East Blue Lake Maintenance Program – White Sucker Removal

In part of reporting for FES Project 18-043 - Fisheries Projects within the North Parkland

Author: Holly Urban

January 2020

Swan Valley Sport Fishing Enhancement Inc.

East Blue Lake Maintenance Program – White Sucker Removal

Summary

East Blue Lake, located in the Duck Mountain Provincial Park, has a reputation of producing some of the largest rainbow trout in the province. This oligotrophic lake is a unique rainbow trout fishery and many other species including lake trout, splake, walleye, yellow perch and white suckers also reside here. Anglers raised concerns on angling quality between 2010 – 2014 reporting not only poor angling quality for catchable rainbows, but also a significant increase in white sucker presence in the lake. Survey results from 2010, 2011 and 2015 confirmed an increase in white sucker abundance. This increase followed rising lake levels in 2010. Other factors, among the increased abundance of white suckers were believed to play a role in the decreased angling quality. Theses factors included the change in fish habitat caused by significant increases in lake levels in 2010 (upwards of 6 feet) and changes in stocking practices.

Following the 2015 surveys, SVSFE proposed a trout maintenance program to remove white suckers as several studies demonstrated increased growth and survival of stocked salmonids following removal programs within a few years. The intention of the program was to target the species during spring congregations and keep efforts to a minimum. Furthermore, recommendations to alter stocking strategies were identified as an important management strategy to increase angling quality. Specifically, to continue the implementation of annual spring scatter stocking of yearling (18+cm) rainbows. This report is a review of trout maintenance programs conducted from 2016 to 2019 and related findings identified during the program.

Table of Contents

List of Figures & Tables

Objective

The objective of the East Blue Lake Trout Maintenance Program was to increase rainbow trout survival and growth believed to be reduced by competition of white sucker populations. To achieve this objective, SVSFE and project partners conducted removal programs, removing and repurposing white suckers from 2016 to 2019. The secondary objective was to collect biological data on other sport fish species, particularly rainbow trout to help identify success/failures of current stocking strategies. Each year, removal programs were reviewed, and new methodologies identified to increase success and minimize cost.

Background

Rainbow trout were first introduced in East Blue Lake in 1970 at moderate rates followed by intermittent plantings of other trout species. In the late 80s there was an apparent shift where rainbows became one of the primary species managed in East Blue. Since then, East Blue Lake has had the reputation of producing some of the largest rainbow trout in the province. This lake has held the provincial record since 2000 with a 32.5" rainbow caught by Harvey Westlake. Angler success remained significant through the 2000s, but following the rising water levels in 2010, more and more anglers reported poor angling quality. This decline was also apparent in the master angler submissions (Appendix 1).

In 2015, SVSFE decided to follow-up on these reports and gather a better understanding of the trout fishery. Investigations consisted of conducting a brook trout index netting (BTIN) program in the spring, fall electrofishing, beach seining and angler interviews. The overall objective of the BTIN was to evaluate and compare the catch per unit effort (CPUE) or relative species abundance to previous years. The BTIN results indicated a high composition of white suckers at 58% of the total catch compared to 27% from the 2010 BTIN survey. Rainbow trout consisted of 35% of the population which was an improvement from the 2010 survey (8%), although 90% were from recent plantings that spring (18+cm rainbows). Electrofishing was unsuccessful in assessing the trout population. The high-water levels and flooded timber prevented technicians from accessing shallow habitats. Following the 2015 assessment, it was determined the most beneficial method to monitor trout populations was through continued angler reports and barrel counts.

The one factor noteworthy from the 2015 survey was the increased composition of white suckers compared to the 2010 BTIN survey. Anglers and locals strongly stated they had never seen white suckers in the lake prior to 2010. Koutecky (2015) stated, "it is not believed suckers are new to the ecosystem, however it is believed that sucker recruitment has increased significantly with the creation of new habitats directly associated with recent high-water periods". Several studies have demonstrated a negative relationship between white suckers and rainbow trout (Kerr 2000). This sparked further investigations in management considerations for a removal program.

Following the 2015 review it was recommended to:

1) Monitor rainbow trout angling success through barrel counts and voluntary angler surveys.
2) Review disadvantages and advantages of felling trees to increase fish habitat (Fisheries Branch initiative).
3) Review and determine suitable stocking rates for rainbow trout and continue the implantation of annual spring stocking of yearling trout (18+cm).
4) Initiate a white sucker removal – maintenance program
5) Conduct a comprehensive literature review on East Blue historical records.

As a result of these recommendations a few immediate actions were taken; 1) stocking strategies were amended 2) a white sucker removal program was established and 3) anglers were encouraged to utilize the online angler surveys to provide feedback on angling quality.

Historical stocking practices were reviewed in addition to discussions with branch staff to determine efficient stocking strategies. The details can be found in the literature review section of the 2015 East Blue Lake Summary. In summary, past stocking strategies varied between spring stocking, fall stocking or the combination of both with rates exceeding 100 fish/acre at times. In the end it was determined spring stocking at a lower rate provided the best return to anglers. Subsequently, stocking was shifted to spring stocking only of 18+cm rainbows in 2016 at a rate between 50 – 100 fish/acre. The rate has fluctuated over the years depending on available stock and/surplus fish.

In 2016, SVSFE, Fisheries Branch and Intermountain Sport Fishing Enhancement conducted the first white sucker removal program. The intentions of the program were to (1) further quantify white-sucker invasion, and (2) remove as many white-suckers as possible (3) develop an effective yet long term management program for East Blue Lake. Following the first removal, the abundance of white suckers was greater than predicted with the removal of 3,576 white suckers. It was suggested to continue the removal program using trap netting and electrofishing methods and continue until species composition of suckers reached a manageable level (ie. similar to 2010 - below or near 25%) or until trout angling quality dramatically improved. This program was replicated each spring from 2016 to 2019.

Methods

Each removal was conducted late May to early June to correlate with white sucker spawning periods. White suckers congregate along specific shoreline areas on East Blue Lake and these were quickly identified in the 2016 program. During that time, trap netting and electrofishing were identified as the suitable catchment methods. Technicians tested short set gill netting but due to ineffectiveness, along with potential increase in trout mortalities, gill netting was not used as a method during removals.

Three to four standard spring-haul trap nets were utilized during the program. Traps consisted of 46 m leads and a 6' wide trap with $2^{1/2}$" mesh. Due to the morphology of East Blue Lake, there are minimal sites suitable for trap netting. Three locations were successful in targeting white suckers and all sites were used throughout the program, with the exception of Rainbow Point in 2019. Water levels had receded in 2019 and not only was this site not suitable for a trap net, but the suckers were absent due to lack of spawning habitat. Trap nets were typically fished overnight. On some instances where catches were significantly low, a net was left for an additional day. The Smith-Root Electrofisher (SR20) from DFO was utilized for shocking efforts. Electrofishing efforts were most successful in the evening hours along the east shoreline, therefore transects were typically concentrated in these areas. Trap netting sites and electrofishing transects locations by year can be found in Appendix 2. For each transect or trap net, technicians recorded; date, time, effort, weather, crew, water temperature, net/transect location, SR20 settings and number of fish caught. Each program concluded when white sucker catches significantly decreased.

White suckers (WHSC) were counted and placed into holding pens prior to being removed. A sub-sample of white suckers were weighed each year to gather a sense of biomass. Random sub-samples measured a minimum of 30 specimens, though in 2019 technicians measured forked length and weight for 60 sub-sampled fish. Other game fish including rainbow trout (RNTR), splake (SPLA), lake trout (LKTR) and walleye (WALL) were measured for fork length & total length, clipped and structures taken for age estimates. Yellow perch (YLPR) were counted and released. In one instance, a northern pike (NRPK) was captured. This fish was sampled and transferred to a nearby pike fishery under the direction of Fisheries Branch.

White suckers were held in either old trap nets with the funnel stitched shut or within holding pens affixed with covers. Fish were held along the main boat launch dock for easy transport. 2016 was the only year live fish were transferred. The recipient lake was Sinclair Lake and this practice was discontinued after the first year as catches exceeded sustainable levels for that lake. Effectiveness of the program over time was determined by comparing annual catch per unit effort (CPUE) of white suckers. CPUE was evaluated strictly through trap net catches as the SR20 electrofishing boat was not utilized every year.

Results

White Sucker Removal Program

The removal program commenced at the end of May each year and concluded around the first week of June. In 2018, higher water temperatures greatly affected catches, therefore water temperatures were closely monitored in 2019. Program dates along with temperature ranges can be found in the table below (*Table 1*).

Table 1: Trout maintenance program timelines & water temperatures

Year	Start Date	End Date	Water Temperature (°C)
2016	May 30th	June 7th	12 – 13.3
2017	May 29th	June 7th	10.8 – 16.8
2018	May 29th	June 1st	15.6 – 16.8
2019	May 27th	May 30th	10.6 – 13.8

During the first removal in 2016, the CPUE of white suckers equated to 9.4 fish per hour of trap netting (Table 2). After the removal of 3,576 white suckers in 2016, 2017 demonstrated a decrease in catch to 6.5 fish per hour. The 2018 CPUE results are inconclusive. The window for targeting white suckers was missed due to rapid warming waters therefore the catch was not representative. After a removal of 6,452 white suckers between 2016-2018 by all catchment methods, the 2019 catches demonstrate an increase with 7.9 fish caught per hour.

Table 2: Trout maintenance program trap netting efforts from 2016 - 2019

	2016*			2017**			2018***			2019***		
Species	**#**	**Effort**	**CPUE**	**#**	**Effort**	**CPUE**	**#**	**Effort**	**CPUE**	**#**	**Effort**	**CPUE**
WHSC	3354		9.43	2630		6.50	246		0.92	1095		7.91
RNTR	99		0.28	89		0.22	8		0.03	10		0.07
SPLA	11		0.03	0		0.00	0		0.00	1		0.00
LKTR	0	355.6	0.00	0	404.6	0.00	1	266.6	0.00	0	138.4	0.00
WALL	16		0.05	15		0.04	14		0.05	11		0.08
NRPK	0		0.00	1		0.00	0		0.00	0		0.00
YLPR	1		0.00	0		0.00	13		0.05	0		0.00
TOTAL	**3481**			**2735**			**282**			**1117**		

*In 2016 white suckers were transferred to Sinclair lake 2992(84%) or given to anglers 584 (16%)
**In 2017 2,349 were sourced to a mink farmer & 281 were given to anglers.
***In 2018 & 2019 all fish were given to anglers

Throughout the program, trap netting and electrofishing were both effective methods. In total, by means of all catchment methods, 8,671 white suckers were removed from East Blue Lake (Table 4). From the subsamples collected each year, white suckers ranged from 813 g to 1136 g in weight. This equates to an estimated biomass of 8,092 kg of fish removed (Table 3). Lengths were only collected in 2019 and suckers ranged from 286 mm to 485 mm in fork length.

Table 3: Trout maintenance program – summary of removal from 2016 – 2019

Method	Year	Effort (hours)	# of WHSC	CPUE (fish /hour)	Avg Weight	Total Biomass Removed (kg)
Electrofishing	2016	1.999	200*	100.07	813.2	~162.6
	2019	8.381	1124	134.12	889.7	~1000.0
Trap Netting	2016	355.583	3354	9.43	813.2	~2727.5
	2017	404.567	2630	6.50	1136.3	~2988.6
	2018	266.550	246	0.92	901.7	~221.8
	2019	138.367	1095	7.91	889.7	~974.2
Gill Netting	2016	3.08	22	7.14	813.2	~17.9
	Total	**1178.5**	**8671**			**~8092.6**

*In 2016, 500 white suckers were caught electrofishing but unfortunately 300 escaped holding pens overnight therefore only 200 removed. CPUE would equate to 250.1 fish/hour

Table 4: Total removal of white suckers by year

Total white suckers removed by ***all methods***	
2016	3576
2017	2630
2018	246
2019	2219
Total	**8,671**

Rainbow Trout

Rainbow trout have been present in the trap nets each year and collecting biological information has provided some insight on stocking effectiveness. In 2016 and 2017 adequate sample sizes of rainbow trout were collected via trap netting. Age estimates from rainbows sampled indicated strong age classes of age four in 2016 and age five in 2017 (Figure 1). Both correlate with the planting of either the spring stocking of 18+cm rainbows in 2013 **or** the fall stocking of 12-15cm in 2012 (Appendix 3).

In 2018 and 2019, very few rainbows were caught within the trap nets (Figure 2). Of the eight-rainbow trout aged in 2018, 63% were estimated at age four. In 2019, similar results, %43 of the seven rainbows sampled were estimated at age four. These age classes correlate with the spring stocking of 18+cm rainbows in 2015 and 2016, respectively.

Throughout the program rainbow trout are found to be on average 464 mm in fork length (18”)(Figure 3 & Table 5). Length at age indicate rainbows reach master angler size (510 mm or 20”) by age four (Figure 4).

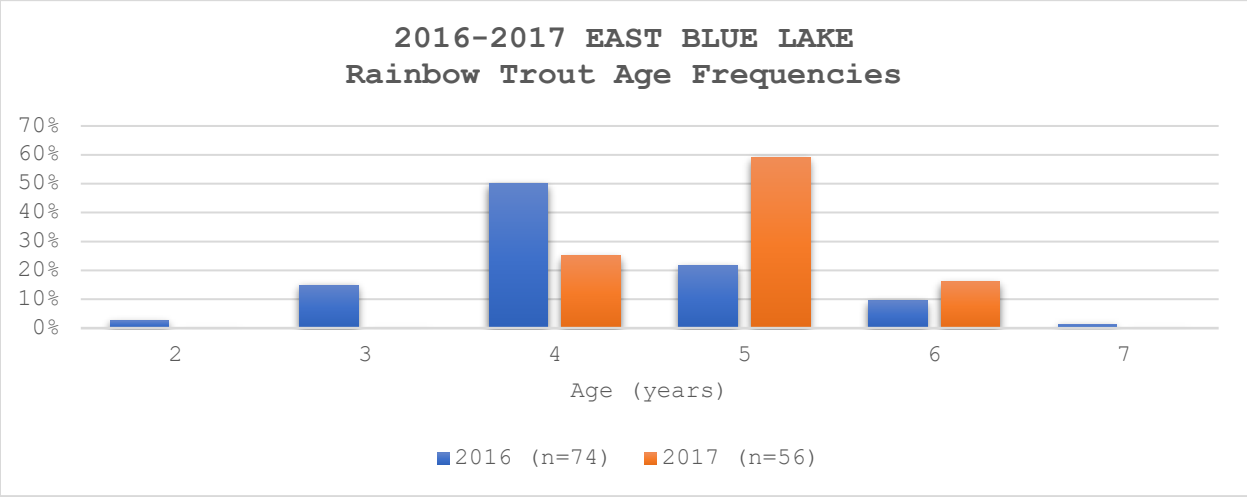


Figure 1: Rainbow trout age frequencies 2016 & 2017

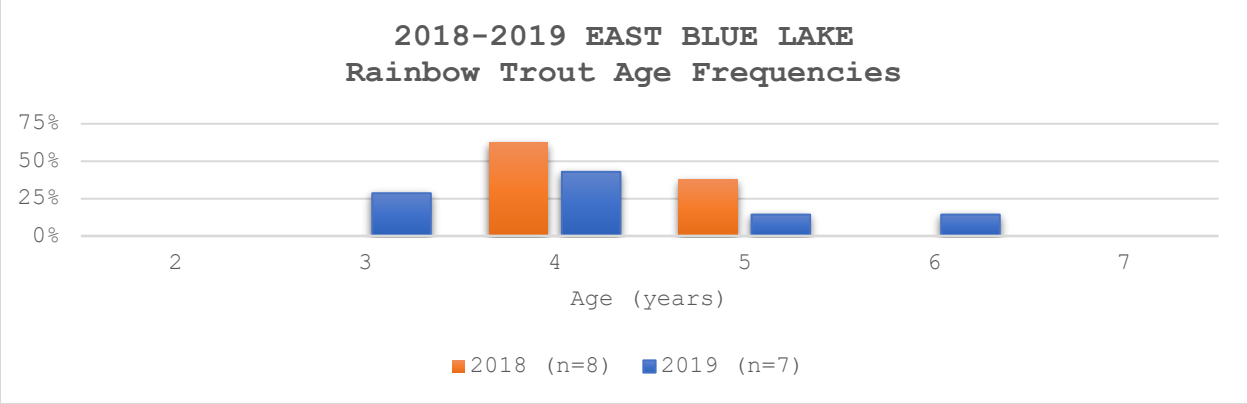


Figure 2: Rainbow trout age frequencies 2018 & 2019

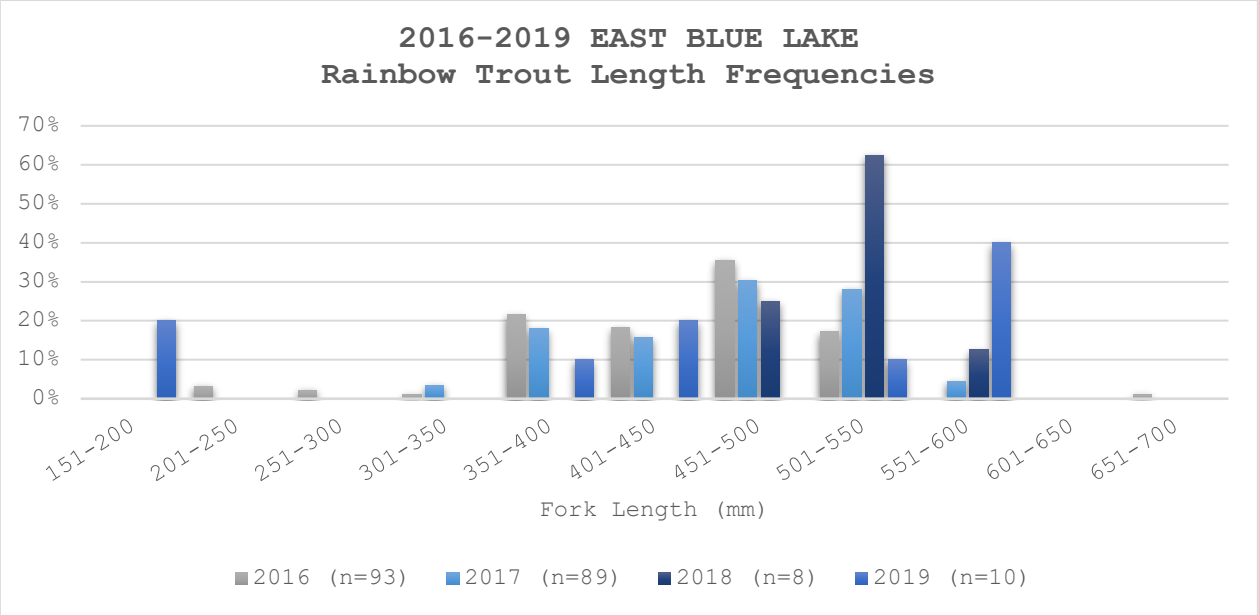


Figure 3: Rainbow trout length frequencies 2016-2019

Table 5: Size of rainbow trout caught during program between 2016-2019

Fork Length (mm)	2016	2017	2018	2019
Min	204.0	320.0	464.0	180.0
Max	660.0	592.0	560.0	570.0
Average	441.6	466.1	512.4	434.8

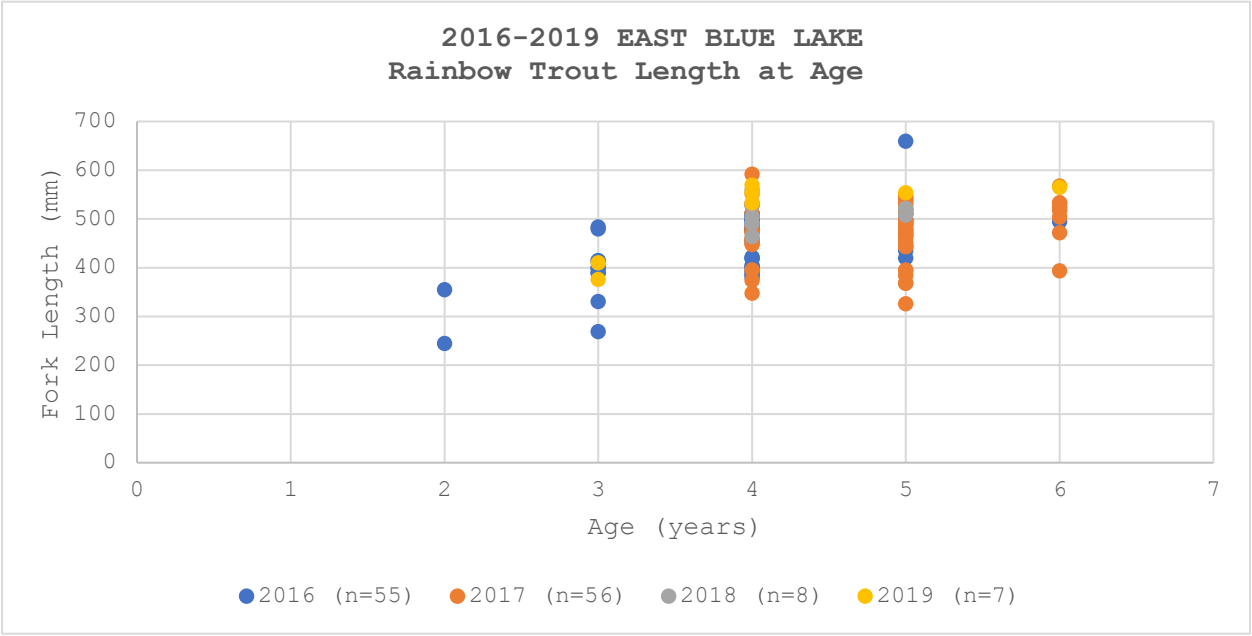


Figure 4: Length of rainbow trout at age

Walleye

Walleye populations are limited in East Blue Lake, but catches have remained fairly consistent and can provide trend information over time. Walleye caught throughout the removal program ranged from 346 to 738 mm in fork length with an average length of 540 mm (Figure 5). In 2017, there was an increased frequency of smaller walleye (300-450mm) which appears to correlate with the age two and three age classes. Age class strengths indicate favourable recruitment years for both younger and older walleye. 2002-2004 display higher recruitment years, while recent success is attributed to the spring of 2011, 2014 & 2015 (Figure 6).

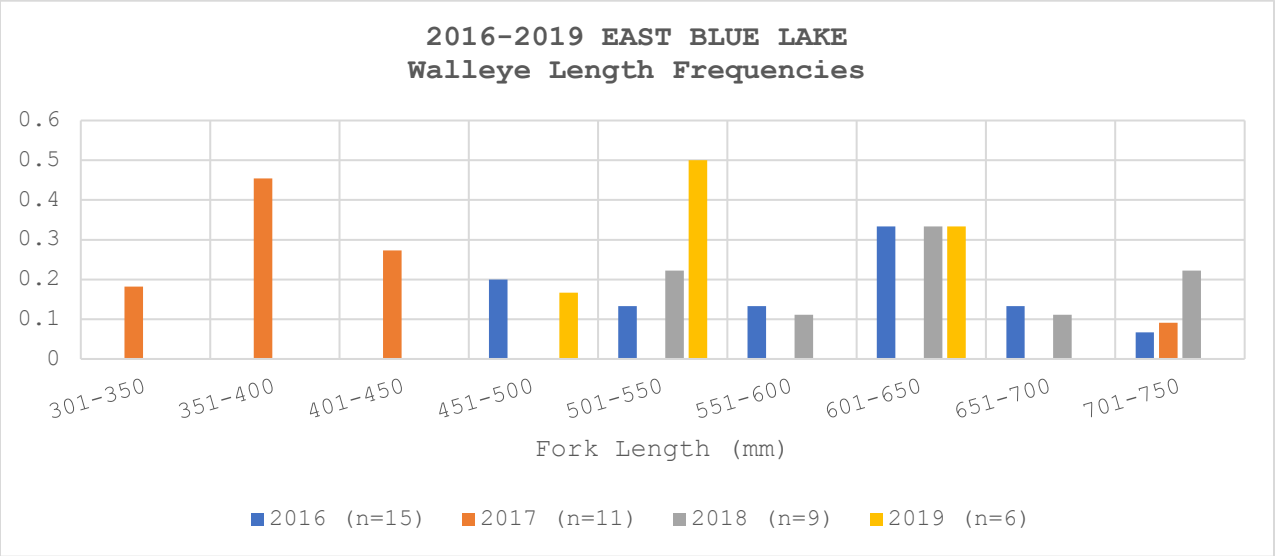


Figure 6: Walleye length frequencies 2016-2019

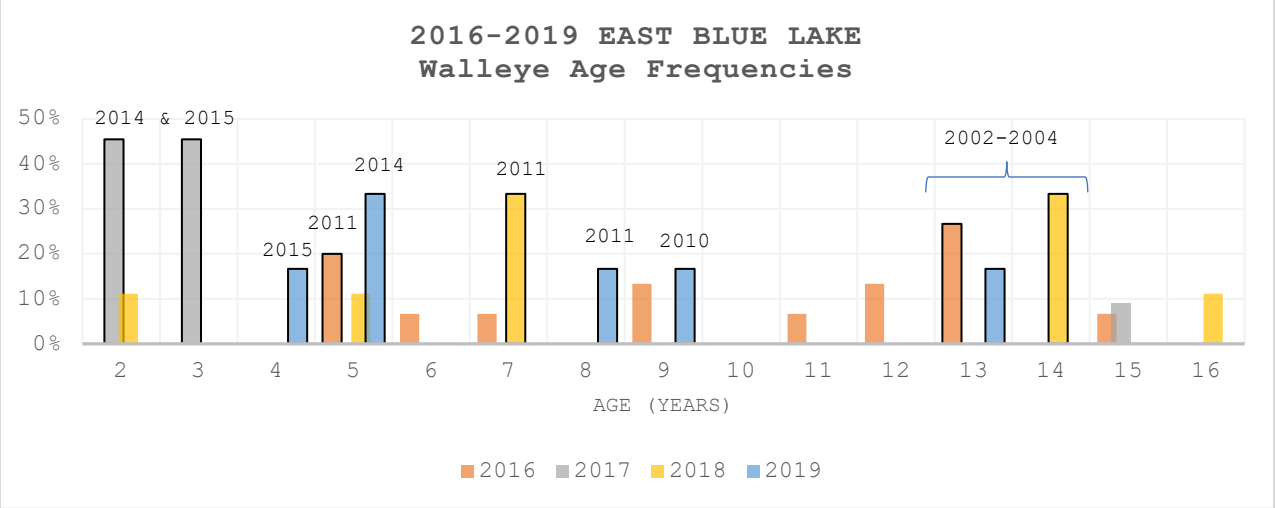


Figure 5: Walleye age frequencies 2016-2019

Discussion

Over 8,600 suckers equating to approximately 8 tonnes of fish were removed between 2016 to 2019 from East Blue Lake. The objective was to conduct annual removals until the composition of white suckers decreased to levels prior to the rising water levels (~27%) or trout angling quality improved. As program strategies were modified, the target to evaluate the progress of program was as well. Through trap netting, catch per unit effort was incorporated as the means to evaluate abundance of white suckers within the system. A target of two fish/hour was determined and if reached, the program would cease. This level was considered achievable within three to four removal programs. Between 2016 and 2017, the CPUE decreased from 9.43 to 6.5 fish per hour. In 2018, the window of opportunity was missed due to a rapid rise in water temperatures and little fish were removed. The slight rise in CPUE to 7.91 in 2019 may be a direct result from the interruption in continuous removals. Although the CPUE levels are far from the target, angling quality has increased and continuing the program is under consideration.

There is evidence that white sucker removal programs can be a benefit to trout fisheries. These successes instigated the removals at East Blue Lake back in 2016. Mechanical removals do involve significant commitments in order to provide long-term results and program success will vary depending on the complexity of the system. For example, a removal program at Moxie Pond in Maine indicated *short-term, low effort removal of white suckers can have long-term, but not permanent benefits* for native or wild brook trout in small homothermous headwater ponds (Obrey 2014). In another study on five larger oligotrophic temperate lakes in Quebec where mass removals occurred over three years found *all white sucker populations experienced growth increases after mass removal,* ***and*** *improved brook trout growth was observed in lakes where the most intensive mass removal occurred* (Brodeur 2001). It further suggested that white sucker and brook trout exhibit compensatory responses following a reduction of intra- and inter-specific competition and that these responses are related to the intensity of mass removal.

For a comparison closer to home, white suckers were removed from Patterson Lake, one of the trophy rainbow and brown trout fisheries in the Parkland Region. In 2016 and 2017 Fisheries Branch and SVSFE removed a total of 4,126 white suckers during a still-water trout assessments. The removal was a secondary objective to monitoring trout populations and considered short-term. Two years following this removal, consultants returned to quantify brown and rainbow trout populations in the fall of 2019. Results indicated a significant decrease in white sucker CPUE between 2017 and 2019, with 19.62 to 1.13 fish caught/hour of trap netting respectively. The 2017 & 2019 surveys were both completed in the fall, but it is important to note water temperatures were cooler in 2019 with an average of 6°C compared to 10°C in 2017. This may have influenced fish movement; however white sucker abundance is considered lower since the removal. Trout populations were characterized as "a sizeable population of large adult brown trout …that is likely to decline rapidly within a few years in the absence of supplemental stocking efforts"

(Turenne 2019). This is similar to the findings in 2016 & 2017. Although the short-term removal has decreased sucker abundance, providing more forage and habitat for trout, there appears to be little change in the trout fishery at this time. It is suspected stocking strategies play a large role in the stocking success.

Each removal program is unique with varying influences. Lake characteristics, species, stocking strategies and removal practices all play a role in the results. Nevertheless, success/failure on mechanical removals are truly lake specific and without long-term maintenance, benefits are limited or short term.

At East Blue Lake, between 2010 and 2015, many influencing factors occurred contributing to the past decrease in angling quality. It is believed the increase in white sucker recruitment played a reasonable part in this. This increase was likely caused from the 2010 flooding of clean gravel sites along the east shoreline. Trends of successful recruitment can also be identified when looking at the walleye populations. Walleye populations are present, remain small but strong year classes correlate with the rising water levels and poor angling quality. Interestingly, the older year classes of walleye present (recruited in 2002-2004), also correlate with low angler success (master angler submissions). After four years of consecutive removals occurring during the high-water period it is anticipated efforts have impacted the white sucker composition to some degree. At this time, water levels have receded significantly and continue to do so. It is uncertain when or if levels will return to the 2010 depths, but as they decrease so will the available spawning habitat for white suckers and walleye.

Unlike other removal programs, the netting results do not indicate any significant increase in growth or species abundance of rainbow trout. The four and five-year age classes remained the dominate ages throughout the program and growth appears stable with rainbows reaching master angler size by age four. The CPUE has dropped throughout the removal program from 0.28 fish/hour in 2016 to 0.07 in 2019. This may be a result of net avoidance or difference in habitat preference as anglers were successful in catching rainbows during the removal programs in both 2018 & 2019. As stated in the 2015 assessment, netting (gill and trap netting) has not provided representative results to the rainbow trout populations and monitoring angler success has provided more insight. Recent conversations with the local lodge owner, Arch Dowsett found that angling has been at its best since the 2010 rising water levels. Arch stated “the last two years have been really good. Shore fishing has increased and angling quality as a whole. The majority of angler’s catches are rainbows around 16-18” but also masters at 23-24” and smaller ones 12-14”. This large representation of all size classes is a good indication of successful stocking practices and likely a more balanced fish community.

The 2015 assessment identified a positive correlation between spring stocking at a lower rate of ~10,000 fish annually and master angler submissions. Following the switch to spring only stocking at a lower rate, Koutecky stated in 2015 "it will be interesting to evaluate the master angler records in 2018 to 2020 to see if the hypothesis of this stocking trend continues". In the following years stocking requests were slightly higher at approximately 15,000 to 20,000 between 2016-2019 to adjust for high bird predation. Note: Historically, years with heavy stocking followed by high master angler submissions (>100), were quickly followed by steep decline in submissions (Appendix 1). Interestingly, recent master angler submissions display positive results from the switch to spring only stocking. 2018 received 33 submissions and 31 in 2019. The submissions do not break any records but instead are similar to stable rates found in the 90s.

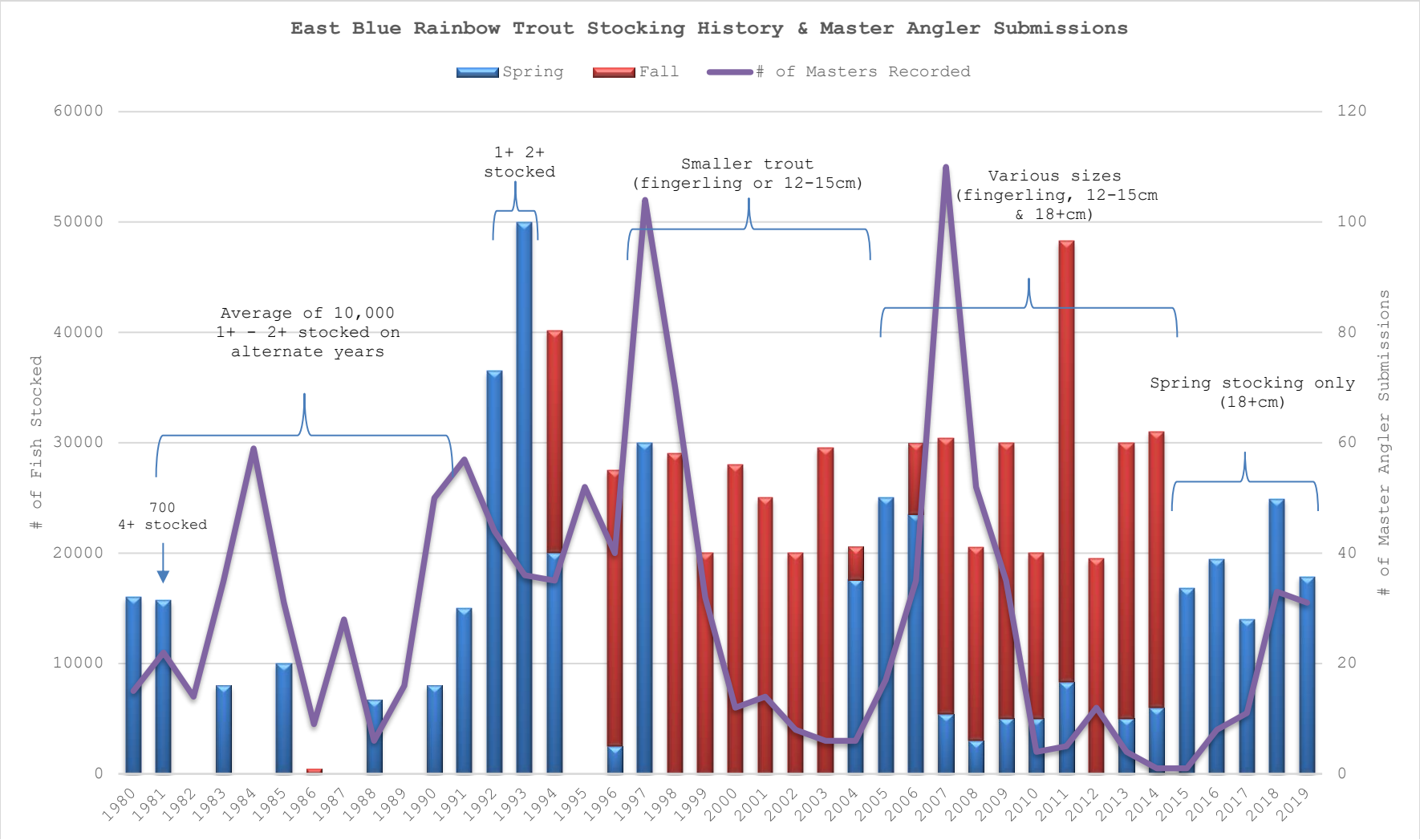
After further literature reviews on mechanical removals and review of the current data, it is recommended to discontinue the removal program at this time. White suckers are not new to the system and the abundance has decreased following the removals. The "target" CPUE levels may not have been achieved, but the objective of a positive trend in trout angling success has. This trend may be a result from lowering water levels, the removal program, change in stocking strategies, or a combination. In conclusion, it is hypothesized the timing of the removal in conjunction with the switch to spring trout stocking was the main contributing factors to the increased angling quality.

Follow-up

Moving forward it is recommended to maintain current stocking strategies and closely monitor angler success. Spring stocking of 18+cm rainbows at a low rate seems to provide stable returns in this system. It is recommended to stock at a rate of 50-75 fish/acre or a maximum of ~19,000 annually. Scatter stocking over deeper water should be incorporated in stocking practices to increase dispersal and survival of fish. The master angler submission, online angler surveys, along with communications with local lodge owners are great ways to efficiently monitor stocking success. Increasing public awareness and promoting angler input would help increase submissions.

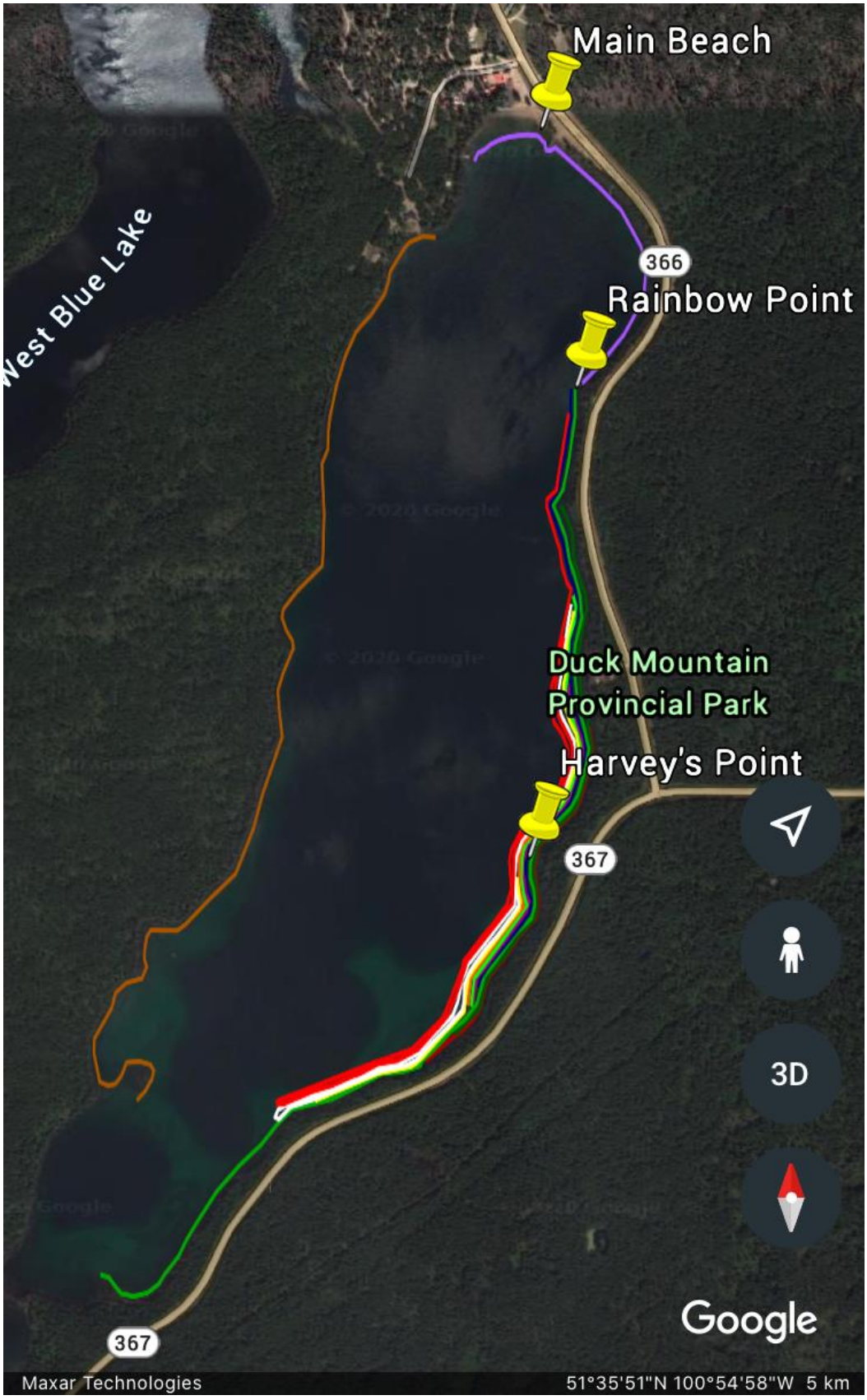
It is recommended that if removal programs are considered in future management practices that solid objectives are reviewed prior to initiating. For example, impacts/negative interactions between species are identified, long-term commitments are established, program is economically and sustainably sound. The East Blue Lake Trout Maintenance Program provided understanding on effective methods and strategies specific to white sucker removal programs in deep oligotrophic lakes within the Parkland. It will be interesting to evaluate angling success in following years.

Appendices



Appendix 1: Review of rainbow trout stocking history and master angler submissions 1980-2019

Appendix 2: Trap netting sites and electrofishing transects for white sucker removal program 2016 – 2019



Appendix 3: Rainbow trout stocking history, condition and rate comparison by year 2011-2019

Rainbow Trout Stocking History, Condition & Rate Comparison by Year						
Year	Time of Year	# Fish/Kg	# Fish Stocked	Total Stocked/Year	# Fish Stocked/hec	# fish stocked /acre
2011	spring	?	8,300	48,300	472.60	191.67
	fall	?	6,000			
	fall	?	34,000			
2012	fall	97.3	12,000	19,500	190.80	77.38
	fall	85	7,500			
2013	spring	28.8	5,000	30,000	293.54	119.05
	fall	120	25,000			
2014	spring	36	6,000	31,000	303.33	123.02
	fall	117	15,000			
	fall	89	10,000			
2015	spring	13	1,400	15,400	150.68	61.11
	spring	20	4,600			
	spring	20.5	2,400			
	spring	20.5	7,000			
2016	spring	12	4,540	19,460	190.41	77.22
	spring	12	1,620			
	spring	12	2,500			
	spring	12	5,400			
	spring	12	5,400			
2017	spring	24	13,000	14,000	136.99	55.56
	spring	27	1,000			
2018	spring	21	4,000	24,900	243.64	98.81
	spring	20	7,200			
	spring	20	7,200			
	spring	18	6,500			
2019	spring	16	6,000	17850	174.7	70.83
	spring	16	6,000			
	spring	15	5,850			

Appendix 4: Representative specimens during trout maintenance program

White suckers

Rainbow trout

Walleye

Literature Cited

Brodeur P. and P. Magnan, 2001. Response of fish communities to different levels of white sucker (*Catostomus commersoni*) biomanipulation in five temperate lakes. Département de chimie-biologie, Université du Québec à Trois-Rivières

Kerr S.J. and T.A. Lasenby. 2000. Rainbow Trout Stocking In Inland Lakes and Streams. An Annotated Bibliography and Literature Review. Fisheries Section Fish and Wildlife Branch. Ontario Ministry of Natural Resources. Pg 7

Koutecky B. 2015. East Blue Lake Stocked Trout Assessments. Swan Valley Sport Fishing Enhancement Inc.

Obrey T. 2014. The Response of a Native Brook Trout Salvelinus fontinalis) Population to the Removal of Competing Species in Little Moxie Pond. Maine Department of Inland Fisheries & Wildlife Fisheries and Hatcheries Division

Turenne E. and M. Lowden. 2019. Patterson Lake Fish Population Assessment. AAE Tech Services Inc.