of Numao and Nutimik Lakes are likely at or surpassing carrying capacity as evidenced by supressed growth, very low body condition, and the disproportionate representation of juveniles in the 500-750 mm FL range, which are caught in exceptional abundance (Figures 3/4). Based on population size structures for the upper three sections of the Seven Sisters Reservoir from 2007 to 2024, density dependent growth suppression in these juveniles appears to inhibit their ability to recruit into the adult population (FL > 800 mm FL; Figure 5). In 2024, sturgeon below Slave Falls and in Numao and Nutimik Lakes of both life stages (except adults in Nutimik Lake) had condition factors falling under the benchmark ~0.71 (McDougall et al., 2024), where the risk of starvation-based mortality events, particularly in juveniles, is elevated.

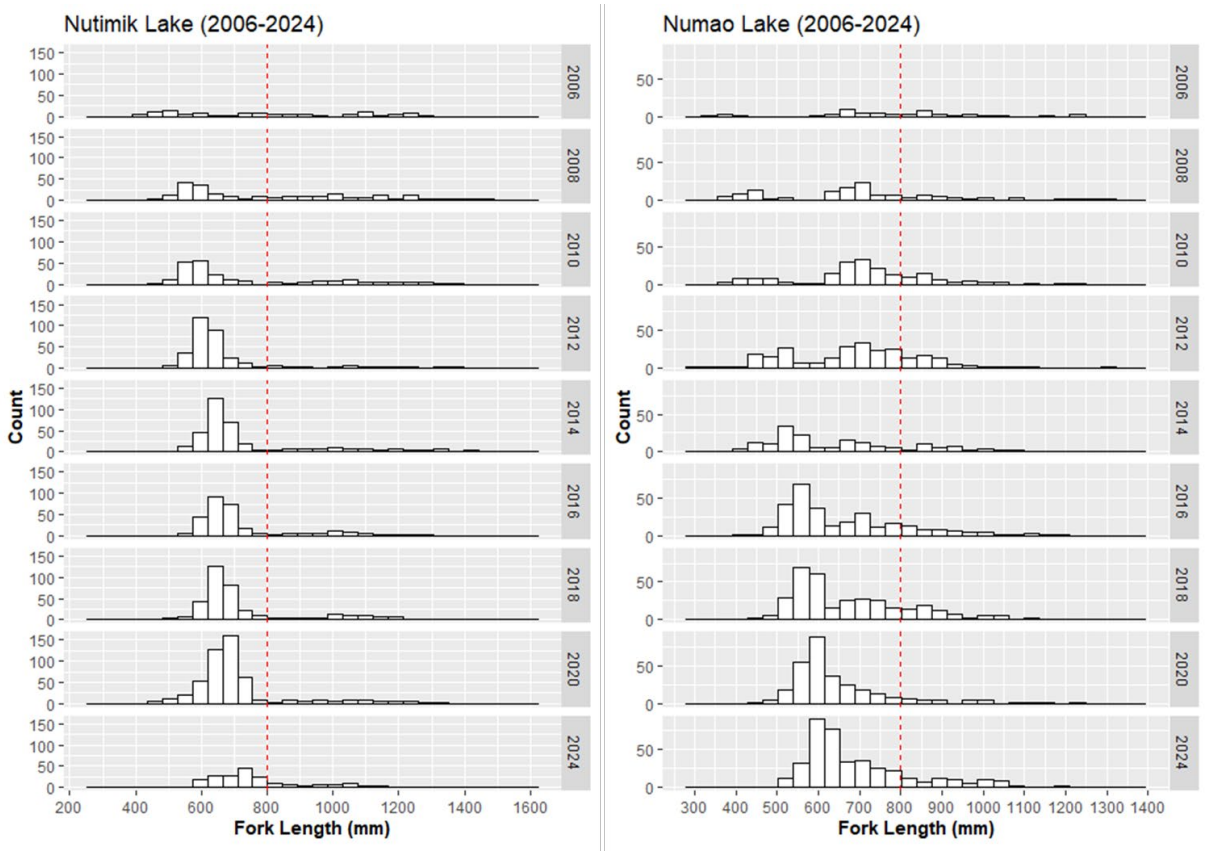

Figure 5: Fork length (mm) frequencies for Nutimik (left) and Numao (right) Lakes in the Seven Sisters Reservoir. Length frequencies shown are from 2006 to 2024. Dashed red line at 800 mm FL separating juvenile and adult/subadult life stages.

Lady Lakes (lower reservoir)

Lake sturgeon in the lower portion of the Seven Sisters Reservoir, also known as the Lady Lakes (describes all river reaches between Dorothy and Natalie Lakes; See Figure 2 map), have been studied as part of several academic research and monitoring programs (Barth et al., 2009, 2011; Barth & Anderson, 2015; Henderson, 2013; Klassen, 2014; Mullen & McDougall, 2021). Results from 2020 and 2024 inventories found that the distribution of sturgeon in the Lady Lakes was not uniform; abundance was generally highest in upstream and middle reaches and lowest in downstream reaches, similar to the pattern observed by previous studies in the reservoir (Barth et al., 2011; Barth & Anderson, 2015; Klassen, 2014). Adult sturgeon populations in Dorothy, Margaret, Eleanor, and Sylvia Lakes appear robust in terms of their abundance and condition factor relative to the rest of the Winnipeg River (Table 2), with Dorothy Lake displaying the highest abundance of adults observed in the Manitoba portion of the Winnipeg River (CPUE = 7.0 LKST/100 m/24 h in 2024). In 2020, there was evidence of juvenile recruitment in these reaches, with strong young-of-year cohorts observed from both 2015 and 2016 (Mullen & McDougall, 2021).

Juvenile sturgeon in the Lady Lakes increased in abundance between 2008 and 2020; for example, mean juvenile CPUE increased in Dorothy Lake (1.5x increase), Margaret Lake (3.2x), Eleanor Lake (1.3x), and Sylvia Lake (1.8x) in 2020 when compared to Barth and Anderson (2015) using similar gear types (Mullen & McDougall, 2021). Results of 2024 inventories in these sections revealed generally stable patterns of abundance across the area since 2020 (Figure 3). Additionally, there are signs of increased abundance of juvenile sturgeon in the lowermost reaches of the Lady Lakes. In 2020, 15 juvenile and one adult sturgeon were captured in the area between Pinawa townsite and Seven Sisters GS (Mullen & McDougall, 2021). In 2024, a total of 17 sturgeon were captured in this same area, 16 of which were adults. This finding is notable given previous juvenile studies in 2006-2008 and 2009-2010 captured no sturgeon in this same area (Barth & Anderson, 2015; Klassen, 2014), suggesting improving populations or habitat use in these sections.

Taken together, recent studies indicate an overall positive outlook for both adult and juvenile sturgeon populations in the Lady Lakes, particularly in Dorothy, Margaret, Eleanor, and Sylvia Lakes. While the total population in these four portions of the Lady Lakes is likely lower than those of the Slave Falls, Numao, and Nutimik Lakes, they exhibit a balanced size structure, high adult densities, and high condition factors more conducive to a healthy population than in upper portion of the reservoir, where sturgeon are at or surpassing carrying capacity, and density dependent effects are strong.

McArthur Reservoir (Lac du Bonnet Lake)

This 35 km reach of river is characterized by moderate to gently sloping shorelines with a mix of boreal forest, developed farmland, and residential shorelines. A portion of the west shoreline of Lac du Bonnet is a dike constructed as part of hydroelectric development. The upper 20 km of the reach is riverine and widens into Lac du Bonnet Lake. The lake receives flows from the Bird and Lee Rivers to the east and the Whitemouth and Winnipeg Rivers to the south. Numerous islands and reefs are scattered throughout the reach. Flow regulation in this reach is through the Seven Sisters GS, which is operated as a run-of-the-river facility. Development is extensive, and includes the townsites of Seven Sisters, Lac du Bonnet, and cottage use along significant portions of the shoreline. This reach is protected under the 1994 conservation closure.

Historical data on the status of the sturgeon population in the McArthur Reservoir is scarce, and the population is believed to have been heavily commercially fished in the early 20th century (Stewart, 2009). Since 2013, Manitoba Fisheries Branch sampling efforts have indicated a robust sturgeon population inhabiting the riverine and adjacent lacustrine habitat of the western portion of the reservoir[2]. To date, no confirmed sturgeon captures have been recorded in the Lee or Bird Rivers, despite appropriate habitat for foraging and reproduction, though there is no known

[2] The following un-cited information accounted in the McArthur Reservoir section is sourced from unpublished Manitoba Fisheries Branch data from various datasets resulting from ongoing mark-recapture datasets and reporting maintained by the province on lake sturgeon in the McArthur Reservoir.

information that would validate historical populations in these areas. Experimental gillnets set in the lacustrine habitat leading eastward into the central basin of Lac du Bonnet Lake has produced limited observations of adults but not juveniles, suggesting selective juvenile habitat preference to riverine habitat as observed in other reaches of the Winnipeg River.

When examining the results of seven biennial monitoring programs from 2013 to 2025, the McArthur Reservoir sturgeon population appears robust and has been used as a reference point for optimal body condition (McDougall et al., 2024b) in a productive reach of the river with good habitat, where density dependent growth suppression has not yet occurred. This population exhibits fast growth and high proportions of mature adults relative to other reaches of the Winnipeg River, particularly the upper reach of the Seven Sisters Reservoir and the Slave Falls Reservoir.

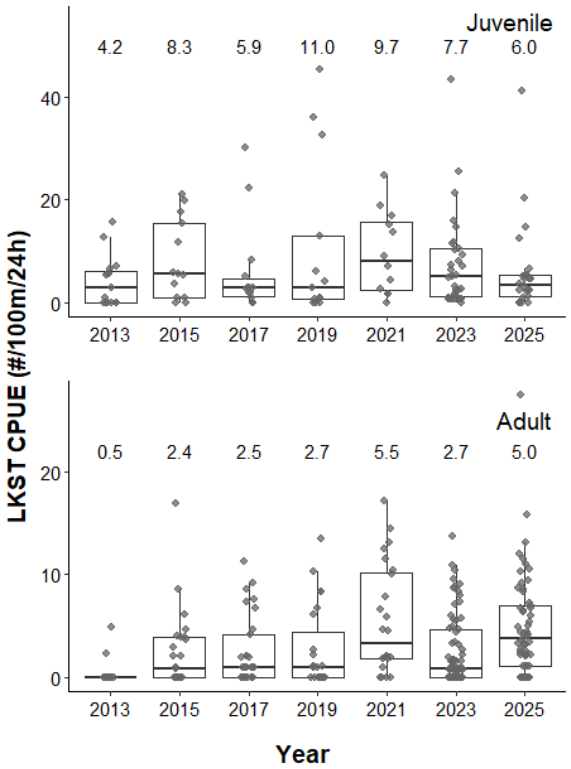

Figure 6: Boxplots illustrating Lake Sturgeon Catch-per-Unit-Effort (CPUE) for juvenile (5.5-inch mesh size) and adult/subadult (9 and 12-inch mesh size) lake sturgeon by sampling year from 2013 to 2025. Statistical significance between sampling years within a life stage are indicated by letter notation.

In 2021 and 2025, adult CPUE was significantly higher than first observed in 2013 (Figure 6). Length frequency histograms show recruitment of several juvenile cohorts into the 800 mm FL size class over the course of the study (Figure 7). Juveniles are moderately abundant in the reach (2025; CPUE 6.0 LKST/100 m/24 h; Figure 6), and no statistically significant differences in juvenile density have been observed between 2013 and 2025. Moreover, experimental 1.5-inch mesh nets set in 2015 captured young-of-year and yearling sturgeon, indicating successful recruitment is occurring in the reach, which is also supported by the periodic representation of small juveniles in the overall size structure (Figure 7). For example, 2025 tagging efforts revealed a strong pulse of juvenile sturgeon (~40-45 cm FL) recruiting into the 5.5 – inch mesh net.

The overall fish community in Lac du Bonnet is robust and offers diverse angling opportunities. Long term annual coordinated aquatic monitoring programs indicate a generally stable and productive fish community. This diversity in species composition is also evident in the catch of non-sturgeon species in McArthur Reservoir sturgeon assessments. For example, in 2025, the 5.5-inch mesh gillnets (n=24) produced a catch of 479 fish comprised of 9 species, of which 25.3 % were sturgeon. Comparatively, when considering the composition of 930 fish caught in 5.5-inch gillnets (n=43) from the Seven Sisters Reservoir in 2024, eight species were captured, of which 85.5 % were sturgeon. This result

suggests that intra-specific competition may be a factor in high density sturgeon populations and possibly validates a balanced fish community in the McArthur Reservoir.

Increased netting effort in 2023 and 2025 was successful in bolstering the total number of tagged individuals (n = 1,700 unique sturgeon encounters) and increasing the recapture rate of previously PIT tagged individuals. Specifically, 2025 efforts demonstrated a more than doubling of PIT tag recaptures since 2023 (6.0 % and 6.9 % for adults and juveniles, respectively). Given this, preliminary population estimates were produced for this reservoir and reported for the first time. However, these population estimates should be interpreted cautiously given the still low overall recapture rate of the models and the increased netting efforts of 2023 and 2025. Still, POPAN model outputs were responsive to annual recruitment patterns to either life stage, and offered reasonable confidence intervals despite low recapture rates, suggesting reasonable predictive power validated by model fitting tests. This protocol will be repeated in 2027 and further refine population modelling.

Preliminary models for the McArthur Reservoir in 2025 revealed an adult population estimate of 10,255 (95% CI; 7,282 – 14,442) sturgeon over 800mm FL. This estimate suggests a strong adult population in this reservoir and further validates high adult densities relative to other reservoirs of the Winnipeg River. 2025 juvenile population estimates are far lower than adults in this reach, though this is likely due to the erratic recruitment patterns typical of the species, and the rapid transition of juveniles into adult/subadult size classes due to good growth. In 2025, POPAN modelling produced a juvenile sturgeon estimate of 1,399 sturgeon (95% CI; 538 – 3,632), and an apparent juvenile survival rate of 0.62. The low survival estimate, when examined in conjunction with biennial length frequencies and past growth data, is more likely an indication of the relatively rapid growth of juveniles into the 800mm FL size class in this reservoir, rather than a measure of true mortality rates. For reference, juvenile sturgeon survival in the Winnipeg River is generally high (e.g. 0.92 -1.0 in Henderson & McDougall, 2024; McDougall et al., 2024b).

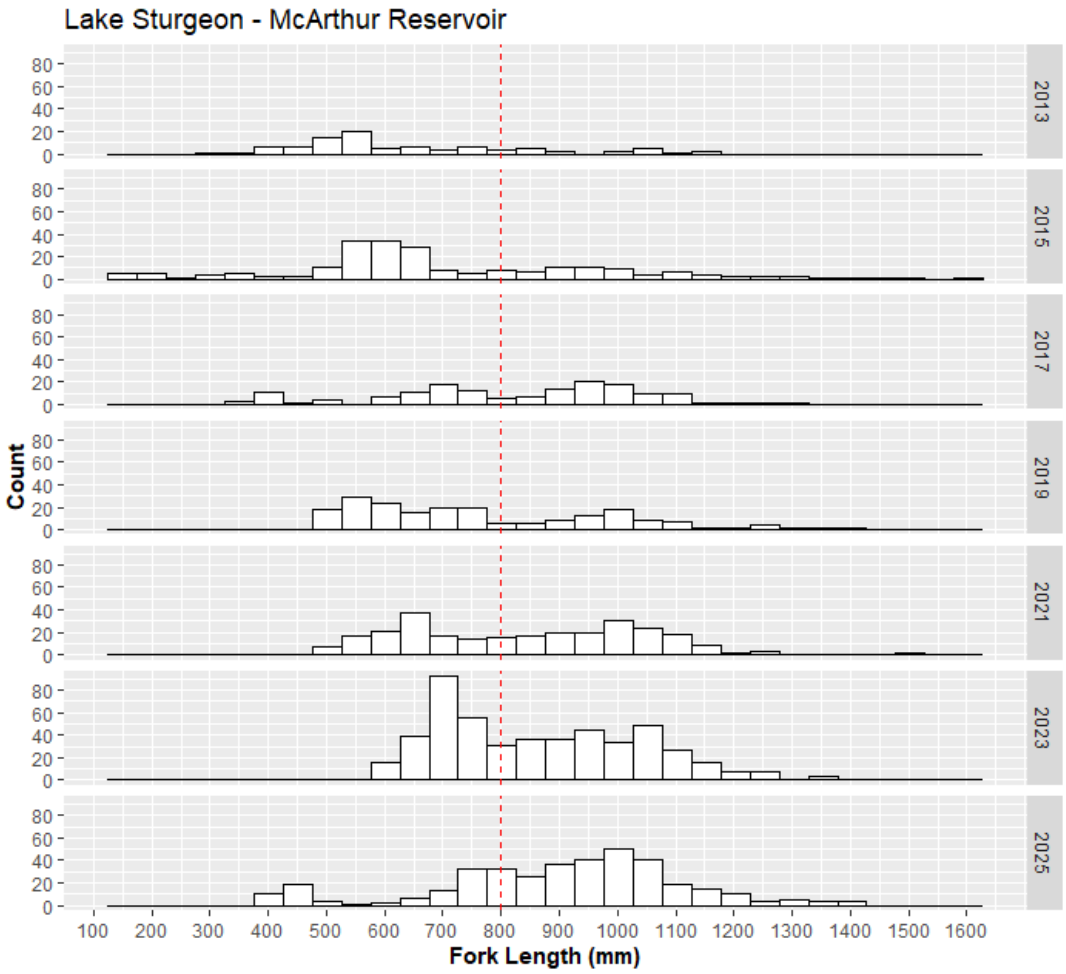

Figure 7: Fork length (mm) frequencies for the McArthur Reservoir (Lac du Bonnet Lake). Length frequencies shown are from 2013 to 2025. Dashed red line at 800 mm FL separating juvenile and adult/subadult life stages.

Great Falls Reservoir

This 9 km reach extends from McArthur GS to Great Falls GS. It is riverine with scattered islands and reefs and flows through a mix of moderate to gently sloping shorelines with a mix of forested and developed land. A portion of the west shoreline is a dike constructed as part of hydroelectric development. Flow regulation in this reach is through the McArthur GS, which is operated as a run-of-the-river facility. Development is minimal except the townsite of McArthur Falls. This reach is protected under the 1994 conservation closure. Manitoba Hydro LSSEP studies have improved our understanding of the population within the McArthur GS to Great Falls GS reach. Fall gill net inventories for juveniles (1”- 6” mesh sizes) and adults (8” – 12” mesh sizes) indicate a low-density adult population, but recruitment is occurring.

The results of four years of juvenile and adult inventories in the Great Falls Reservoir indicate that the juvenile population increased from 2020 to 2023, partially driven by a strong 2022 cohort that was captured in 2023 (Lavergne & McDougall, 2024). Large-mesh gillnets were

fished from 2020 to 2023, with the highest adult CPUE observed in 2023, despite generally low adult densities observed in the preceding years (Lavergne & McDougall, 2024). A total of 283 unique sturgeon have been sampled in the Great Falls Reservoir, but low recapture rates (3.2 %) have not permitted a population estimate to be produced, and may be reflective of strong young-of-year cohorts, as well as immigration and emigration caused by entrainment at both ends of the reservoir (Lavergne & McDougall, 2024).

Downstream entrainment is known to occur for sturgeon in the Great Falls Reservoir. Acoustic telemetry studies conducted on 20 tagged sturgeon in this reservoir produced notable results for five individuals, of which three were confirmed to be entrained through the Great Falls GS (two of which were presumed mortalities), and two that ceased being detected but based on their previous movement patterns were presumed to be either entrained or impinged in the GS (Henderson & McDougall, 2024).

Pine Falls Reservoir

This 23 km reach of the river between Great Falls GS and Pine Falls GS is characterized by moderate to gently sloping shorelines with a mix of boreal forest, farmland, and residential shorelines. It receives inflow from the Maskwa River and Catfish Creek. Development in this reach occurs on both sides of the river and includes the communities of McArthur Falls, Whitemud Falls, Silver Falls, St. George, and Powerview. In addition, there are residential, and cottage developments scattered along the shoreline. This reach is protected under the 1994 conservation closure.

MB Hydro LSSEP studies since 2010 have improved our understanding of the population within this reach. Fall gill net inventories for juveniles (1” – 6” mesh sizes) and adults (8” – 12” mesh sizes) indicate that abundance is low for adults, but high for juveniles. Spawning has been documented at Whitemud Falls and below Great Falls GS.

Between 2020 and 2023, sufficient captures and recaptures were recorded to produce population estimates for juvenile sturgeon, POPAN models predicted a juvenile population of 5,284 (95% CI: 3,900 – 7,159) in 2021, 5,288 (95% CI: 3,905 – 7,160) in 2022, and 8,822 (95% CI: 6,404 – 12,182) in 2023 (Lavergne & McDougall, 2024). Based on the mean weight and population estimates of sturgeon in this reach in 2023, a juvenile biomass of 17,564 kg was calculated (Lavergne & McDougall, 2024). The elevated juvenile biomass in this reach may indicate a population approaching carrying capacity, given patterns of incremental length/weight increase and body condition that could indicate growth suppression (Lavergne & McDougall, 2024).

Like upstream reservoirs, data from recaptured juvenile sturgeon in the Pine Falls Reservoir indicate that recaptured fish generally show high site fidelity and are often recaptured in close proximity to their initial location. Further, sturgeon are most densely populated in the upstream portions of the reach, with Silver and Whitemud Falls seemingly presenting a natural barrier to movement (Lavergne & McDougall, 2024). In recent years, there have been multiple

observations of injured or dead sturgeon downstream of the Great Falls GS that could plausibly be caused by turbine strikes. To learn more about how sturgeon in this reach interact with hydroelectric equipment, Manitoba Hydro`s LSSEP funded an acoustic telemetry study beginning in 2022. Movement data from 50 sturgeon in the reach has thus far shown low rates of interaction with the GS, but entrainment through Great Falls and Pine Falls GSs appears to be occurring (Henderson & McDougall, 2024).

Pine Falls GS to Lake Winnipeg

Lake sturgeon are known to inhabit the riverine habitat downstream of the Pine Falls GS, and their spatial distribution generally extends to Traverse Bay East of Elk Island. Historically, it is likely that this area supported a robust sturgeon population impacted by commercial fishing harvest. This reach of the Winnipeg River is not protected by the 1994 conservation closure, and no contemporary population monitoring was conducted until 2025. Previously, observational reports from anglers and commercial fishers validated that sturgeon reside in this area, though little was known about their abundance and stock metrics. This portion of the Winnipeg River allows for domestic Indigenous harvest and recreational catch-and-release fishing for sturgeon. No population estimate has been generated for this area to date.

In 2016, as part of a DFO acoustic telemetry fish movement study in Lake Winnipeg and its tributaries, 42 sturgeon were captured for acoustic tagging in May 2016 with an average fork length of 1,035 mm (range 745 – 1,390), and an average body condition of 0.89 (range 0.75 – 1.17; DFO, unpublished data, 2016). Acoustic telemetry studies indicate that sturgeon tagged below Pine Falls GS favour riverine habitat immediately upstream of Traverse Bay, while periodically venturing in the lacustrine habitat during the late spring and summer months. During this period, over 90% of tagged sturgeon increased their median distance from Pine Falls GS from ~ 1-2 km to ~10-15 km (L. Gutowsky, pers. Comm, 2025). In addition to ongoing acoustic telemetry research on sturgeon in this reach, MFB has initiated a long-term population monitoring program to fill knowledge gaps on population trajectory and performance.

In late June 2025, MFB executed a lake sturgeon population monitoring effort from Pine Falls GS into Traverse Bay. Gear types and timing remained consistent with other provincial efforts for mark-recapture programs upstream where 5.5, 9, and 12 – inch mesh sturgeon nets were fished, and all lake sturgeon captured were checked for pre-existing tags, measured, weighed, and PIT tagged. The program resulted in a relatively low catch rate where 42 sturgeon were captured in 48 nets, with an overall juvenile and adult CPUE of 1.23 and 1.12 LKST/100m/24h, respectively. Adult sturgeon were generally more abundant in Traverse Bay than the Winnipeg River section of the study area, where the opposite was true of juveniles. Body condition was 0.78 and 0.83 for juveniles and adults. Two recaptures were recorded during this program, respectively originating from the McArthur Reservoir and Great Falls Reservoir upstream in the Winnipeg River and passed downstream through several generating stations to reach Traverse Bay.

In addition to preliminary mark-recapture efforts, an additional 35 acoustic tags were installed to lake sturgeon in this study area in conjunction with DFO, to maintain movement data for these sturgeon in the larger context of the Lake Winnipeg system. Overall, this early effort to describe and measure the abundance of the Pine Falls/Traverse Bay sturgeon population revealed a low-density catch of moderate to high body condition individuals, where adults were proportionally more represented in the size structure (78.6% of total sturgeon catch), but evidence of recruitment was recorded in multiple juvenile size classes. Future monitoring efforts may include PIT tagging adults during spawning period congregations upriver where catch rates may increase the efficiency of mark-recapture efforts for the adult population.

Conclusion

Since the implementation of the 1994 lake sturgeon conservation closure on the Winnipeg River between Pine Falls GS and the Manitoba-Ontario border, the outlook for the sturgeon population is positive. The remarkable recovery of these iconic fish in many reaches of the Winnipeg River represents an exceptional success story for conservation in Manitoba. Decades of research and monitoring efforts have made it possible to increase the resolution of understanding of these populations. From these efforts, we can conclude that in recent years, while many reaches have reached reasonable recovery targets, several have likely exceeded those targets, and have for some time. However, populations above Pointe du Bois GS and below Pine Falls GS should be monitored carefully, as there are still knowledge gaps that need to be addressed to inform sustainable fisheries management objectives for all reaches moving forward.

Future monitoring effort will focus on maintaining long term population estimates and stock metrics on those systems where our understanding is comprehensive, as well as to increase efforts on lesser studied reaches to achieve the level of understanding that informs long-term management. Future research should be targeted to answer questions relevant to the biology and ecology of Winnipeg River sturgeon as it pertains to the management of sturgeon in these river reaches. Future fisheries management will also require strong partnerships with Indigenous communities and non-Indigenous resource users to ensure that consideration is given to the priorities, concerns, and motivations of those impacted by management decisions. While sturgeon have proven robust in their ability to overcome historical harm, we must be careful not to deplete the resource and move forward with a plan that will ensure Manitobans access to healthy sturgeon populations for generations.

Table 3: Summary of juvenile and adult populations estimates with 95 % confidence intervals estimated through robust POPAN.

WPG River Reach	Study Year	Juvenile	Adult
ON Border – PDB	-	-	-
Slave Falls Reservoir	2020 (JUV) 2021(AD)	Pre-2011 cohorts: **6,063** (5,172-7,106) Post-2012 cohorts: **1,069** (660-1,732)	**2,332** (2,035-2,672)
Seven Sisters Reservoir	2024	**18,745** (13,597 – 25,842)	**11,046** (6,971 – 17,505)
McArthur Reservoir	2025	**1,399** (539 – 3,632)	**10,255** (7,282 – 14,442)
Great Falls Reservoir	-	-	-
Pine Falls Reservoir	2023	**8,822** (6,404 – 12,182)	-
Pine Falls – Lake Winnipeg	-	-	-

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