CHAPTER 5 – FISH POPULATIONS IN OUR LAKES

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In previous report cards, we did not make much reference to the fishes which inhabit our waterways. These ecologically important components of our aquatic ecosystems are also important drivers of our recreational and tourism economy. Spending an early morning or a tranquil evening fishing in a canoe can be a highlight of time spent in Muskoka. Even in winter, there are fishing opportunities through the ice, and enthusiasts wait eagerly for the ice to be thick enough to put out their ice huts in time for the start of the ice-fishing season.

Most freshwater fishes require unpolluted water and suitable spawning sites, but rather than treating certain fish species as indicators of watershed health, we will tell the story of an alteration of management regulations now nearing completion. Because the fact that some fishing regulations are under review is partly a direct consequence of changes taking place in our Muskoka watersheds, changes that alter their suitability as fish habitat. In other words, the need for a change in fishing regulations is a sign our Muskoka watersheds are changing.

SOME BACKGROUND

Close to 100 species of fish make their homes in the lakes, rivers, streams, and wetlands of the Muskoka watersheds. Among them are well-known fishery species such as smallmouth and largemouth bass, walleye, northern pike, brook and lake trout, not to mention the pumpkinseed sunfish, that very first fish that every six-year-old catches and takes home proudly for dinner. The fishery species can be broadly divided into cold-water, cool-water and warm-water species. Cold-water species such as lake trout, brook trout, and lake whitefish require the deep, cold, well-oxygenated water characteristic of many of our lakes. They are competitively inferior to cool-water and warm-water species such as walleye and bass, species which also feed upon their eggs and juveniles. Several warm-water species, including smallmouth and largemouth bass and several sunfishes are invasive species in the Muskoka watersheds which have been expanding

their ranges northward over at least the last 100 years as settlement progressed and more recently, as the climate warmed. These invasive species have also been helped in spreading through many of our lakes by individuals who have (usually illegally) added fish to lakes in which they do not already occur in the expectation they would improve fishing.

In Ontario, the Ministry of Natural Resources and Forestry (MNRF) has responsibility for sustainable management of recreational fishery species. MNRF scientists evaluate the status of each fishery species; whether populations are expanding or declining, whether fish are growing to a good size, whether they are healthy. Based on these evaluations, they set fishing regulations to manage when, where, how, and how many fish of each species a person may catch. They also set regulations to manage the use of live bait and to prevent the unauthorized transfer of live fish between water bodies. They are responsible, by means of these evaluations and regulations, for ensuring, so far as possible, that people will be able to continue to enjoy recreational fishing for decades to come. It's a daunting responsibility but one MNRF staff undertake willingly. MNRF's Provincial Fish Strategy describes the goal as to maintain *"healthy ecosystems supporting native self-sustaining fish communities, and fisheries that provide long-term ecological, social, economic, cultural and health benefits for the people of Ontario."*

Until 2005, MNRF attempted to manage recreational fisheries on a lake-by-lake basis, evaluating the status of fish populations in each lake and determining appropriate catch limits based on those. With the number of lakes in Ontario, this was an enormous task. The New Ecological Framework for Fisheries Management (OMNR 2005), introduced by MNRF in 2005 shifted management to a broader landscape level from the earlier emphasis on individual lakes. The key pillars of the framework were replacing existing fishing divisions with a set of 20 Fishery Management Zones (FMZ) across the province based on biological, climatic, and social considerations. The Muskoka watersheds lie within FMZ 15, which extends in a broad swath across central Ontario from Georgian Bay to the Ottawa River. The Muskoka watersheds represent about 1/7 of FMZ 15 extending from the western edge to about the centre of the zone and covering the middle third of the western half of the Zone. By shifting management to the FMZ scale, MNRF was able to streamline fishing regulations, monitor the main fishery species at the FMZ scale, and prepare fisheries management plans for each FMZ. MNRF also sought to enhance public engagement in the management process by forming Zone-based Fisheries Advisory Councils comprised of community volunteers, to provide advice to MNRF on various aspects of fisheries management.

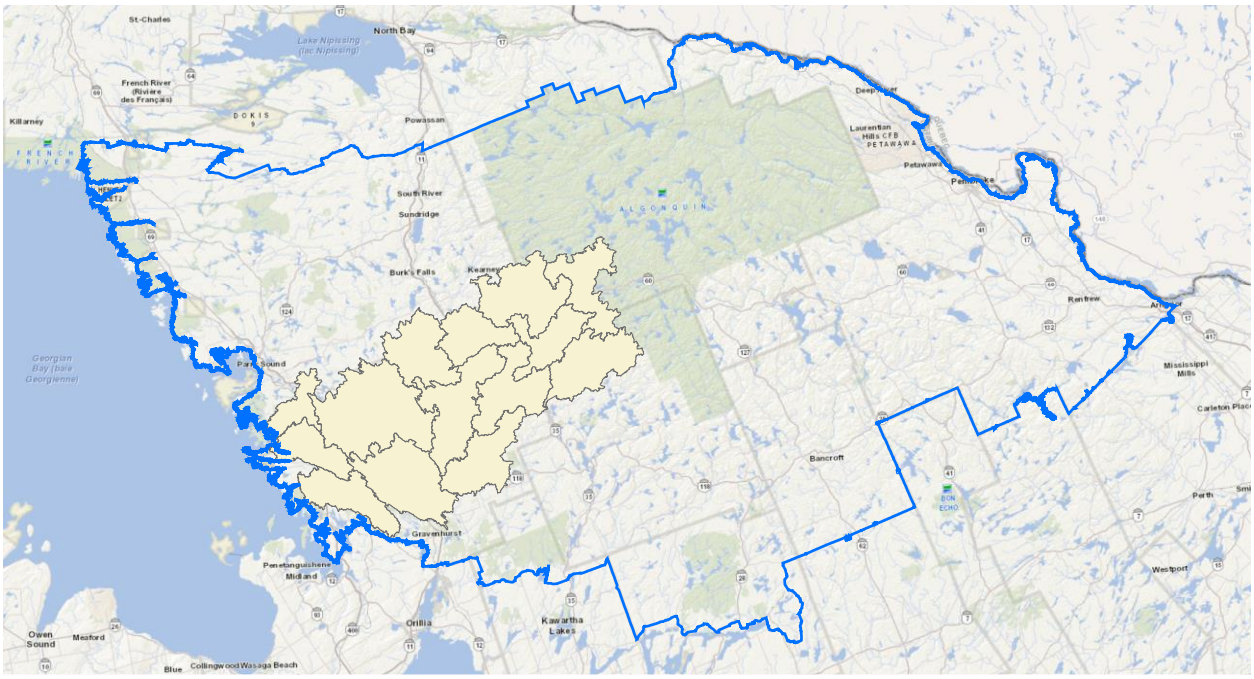

Figure 14. Fisheries Management Zone 15 (blue outline). Muskoka River watershed is shown in tan with grey outline.

In 2017, MNRF began the process to develop a new draft management plan and associated background information report for FMZ 15. The documents were posted on the Environmental Registry for public comment in the fall of 2022 (https://ero.ontario.ca/notice/019-5715). The background information report describes the status and trends of a broad suite of parameters on fish populations such as fish species distribution and abundance and stressors that impact them such as occurrence of invasives species, water quality, and fishing effort.

At this time, the plan is in draft form and may be subject to changes. However, some general statements can be made. Drawing on earlier strategies, the plan has a strong emphasis on conserving the primary native cold-water fish species; brook trout, lake trout, and lake whitefish. These species are sensitive to impacts from human-caused stressors that are expected to intensify in the future. Climate change is expected to reduce the amount and quality of habitat for cold-water species while favouring the cool-water and warm-water species that often compete with and even prey on trout and whitefish. Climate change is also a confounding or contributing factor to other stresses such as water quantity and quality and the spread of introduced species which also are expected to impact cold-water species increasingly. Here we illustrate the management challenges by considering lake trout *(Salvelinus namaycush)*.

LAKE TROUT IN THE MUSKOKA WATERSHEDS

Lake trout are an iconic fish species of the central Ontario shield landscape. They are a glacial relict species restricted to deep, cold, low productivity lakes; the type of lake that attracts people to the area. As a result, the things we do to these lakes often put our native lake trout populations at risk. The main stressors include the introduction of non-native species, nutrient enrichment from watershed and shoreline development, alteration of near shore habitat, climate change, and harvest of the fish themselves.

Since 2006, MNRF has maintained a formal list of lakes that are designated for lake trout management (OMNRF 2015b). Lakes are designated as *natural*, where populations are maintained by natural reproduction, and *put-grow-take* (PGT), where populations are maintained by artificial stocking. As of 2015, there were 55 natural and 19 PGT lake trout lakes in the Muskoka watershed (Appendix C). The greatest numbers of lakes occur in quaternary watersheds Baysville Narrows-South Branch Muskoka River, Distress Pond-Big East River, Hollow River, and Tea Lake-Oxtongue River in the eastern highland area of the watershed. Of those, 23 are natural lakes in Algonquin Park. However, the greatest concentration of surface area is in the Lake Muskoka-Muskoka River and Lake Rosseau watersheds which contain the large Muskoka Lakes. The PGT lakes tend to be smaller and naturally have less and poorer habitat for lake trout making them more likely to be impacted by various stressors. Notable exceptions include; the Huntsville Lakes (Vernon, Fairy, Peninsula) and Mary Lake, which despite being large and deep, do not currently support natural lake trout populations. That is thought to be primarily due to interactions with introduced non-native smelt in interaction with other factors, including low water clarity.

The introduction of this Background Report describes the phenomenon of shifting baselines and our inability to track slow environmental changes. Human activities started to change lakes in ways that would have impacted lake trout well before formal monitoring of fishery species began, so we simply do not know how many lakes originally supported populations of lake trout. Many lakes that are currently stocked on a PGT basis probably had native self-sustaining populations that have been lost due to the combined effects of overharvest, introduced species such as bass, water level manipulation, and other stressors. Also, there are a number of lakes that were managed for lake trout by stocking in the past, but no longer are. In many cases it isn't known whether they ever had natural populations of this fish, or if they were simply maintained by stocking. Overall, we know we have lost some naturally reproducing lake trout populations, but the extent of this decline isn't known.

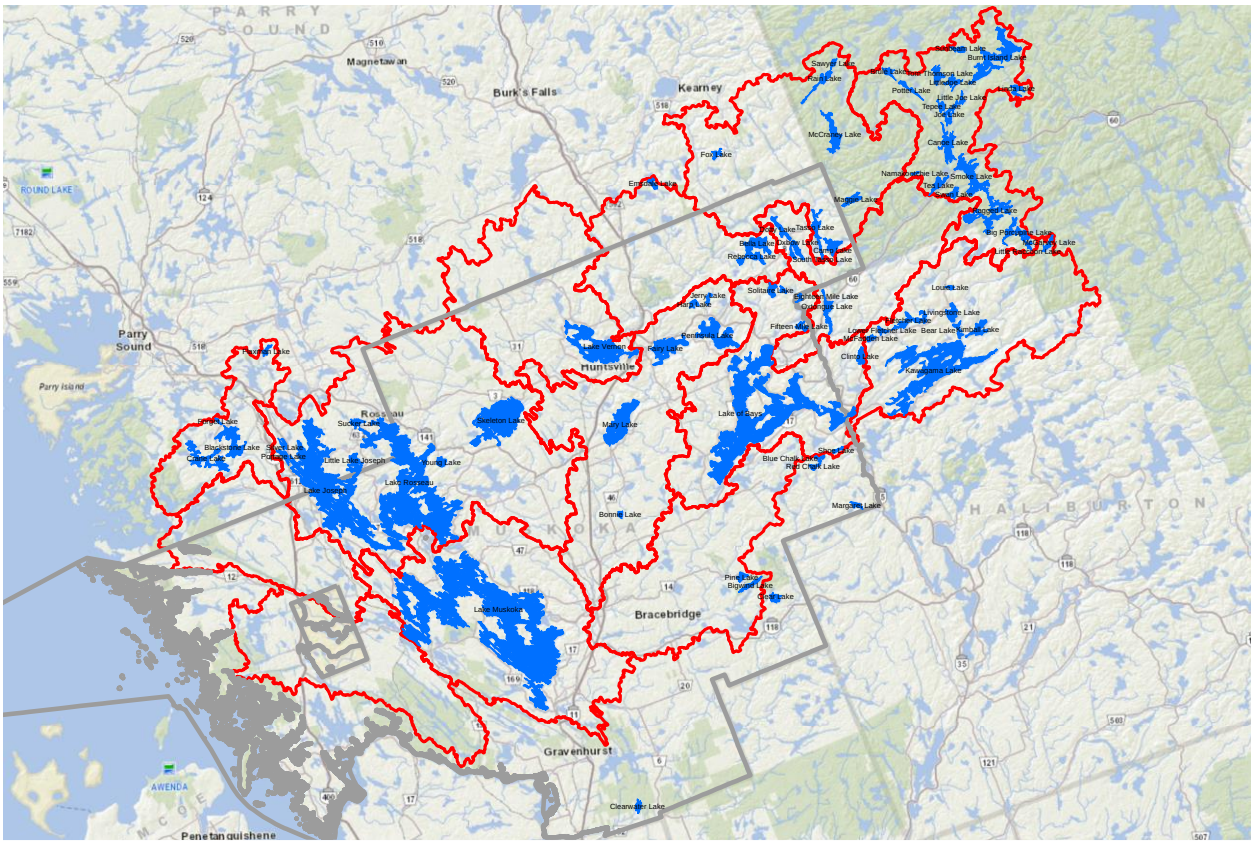

Figure 15. Map of lakes designated by the MNRF for the management of lake trout in the Muskoka River watershed and the District of Muskoka (2015).

What is known is that on-going climate change is expected to further worsen their long-term chances for survival and that the present levels of fishing will not likely be sustainable indefinitely. Present levels of fishing may have been sustainable when current fishing regulations were put in place in 2005, but environmental changes since then have already impacted this species.

Continuing climate change is expected to further reduce the amount and quality of habitat for lake trout reducing populations directly, but also making them more vulnerable to impacts from confounding factors. The most important direct effect is the lengthening of the season when a lake is stratified with a layer of warm water preventing oxygen from the atmosphere reaching the deeper, cold water. Reduced levels of dissolved oxygen in the deep water reduce the number of fish which can live there without exhausting oxygen supplies. A second direct effect, also caused by the lengthening of the period of the year when the lake is stratified as well as by warming of the surface waters, is a deepening of the thermocline, the transitional layer of water

between warm surface waters and cold deep waters, which effectively reduces the volume of the deep-water habitat available for lake trout.

Indirectly, continuing climate change is likely to facilitate the competitive and predatory activities of cool- and warm-water species, such as bass, further harming lake trout populations. This is because the warming effects of climate change are expected to directly benefit populations of warm-water, and perhaps cool-water species.

Recognizing the multiple stressors facing lake trout, as well as the fact that evaluations showed they could not sustain current levels of fishing, the FMZ 15 plan had to explore ways to ease the cumulative pressures on their populations. The only real tool available for fishery managers to conserve fish populations is to manage the recreational fishery in ways that will reduce the amount of fish taken. In this way, resiliency of the fish to other stressors over which we have little local or direct control can be increased. The FMZ 15 plan, now in draft form, proposes a reduced length of the open season and establishing of minimum size limits based on the observed growth rate observed in each lake. These measures are expected to reduce overall mortality rates and improve abundance. Fish stocking in PGT lakes will continue to be used to divert fishing effort from natural lake trout lakes and provide additional fishing opportunities to support local communities and businesses. Stocking of viable natural populations will not be done because of the potential negative impacts of stocked fish. The plan also features a strong educational element to try to reduce the impacts of introduced species and habitat loss.

The changes being made to the regulations governing fishing for lake trout are a consequence of the fact that our lakes are changing in ways that make it more difficult for this species to survive. That they are necessary is another illustration of how the impacts of climate change ripple through the ecosystem in unexpected ways.