



Glad Lake Maintenance Program & Stocked Trout Assessment 2020

In part of reporting for FES Project 19-036 -
Recreational Fisheries Enhancement & Youth
Angling Opportunities in the Northern Parkland

Summary

Glad Lake has been managed as a trout fishery since the 1940s. Lake trout were first introduced, followed by many other trout species including splake, rainbow trout, brook trout, cutthroat trout, arctic char and sparr. Throughout time, walleye, northern pike, yellow perch and white suckers have also resided within the community.

Northern pike are known to significantly impact trout stocking efforts and removal programs have been a part of Glad Lake's management practices historically and today. SVSFE has conducted the annual "Glad Lake Maintenance Program" since 2015 and a total of 1,329 northern pike have been transferred since 2015. The objective was to increase survival of recently stocked arctic char (*Salvelinus alpinus*). The char were re-introduced as an initiative to increase and diversify angling opportunities in the area. Arctic char eggs were purchased in 2015 with funds provided by the Hunter & Anglers Preservation Fund and the 22,250 char were raised by the Whiteshell Fish Hatchery and stocked in 2017. An additional planting of 25,550 were supplied by the Whiteshell Fish Hatchery and stocked in the spring of 2020 subsequent to the transfer.

The 2020 pike transfer is a continuation of this ongoing program. In addition, SVSFE conducted a short electrofishing survey in the fall of 2020 to assess stocked trout survival. The results from both the transfer and fall survey indicate success from the program. Lake trout abundance continues to increase, while pike numbers are maintaining a low CPUE rate. The 2020 highlight was the recapture of arctic char indicating fair survival from the 2020 planting. With the positive response from the removals, SVSFE recommends continuing with the program on an annual basis and continual monitoring of trout populations through periodic surveys.

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Objective

The primary objective of the annual Pike Transfer Program is to decrease predation on stocked trout introduced to Glad Lake and, in turn, increase stocking success. The goal has been to maintain a low maintenance program, with consistent timelines (early ice off), while removing and transferring as many northern pike as possible during spring spawning periods.

The secondary objective to the program in 2020, was to evaluate survival and growth of the arctic char plantings in 2017 (22,250 18+cm) and 2020 (25,550 18+cm) and the current lake trout population. This report will summarize efforts from 2020 and compare findings from past transfer programs. For more background information on the transfer program and Glad Lake management please refer to previous reports.

Methods

Pike Transfer Program

Throughout the transfer programs, the key factor identified to catching pike is to net as early as possible. Northern pike commonly spawn when the lake remains ice covered. Glad Lake is a deep 70.4-hectare oligotrophic lake located in the Duck Mountain Provincial Park with a maximum depth of 39.9 m (over 130 feet) and an average depth of 10.8 m. Fortunately, the north bay offers opportunities to set nets, as it is typically ice free for a couple days prior to the lake opening up. The electrofishing boat was unavailable in the spring, therefore catch methods were exclusive to trap netting using one large mesh (2.5") trap net and one small mesh (1/4") trap net. Trap nets were monitored daily and pulled every one - five days and fished exclusively in the north bay (Figure 1). Netting continued until catches were insignificant.

All pike caught were sampled for fork length, sex, general condition, and age structures taken. All walleye and any northern pike >550 mm were transferred to Wellman Lake while pike <550mm were transferred to Chain Lakes (south & north basin). Size categories for recipient lakes was slightly different from previous transfers (650mm for previous years). Trout were sampled and released, while other game fish such as white suckers and yellow perch were simply counted and released.

Fall Electrofishing Survey

SVSFE utilized Fisheries & Oceans' (DFO) SR20 electrofishing boat for method of capture. The electrofishing survey was completed by shocking the entire shoreline in depths ranging from 1 to 3.5 meters. Trout were sampled for fork length, total length and age structures collected before being released. All northern pike caught during the survey were measured and transferred Wellman Lake.

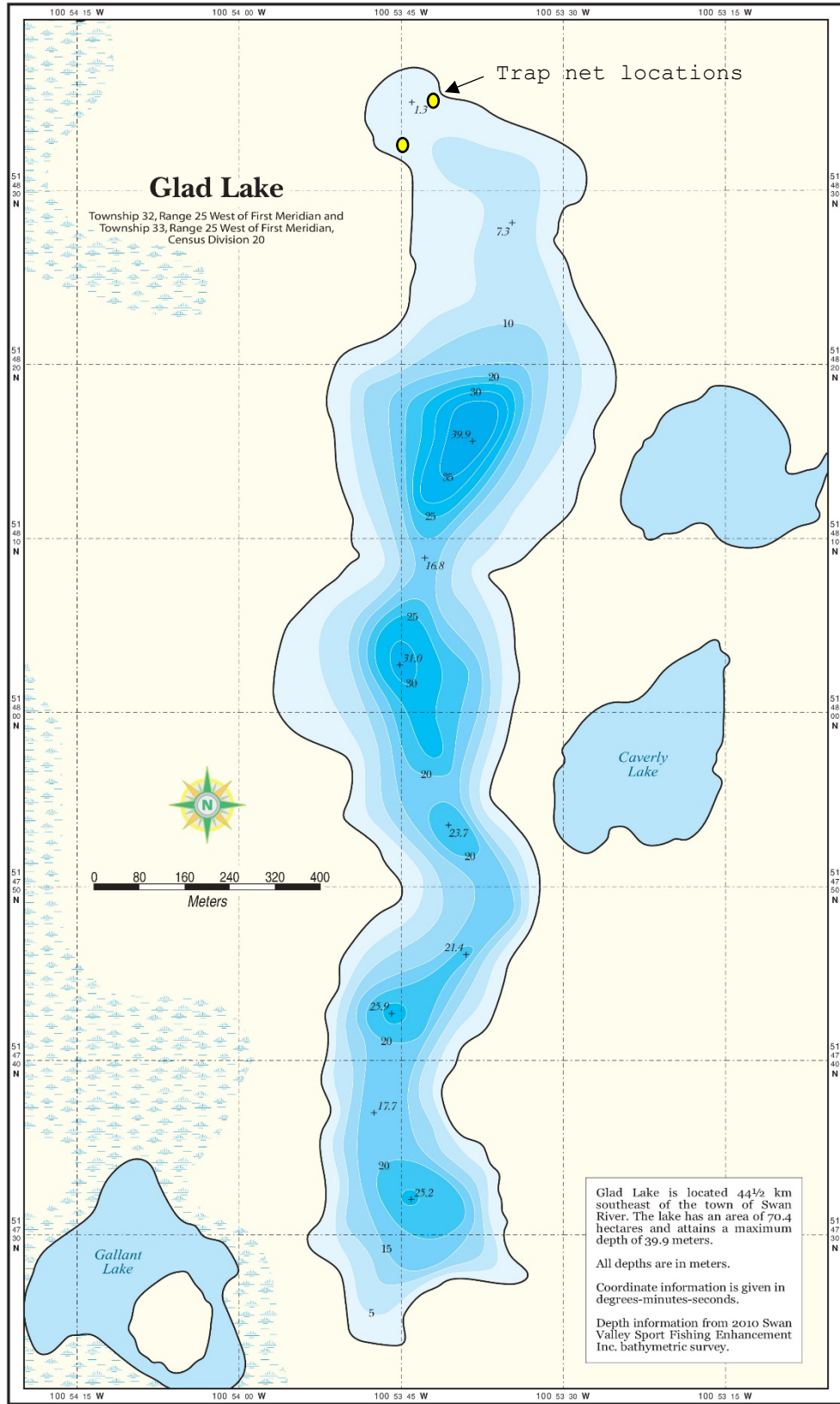


Figure 1: Glad Lake trap net locations for transfer program

Results

Pike Transfer Program

The Pike Transfer Program ran for 10 days from May 11th to 21st. At this point catches decreased and concluded the 2020 transfer. Water temperatures ranged from 5.2°C to 11.8°C and trap netting equated to a total effort of 448.7 fishing hours. In total, catches were comprised of 64 northern pike (NRPK) and 19 walleye (WALL), 3 lake trout (LKTR), 576 yellow perch (YLPR) and 233 white suckers (WHSC) (Figure 2).

Catch per Unit Effort (CPUE)

Relative species abundance over time is determined through catch per unit effort (CPUE) or number of fish caught per hour (Table 1). The transfer program efforts appear to be maintaining pike abundance. CPUE in 2019 was 0.137 fish/hour where 2020 levels were similar at 0.143 fish/hour. All other species abundance has increased with the decrease of this top predator. White suckers and yellow perch have displayed the highest increase over the years. Lake trout and walleye have displayed a slight increase over the years with lake trout present the past two years and walleye present each year apart from 2018.

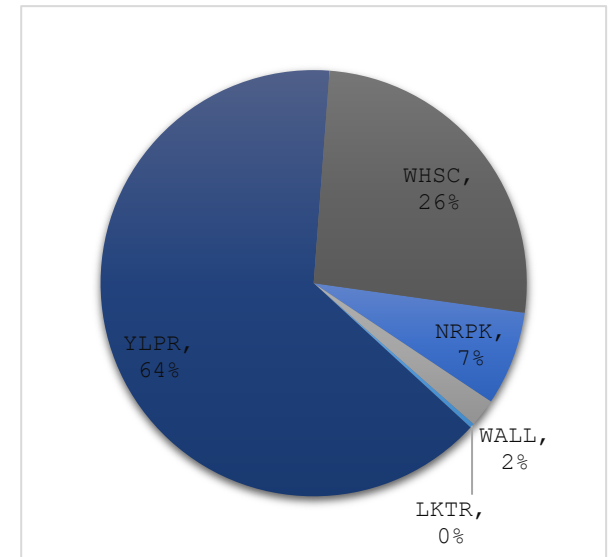


Figure 2: Pike Transfer - Species Composition

Table 1: Catch per unit effort comparison 2015-2020

Year	EFFORT (hours)	NRPK	CPUE	WHSC	CPUE	YLPR	CPUE	WALL	CPUE	SMBS	CPUE	Trout	CPUE	Total
2015	738.9	99	0.134	104	0.141	4	0.005	1	0.001	0	0.000	0	0.000	208
2016	2482.5	398	0.117	123	0.050	34	0.014	8	0.003	0	0.000	0	0.000	563
2017	2466.1	450	0.182	125	0.051	160	0.065	2	0.001	1	0.000	0	0.000	738
2018	557.9	244	0.437	122	0.219	177	0.317	0	0.000	0	0.000	0	0.000	543
2019	540.2	74	0.137	163	0.302	370	0.685	3	0.006	0	0.000	1	0.002	611
2020	448.6	64	0.143	233	0.519	576	1.284	19	0.042	0	0.000	3	0.007	895
Total	6785.6	1329		870		1321		33		1		4		2663

Northern Pike

A total of forty-five pike were transferred to Chain Lakes; twenty-two to the north basin & twenty-three to the south basin. Nineteen pike were transferred to Wellman for a total of 64 pike removed in 2020. Northern pike ranged from 250 mm to 940 mm in fork length with an average size of 486 mm (19") (Figure 3). More importantly, over the years of the transfer program, larger pike are becoming more infrequent. For the past few years northern pike are typically smaller than 700mm (Figure 6). Since 2015, a total of 1,329 pike have been removed via trap netting with an additional 134 caught in experimental gill netting, angling or electrofishing.

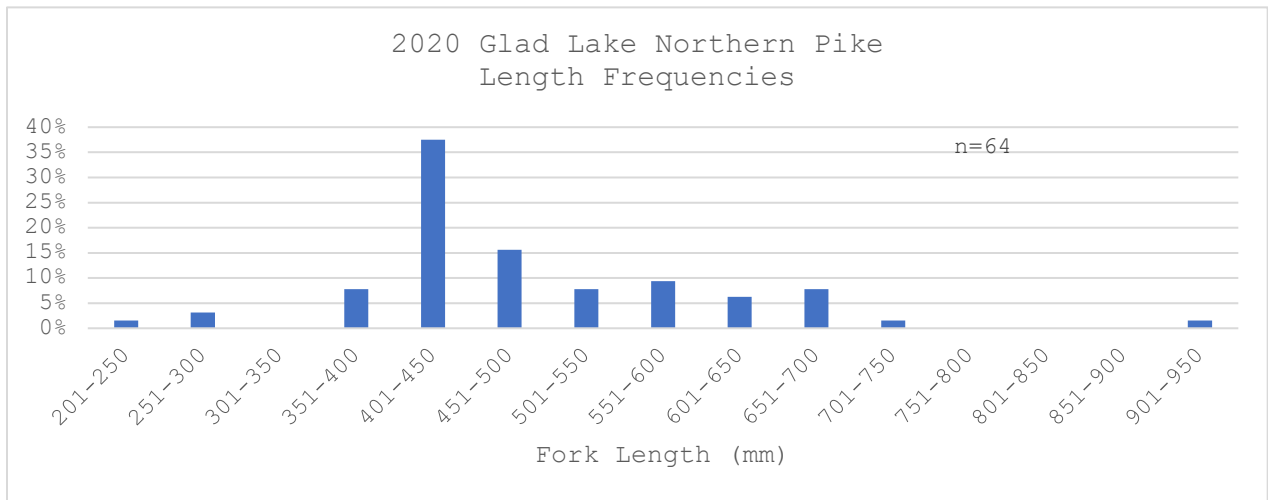
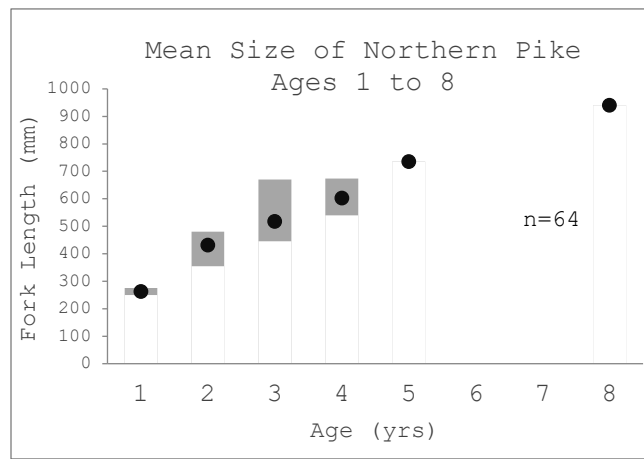
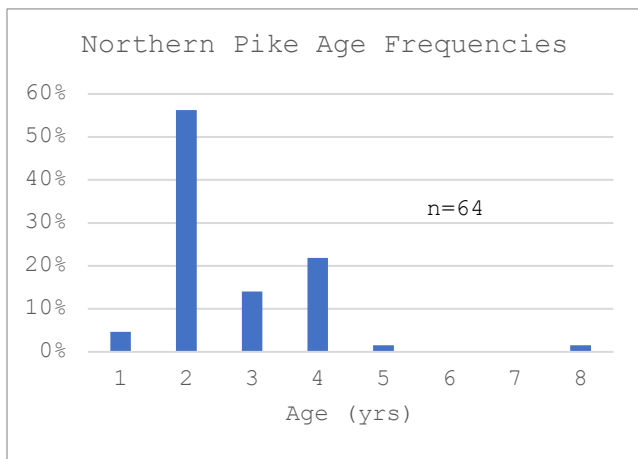


Figure 3: Length frequencies of northern pike transfer in 2020



Figure 4: Sample of northern pike caught during transfer



Ages estimates indicated pike ranged from one to eight years old with a dominant age class of two. From the 2020 samples, males and females were found to mature at age two. Pike at this age averaged 432 mm and ranged anywhere from 355 mm to 480 mm (Figure 5).

Figure 5: Pike age frequencies and length range at age

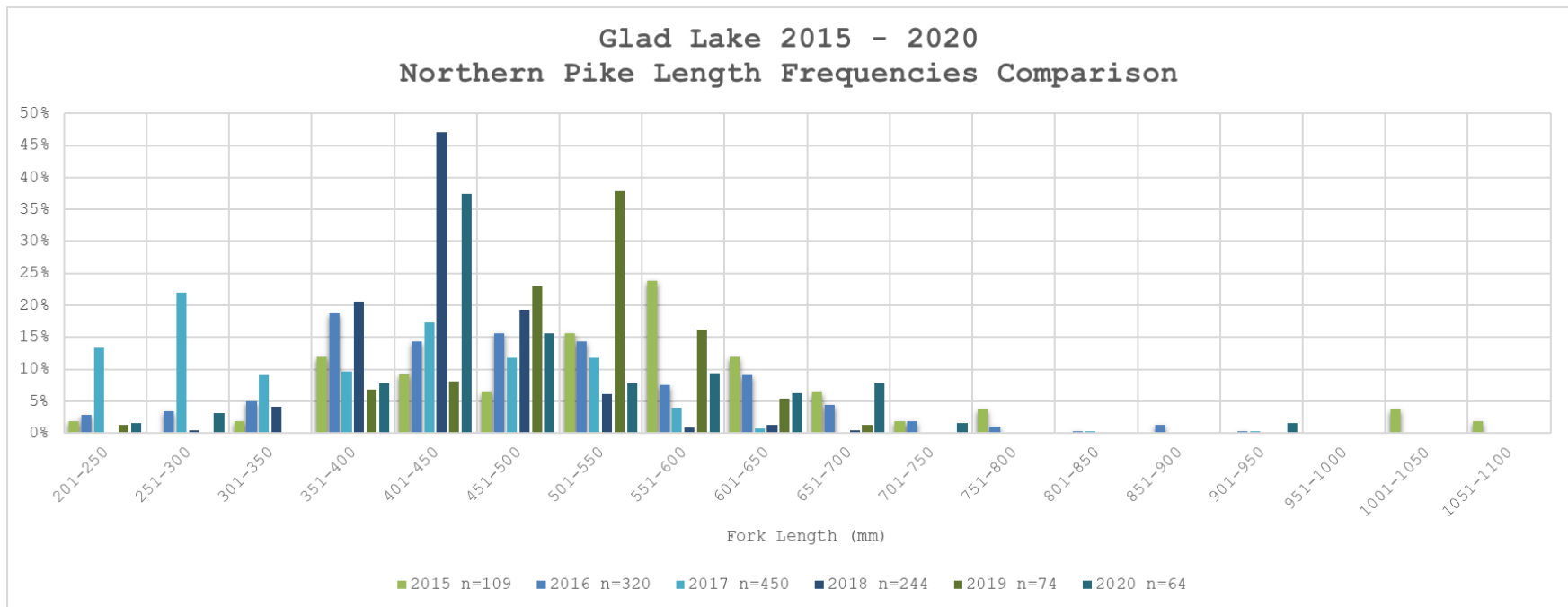


Figure 6: Pike length frequency comparison from 2015 - 2020

Lake Trout

Three lake trout were caught and released on May 14th in the large trap net set. The trout were all similar size and averaged 550 mm fork length. Two were estimated at age four and the other at age five (Table 2).

Table 2: Lake trout size and age

Fish #	Fork Length	Total Length	Age
GL-20-0053	535	579	4
GL-20-0054	572	632	4
GL-20-0055	545	605	5



Figure 7: Sample of lake trout caught during transfer



Figure 8: Sample of walleye caught during transfer

Walleye

Nineteen walleye were caught and transferred to Wellman Lake. Walleye ranged from 355 mm to 555 mm (fork length) and averaged 477 mm. Age estimates found walleye to be three to five years of age with four being the dominate age class.

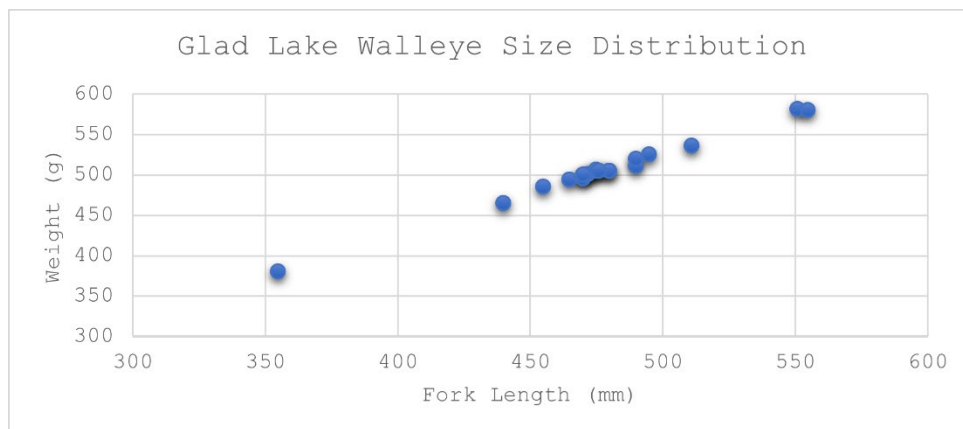


Figure 9: Walleye size distribution

Fall Electrofishing Survey

The electrofishing survey was conducted on the night of September 9th, 2020. During this time, the water temperature was 13.5°C. Of the 6 kilometers of shoreline sampled, effort equated to 8,448 seconds of electrofishing. A total of 21 fish were caught: three lake trout, eight northern pike and ten arctic char.

Lake Trout

The three lake trout were captured along the south shoreline of Glad Lake (Figure 12). This is a regular spawning area for the species. Several other lake trout were observed but to not stress the fish, technicians moved through the area and only collected the three specimens. Lake trout were similar in size and ranged from 553 mm to 687 mm with age estimates at 5 and 6 years of age.



Figure 10: Sample lake trout from electrofishing survey

Table 3: Lake trout length/age

Fish #	Fork Length (mm)	Total Length (mm)	Age (yrs)
GL-20-0506	687	763	5
GL-20-0507	665	735	6
GL-20-0518	553	606	6

Arctic Char

Of the ten arctic char caught, all were caught in various habitats along the east shoreline (Figure 12). Char ranged from 245 mm to 308 and were all estimated at age two, indicating they were from the 2020 planting.

Table 4: Arctic char length/age

Fish #	Fork Length (mm)	Total Length (mm)	Age (yrs)
GL-20-0500	308	321	2
GL-20-0501	252	270	2
GL-20-0502	298	315	2
GL-20-0503	245	262	2
GL-20-0504	263	281	2
GL-20-0505	285	305	2
GL-20-0508	245	263	2
GL-20-0515	247	265	2
GL-20-0516	261	280	2
GL-20-0517	280	305	2



Figure 11: Sample arctic char from electrofishing

Northern Pike

The eight northern pike varied in size from 195 mm to 690 mm in fork length. These fish were not age and all pike from the survey were transferred to Wellman Lake.



Figure 12: Electrofishing effort during fall survey. Char captured between wpt. 200-207. Lake trout captured at wpt 207

Discussion

Glad Lake has offered some unique angling opportunities in past years thanks to some active management strategies. In the past 20 years, pike had compromised the state of the fishery as populations grew and trout stocking success became limited. Valiant (1980) noted in the 1978 lake survey "pike are the limiting factor affecting the establishment of exotic species such as rainbow trout or splake as well as reducing the opportunity for the lake trout to become well established". Mechanical removals were a large contributing factor to Glad Lake becoming a popular trout fishery back in the 80s and 90s.

Following the sixth annual removal in recent history, the transfer results indicate efforts are benefiting the trout populations. 2020 highlights the success of arctic char stocking since the early 90s. 2019 marked the first year for lake trout to appear in the program's trap nets. In addition, the 2019 Brook Trout Index Netting (BTIN) survey, recent angler reports and electrofishing surveys indicate lake trout are exhibiting recruitment corresponding with the start of the removal program.

Current Trout Populations

The presence of char in the 2020 survey provided some assurance and indicated current success to the 2020 spring planting of arctic char. Char were not only caught in the fall electrofishing survey, but anglers also reported a few catches in the summer months. The char planted in 2017 & 2020 were both Yukon Gold strain from Icy Waters Hatchery and raised by the Whiteshell Fish Hatchery prior to stocking. The 2020 stock did exceptionally well in the hatchery compared to the 2017 stock and were much larger at the time of stocking (20 fish/kg compared to 56 fish/kg). In the past, successful char stocking was directly related to spring stocking of larger char. With positive results, Fisheries Branch and the hatchery have agreed to continue char stocking on a two-year basis.

The lake trout are also displaying positive effects from the removal program. Catch per unit effort (CPUE) has increased and natural recruitment is evident with trout age estimates at four to six years old. These age classes correspond with the initial removals. Anglers have also reported an increase in lake trout catches over the last two closed water seasons. It is believed the removal of the larger pike within the system has increased trout survival and also resulted in the increase of preferred forage (yellow perch/white suckers). This may be contributing to the increase in lake trout densities. Currently, lake trout stock is very limited in the province and at this time, it is believed supplemental stocking would not benefit the population.

Future Management Considerations

Trout Stocking Regime

Arctic char remains the focus trout species in management objectives for Glad Lake. The Whiteshell Fish Hatchery has agreed to the request of biennial stocking of ~15,000 arctic char for Glad Lake. Future stocking rates could be lowered to 25 fish/acre (5000 fish/ every two years) if managers decide to decrease stocking or less stock is available.

It is recommended to hold off on stocking any additional species within the system. This has been a topic which has been tossed back and forth over the last few years. With minimal evidence of char success, SVSFE was considering the option of re-introducing the faster growing rainbow trout to provide angling opportunities while char reached a targetable size. Stocking rainbow trout to produce a "three- tiered" salmonid fishery has proven to be a successful technique in several instances with species having different temperature preferences (Kerr 2000). Although this has merit, additional competition in an unproductive oligotrophic lake may cause more harm than benefit to the two trout species which appear to be responding well to the pike removal at this time. If management favors the addition of rainbows, recommended stocking rates can be found in the 2019 Glad Lake report.

Transfer Program & Monitoring

The management practices over the last four decades says it all. Pike removals are essential to attain a successful stocked trout fishery. Glad Lake has displayed 1) how quickly the pike population can bounce back with lack of maintenance and 2) how it has the potential to produce a top-quality fishery if pike populations are maintained. It is recommended to continue with annual removals through the transfer program and monitor trout stocking success through the removal program and periodic surveys.

Some considerations:

- 1) Remain consistent with netting program. This is a long-term initiative but maintaining consistency ensures the success of the program. By keeping efforts simple and allowing volunteers to assist, the program can easily be carried out by a few personnel in a few weeks.
- 2) Monitor trout stocking success through periodic surveys including fall electrofishing and spring netting. Trout have shown positive reactions to the removal and gathering a better understanding of the population dynamics will assist in future management decisions. Fall electrofishing is a one-night survey and is successful in validating trout survival. A short set lake trout survey (SLIN) is scheduled for the spring of 2021 and will provide valuable information on both the current lake trout population and arctic char stock response.

- 3) Evaluate recipient lakes. Pike are transferred to different recipient lakes dependant on size. Larger pike are taken to Wellman Lake and the 2019 assessment noted the pike population has benefited from the introduction of larger pike. Past anecdotal reports indicate good angling quality on Chain Lakes. This is the lake where most of the pike are transferred (fish <55cm). It is recommended to investigate Chain Lakes in future assessments to ensure pike introductions are benefiting the fishery.
- 4) Enhance fish habitat. This initiative has been on the list for some time. Cover provides important habitat for a number of aquatic organisms (Kavanagh 2016). In several reports through Glad Lake's history, managers have noted low/poor fish cover. There are many types of ways to improve fish cover including the addition of brush/logs, rocks, tires or man-made cover (ie. Berkley Fish Habs) to attract fish and promote productivity. Improving fish cover would provide protection for small fish and a source of food for those fish. If managers feel this is a practice which could benefit the fishery, SVSFE could pursue investigations.

With SVSFE taking an active role in management efforts at Glad Lake, and strong partnerships between government entities and lake users, it is believed that this trout fishery is becoming a stocked trout destination in the Parkland for anglers once again.

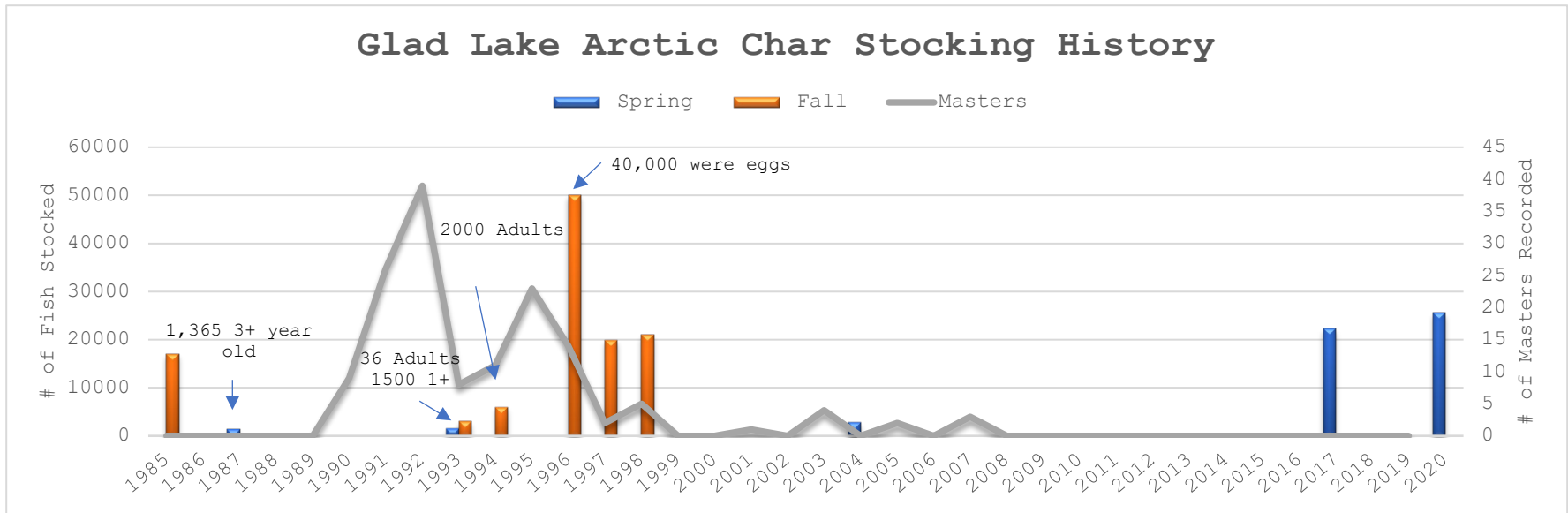
Appendices

Appendix 1: Glad Lake stocking history 1944 - 2020

Year	Lake trout	Splake	Rainbow Trout	Cutthroat	Brook Trout	Arctic Char	Sparr
1944	60	-	-	-	-	-	-
1945	78	-	-	-	-	-	-
1946		-	-	-	-	-	-
1947		-	-	-	-	-	-
1948		-	-	-	-	-	-
1949		-	-	-	-	-	-
1950		-	-	-	-	-	-
1951		-	-	-	-	-	-
1952		-	-	-	-	-	-
1953	5,000	-	-	-	-	-	-
1954	4,000	-	-	-	-	-	-
1955	-	-	-	-	-	-	-
1956	10,000	-	-	-	-	-	-
1957	5,700	-	-	-	-	-	-
1958	7,500	-	-	-	-	-	-
1959	17,000	-	-	-	-	-	-
1960	19,130	-	-	-	-	-	-
1961	20,000	-	-	-	-	-	-
1962	20,000	-	-	-	-	-	-
1963	-	-	-	-	-	-	-
1964	-	-	-	-	-	-	-
1965	1,000	-	-	-	-	-	-
1966	1,000	-	-	-	-	-	-
1967	1,000	-	-	-	-	-	-
1968	-	2,000	-	-	-	-	-
1969	-	2,000	-	-	-	-	-
1970	-	2,000	2,000	-	-	-	-
1971	-	2,000	2,000	-	-	-	-
1972	-	2,000	2,000	-	-	-	-
1973	-	2,000	-	-	-	-	-
1974	-	3,000	2,000	-	-	-	-
1975	3,000	-	-	-	-	-	-
1976	2,000	-	-	-	-	-	-
1977	-	-	-	-	-	-	-
1978	-	-	-	-	-	-	-
1979	-	-	-	-	-	-	-
1980	-	-	-	75,000	-	-	-
1981	-	-	-	35,900	7,100	-	-
1982	-	-	-	-	-	-	-
1983	-	-	-	-	-	-	-
1984	-	-	-	-	-	-	-
1985	-	-	-	-	-	17,000	-
1986	-	-	2,000	-	-	-	-
1987	-	-	-	-	10,700	1,365	-
1988	-	-	-	-	-	-	-
1989	-	-	-	-	-	-	-
1990	-	-	3,200	-	-	-	-
1991	-	-	6,000	-	-	-	-
1992	-	2,000	3,200	-	-	-	-

Year	Lake trout	Splake	Rainbow Trout	Cutthroat	Brook Trout	Arctic Char	Sparr
1993	-	-	51,000	-	-	4,536	-
1994	-	-	37,609	-	-	6,000	-
1995	-	-	13,600	-	-	-	-
1996	-	-	10,000	-	-	50,000	32,500
1997	250	-	15,000	-	-	20,000	10,000
1998	10,000	-	6,564	-	-	21,000	-
1999	-	-	30,000	-	-	-	-
2000	25,000	-	11,870	-	-	-	-
2001	15,000	-	26,000	-	-	-	11,250
2002	-	-	14,200	-	-	-	-
2003	-	-	15,900	-	-	-	-
2004	30,000	-	15,000	-	-	2,800	-
2005	20,000	5,000	18,000	-	-	-	-
2006	-	-	-	-	-	-	-
2007	-	-	10,200	-	-	-	-
2008	-	-	3,500	-	-	-	-
2009	40,000	-	20,500	-	-	-	-
2010	-	-	5,000	-	10,000	-	-
2011	16,000	-	-	-	2,500	-	-
2012	-	-	5,000	-	1,075	-	-
2013	22,600	-	1,500	-	-	-	-
2014	-	-	-	-	-	-	-
2015	-	-	-	-	-	-	-
2016	-	-	-	-	-	-	-
2017	-	-	-	-	-	22,250	-
2018	-	-	-	-	-	-	-
2019	-	-	-	-	-	-	-
2020	-	-	-	-	-	25,550	-
Total	295,180	22,000	332,843	110,900	31,375	170,501	53,750

Appendix 2: Arctic Char stocking history and master angler submissions 1985 - 2020



Literature Cited

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