Pine Lake Muskoka—An Introduction

Location

Pine Lake, Muskoka, six km west of Gravenhurst, Ontario is a nutrient-poor, young lake situated at the southern edge of the Canadian Shield, 232 m above sea level. The lake is five kms long but only one km at the widest —aligned in an east-west direction. It is divided into three almost equal portions each separated by narrow channels— "First" and "Second Narrows". Pine Lake has a surface area of 156 hectares, a shoreline perimeter of 23 kms., a maximum depth of 11 m and a total watershed of 25 km^2. Because the lake is shallow and dark coloured it warms up quickly in spring and summer. It is at the southern edge of the Muskoka River watershed. Approximately 68% of the watershed is covered in forest and other natural vegetation; 15% consists of water (lakes, rivers, and ponds), 11% is wetlands, and 2% is rock barrens and outcrops. Settlement areas only make up 2% of the watershed while developed land such as agriculture (cropland, horse and cattle pasture and open fields) and golf courses make up 2% of land cover within the watershed (Muskoka Heritage Foundation, 2007).

Drainage

The drainage basin of Pine Lake is relatively small. It includes Deer Lake, Pigeon Lake, and Hidden Lake, all north of Pine Lake and uncottaged. The rock ridge paralleling Pine Lake to the south is a watershed divide. Waters south of here flow into the Severn River watershed. All water from Pine Lake drains north via Pigeon Creek which crosses Hwy. 169, flows one km, and enters Lake Muskoka.

Underlying Soils

The southern Shield is a region with a soil cover averaging only 15 cm. Pioneer logging and farming might have had an effect, but glaciation is primarily to blame for leaving us with a thin soil cover. Without much in the way of hills, surface water moves slowly, and the area has broad stretches of wetland, small lakes and rivers. Slow water flow and thin soil mean the area quickly feels the impact of any type of environmental damage, whether it is in airborne pollutants, climate change or simply excessive development. Where the bedrock is covered by soils, it is generally very thin and nutrient poor, therefore limiting the amount of nutrients that flow to adjacent water bodies.

Water Drainage

Virtually all of our lake water comes from precipitation either as rain or melted snow, most in the form of spring runoff. The exposed bedrock which we have in abundance is hard and insoluble unlike the limestone south of the Shield. The water in Pine Lake is soft, particularly noticeable when compared to Toronto water. If you are fortunate to

obtain your water from the lake instead of having a drilled well, you can appreciate your showers. You will never feel cleaner than with Pine Lake water!

Water Levels

Many factors affect the water level of Pine Lake. These include: spring snow melt, drainage basin run-off, heavy rainstorms, drought, evaporation of lake water, beaver dams constructed (higher water) or breached (lower water) and seepage to and from the lake bottom. There are no artificial controls over the Pine Lake water levels. During a dry summer water levels will drop and for several months there is essentially no water flowing in or out of Pine Lake. Summer lake levels normally vary within a range of .5 metres but can fluctuate dramatically. For example, following a 2 ½" rain accumulation on 20 July 2009, lake levels increased 5" by 27 July but then dropped 4" by 4 August. Lowest lake levels are normally in mid or late summer. One advantage of being on a smaller lake is that we avoid the destructive spring floods which have happened with great regularity in recent years on Lake Muskoka. The area above the high-water mark influenced by the presence of water is the riparian zone This zone buffers polluted water and runoff sediment. By maintaining buffer zones, we reduce problems of pollution and runoff from flooding.

Topography

The deepest part of Pine Lake is in the centre of the first lake at 11 m; the second lake deepest part is 10 m. while the third lake is essentially a shallow groove with the deepest part near the narrows at 7 m. Surprisingly, little Hidden Lake, accessible via a one km. trail from the second lake is the deepest of all at 20 m. The surface geography of Pine Lake can be described as an area of bare rock ridges and shallow sandy till. The rock structures shape the topography of the bottom of Pine Lake, with some ridges persisting under water.

Description of lake

The colour of the lake water in Pine Lake is brown, typical for a Muskoka lake and caused by high levels of tannin in the water. At an average depth of about 5 m, Pine Lake is quite shallow, particularly compared to the three large lakes to the north. This means that the lake warms up quickly in the spring with the top metre sometimes reaching temperatures of 26°C by the end of June. Cottagers in Lake Muskoka or even colder Lake Simcoe can only dream of these bathwater conditions. An 11-year survey of Pine Lake water temperatures for 1 July showed the lowest temperature of 21°C and highest at 26°C, average of 24°C, much higher than neighbouring larger lakes. Surface water temperatures will fluctuate quickly with a cold spell or heavy rain but generally remain in the mid 20°C's for July and August. In some years, it is quite possible to enjoy a swim, albeit brisk in Pine Lake for six months—from the end of May to early October—certainly the case in 2016.

Winter conditions
Winter freeze-up generally occurs in mid-December while spring ice break-up in 2017 was 11 April. Over the past few decades, the period of ice cover has been reduced by almost one month. At one time, the five-km. length of Pine Lake was a major snowmobile highway. With the shorter ice cover season, and uncertain ice conditions, snowmobiling on Pine Lake is now a risky business.

Lake Turnover
Water is densest at 4°C. Above or below that it is becomes lighter. Just before freeze-up and just after spring melt, the murky water on the bottom of Pine Lake mixes readily with the clear surface water. The complete lake water then becomes dark and dirty: Secchi disc readings will be quite low. This interesting phenomenon is termed "lake turnover".

Surface water movements
Because Pine Lake is narrow, long and oriented east-west and because prevailing winds are from the west, water piles up at the eastern end during strong winds (" fetch"), then as the wind abates, the waters bounce back west. Higher winds do produce whitecaps on the broader portions of the lake. Winds also creates upwellings wherein colder water is pushed to the surface to create long smooth linear streaks. Best seen during a rainstorm these slicks align east-west with prevailing winds and provide delightful moving patterns.

Shoreline description
In 1912, following earlier clear-cutting, a massive forest fire burned much of southern Muskoka. Most of the landscape was burned to the ground including all the land around Pine Lake. Early photographs of cottages show only a few stunted trees in the background. In the past 100 years, the forests have come back, and White Pine now dominates much of the shoreline. Combined with the rock ridges, this provides a rugged and picturesque shoreline, characteristic of the lake-studded landscapes of Muskoka. About 95% of the shoreline is natural with a small number of cottages retaining hardened concrete shore walls or mowed shoreline lawns. The lake itself is surrounded by natural areas with a few small farm fields to the east.

Shoreline Buffers
The riparian zone is the interface between land and water. These zones are important in ecology and environmental management for soil conservation, habitat biodiversity, and the impact on shore and lake ecosystems. Most municipalities have by-laws to protect the shoreline from degradation.
Town of Gravenhurst Zoning By-Law 5.23.1 requires that land 20 metres wide from the summer water line remain in a natural, undisturbed state, i.e., as a shoreline buffer By-Law 2014-27 regulates the removal and dumping of fill, the removal of topsoil, and the alteration of the grade of any property in the Town of Gravenhurst. A cruise along the shore of Pine Lake will show that most cottagers comply with the by-laws and

natural shorelines are maintained. This provides an attractive and rewarding Muskoka aspect to Pine Lake.

Geology
The Pine Lake watershed lies near the southern edge of the Canadian shield. The surface is an undulating mass of durable gneiss and granite. The southern edge of the Shield is only about 20 km south of Pine Lake where the old hard rock dips under young sedimentary rock. The base rock of Pine Lake is mainly gray gneiss with some pink granite, both very old rocks. Our rock is a banded metamorphic rock composed mainly of quartz, feldspar and hornblende with a sprinkling of dark red garnet crystals. Light and dark minerals are segregated into alternating layers and squeezed into beautiful complex folds and swirls. The shoreline is shaped by the bedrock layers and fractures. This is evident in straight sections of shorelines and in the alignment of islands, points, or bays.

Glaciation
Much of the present appearance of Pine Lake results from the last ice age. The glaciers removed loose debris and weathered rock and pushed it farther south. But then as the glacier receded, meltwater flowed over the underlying bedrock exposing more surface rock than elsewhere in Ontario. This created the rocky islands in Georgian Bay and rock barrens in southern Muskoka. It is the combination of the exposed rock along with pine shorelines that gives Pine Lake pride of place in Muskoka

Natural environment
Pine Lake supports many species of native plants and animals. Many beaver dammed wetlands surround the lake. Generally acidic and boggy, they are composed of peat mosses, grasses, sedges, and shrubs. They provide habitat for turtles, frogs, snakes, Wood Ducks, and Blue Heron rookeries.

Torrance Barrens
The western half of Pine Lake including all the third lake is surrounded by the Torrance Barrens Nature Preserve. The structure of the ancient Shield is evident with bare rock dominating the terrain, lichen and stunted tree growth the only cover. Torrance Barrens can be accessed by clambering up steep cliffs bordering the third lake or by driving to the Torrance Barrens Dark Sky Preserve on Muskoka Road 13.

Fish
With good fish habitat, Pine Lake supports a healthy population of Small-mouthed Bass and Large-mouthed Bass. Not native to the lake, smallmouth bass were introduced in 1935, largemouth bass in 1949. Failed introductions include Atlantic Salmon in 1935 and Pickerel (Walleye) in 1946. The invasive spiny water flea has been detected but fishing results do not seem to have been impacted. Fishing pressure is low with most anglers practising "catch-and-release". A major plus to the fish population of Pine Lake

is the absence of Northern Pike. Pike will dominate lakes to the detriment of the more attractive and edible bass.

Forestry
The familiar White Pine and rock outcrops surrounding small lakes is typical of the Muskoka portion of the Canadian Shield and is distinctive world-wide. Following the forest fires of the early 20th Century, White Birch grew quickly along much of the shoreline. An early successional species, it has now been replaced by White Pine which regenerates well on shoreline. Red Pine is almost as abundant as White Pine but lacks the distinctive curving branches and beautiful silhouette of the White Pine. Away from the shoreline, the forest surrounding Pine Lake consists primarily of pines, Sugar Maple, Trembling Aspen, and Large-toothed Aspen. Wetlands support Speckled Alder and Red Maple. Hemlock thrives in north-facing shade cooler sites. At present, there is minimal logging done around Pine Lake with some selective fuelwood cutting in bush to the south.

Plants
In spring, Pine Lake is graced by an assortment of ephemeral flowers including an abundance of White Trilliums. Many species of ferns show well throughout the summer with fall asters and goldenrods providing the peak of colour in September. Of note, Pine Lake does not suffer from the scourges of Purple Loosestrife, Tall Reed Grass (Phragmites) or other invasive weeds.

Water clarity
Regular water clarity testing using Secchi disks has shown that lake water is clearest in early spring and late fall, most turbid in the summer. Ice cover allows organic matter to settle to the bottom while watercraft activity and high winds stir up the water to depths of 20'.

Phosphorus, and blue-green algae blooms
Muskoka District records show Pine Lake spring phosphorus levels have dropped from 12 microgram /litre in 1988, a high of 14 ug/L in 2002 to 6 ug/L in 2016. This compares favourably to many other lakes in Muskoka. Pine Lake is classified as a medium depth mesotrophic lake. It is too shallow to support trout but too deep for serious blue-algae blooms. These algae blooms are caused by a combination of shallow water and hot summer temperatures along with excessive phosphorus from septic systems and runoff. Pine Lake has had a few minor blue-green algae blooms wherein cottagers noted bits of what seemed to be bright green indoor-outdoor carpeting, but nothing of note compared to certain other Muskoka Lakes.

Ownerships and cottage developments
About 50% of the shoreline of Pine Lake is privately owned with the balance being protected Crown land. Presently there are about 170 cottage lots with the oldest cottages dating from the 1930's. Seven roads and lanes provide access to almost all

cottages. Only a handful are still boat-access. There are two properties with commercial activity—both managing cabins on Hwy. 169. Sewage is handled by holding tanks and septic systems, very few outhouses are grandfathered.

Disturbances

Most cottages are generally set back from shore with naturalized shorelines and well-treed lots. Generally, cottagers are good stewards and use sensible lighting with low wattage non-intrusive ground-aiming waterfront lights. There are perhaps twenty boathouses and very few grassed lots. Cottagers express concerns over the visual impact of large boathouses and the shoreline erosion and noise disturbance caused by wake boats. The increase in the proportion of rental units is a worry to long-term cottagers. Sound travels much farther over water. On a calm day, particularly in morning or evening, it is possible to hear neighbouring cottagers carrying on a normal conversation on Pine Lake up to a kilometre away—not something you could expect in any other environment.

District of Muskoka Surveys

The Pine Lake Ratepayers Association works with the lake steward program to measure water quality components. As well, annual benthic (bottom-dwelling) aquatic invertebrate surveys have been conducted by the District of Muskoka for the past ten years. The pattern of abundance of different species collected indicates the health of the ecosystem—results indicate there is no cause for concern. The District collects water chemistry information. The District of Muskoka Lake System Health Water Quality Monitoring Program Data Report is updated every year and available on-line.

Special features

Special places on the lake include the many high rock ridges, the portage to Hidden Lake, two narrows and Torrance Barrens Conservation Preserve. Perhaps the most spectacular shoreline feature is the ~20-m-high cliff that dominates the first lake just before the narrows.

Environmental Issues

Fortunately, acid rain, lead pollution and DDT are no longer issues in the region. Ozone depletion and UV damage are not a problem given the colour of the lake water. Zebra mussels prefer limestone substrate so are not a threat in Muskoka. Spiny water fleas may cause problems such as increasing accumulations of plankton.

Shoreline and dock night lighting provides for interesting discussions. Some cottagers feel they provide an attractive ambience to their property; others feel the lights are polluting and detract from the natural setting.

Conclusion

Pine Lake exemplifies the enchanting qualities of cottage country on the Canadian Shield: rugged rocky landscape, towering pine trees, beautiful shoreline, and clean fresh water. Although no major development is expected, it is always to be feared. For

example, the potential for the development of vacant lots is unknown. For cottagers, many of whom have owned the property for generations, it is clear that Pine Lake has a special place in their hearts.

George Bryant
g.bryant@sympatico.ca

Notes

Fresh Water (1998) by E.C. Pielou is an excellent source of information on lake characteristics.