



Muskrat Lake Shoreline Assessment Summary Report

Submitted by Watersheds Canada and the Canadian Wildlife Federation.

.Love Your Lake is a program of Watersheds Canada and the Canadian Wildlife Federation.



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Introduction

The state of the shoreline is important to the overall health of a lake and the people and wildlife that call it home. Maintaining or restoring shorelines to their natural state, helps maintain good water quality by reducing nutrient inputs and preventing soil erosion. Natural shorelines also provide some of the most productive and diverse wildlife habitat on the landscape. Naturally occurring plants at the water's edge and in shallow water provide important wildlife habitat and help protect shorelines from erosion due to changes in the water level or wave action. A natural shoreline also provides wildlife with food and habitat, which creates recreational opportunities such as fishing or bird watching. An abundance of wildlife living within an area is a good indicator of a healthy shoreline.

Highly developed shorelines, on the other hand, can impact the health of a lake. Shoreline erosion can negatively impact the lake by contributing to poor water quality, nutrient and sediment runoff, habitat loss and excessive weed growth. Disturbed shorelines are typically observed with areas that have been cleared of all or most vegetation, lawns that extend to the water's edge and hardened structures such as retaining walls, which replace natural vegetation.

The Love Your Lake program promotes shoreline stewardship and helps shoreline property owners protect and restore their shorelines, thereby improving the health of their lake.

Methodology

Locally trained surveyors assess the health of shoreline properties on a lake using the standardized Love Your Lake Shoreline Assessment Method. Data which is collected is used to produce a personalized report for each property owner which describes existing conditions on their shoreline, suggests stewardship actions and provides additional contacts, resources and sources of support. This program is non-regulatory and completely voluntary. Property owners generally have a common interest to manage their properties in ways that maintain property value and lake quality and this program provides the information and support to do so.

In 2017, 327 properties were assessed totaling about 36km of shoreline on Muskrat Lake. The shoreline survey involved an assessment of the entire shoreline of Muskrat Lake. This report summarizes the information on shoreline classifications, development, runoff, invasive species, habitat and recommendations and restoration opportunities. This report can be used as a source of information on the current physical conditions of Muskrat Lake and as a baseline to compare future surveys. It can also be used by the lake association and other partners to determine opportunities for restoration, education and stewardship on a lake wide level.



Map Credit: Google Maps

The following information was produced for the entire lake by summarizing the data collected from the shoreline property assessments:

- Shoreline Restoration
- Building Setbacks
- Runoff
- Shoreline Development
- Retaining Walls
- Ornamental and Regenerative Lawn
- Aquatic Plants
- Sediment
- Invasive Species
- Wildlife Habitat
- Property Slopes

Recommendations for shoreline naturalization were assigned to properties using a combination of the shoreline classification data and the buffer recommendations.

Results from Muskrat Lake

Shoreline Classifications

Each shoreline property was given percentage classifications in four possible classes (natural, regenerative, ornamental and degraded), rounded to the nearest ten percent. This is based on shoreline development, retaining walls and shoreline vegetation. The table below summarizes these classes with descriptions and photographs.

Classification & Description

Natural – A healthy buffer of vegetation and/or a natural shoreline of sand or exposed rock that is undisturbed and undeveloped.

Regenerative – Natural vegetation has been removed in the past, but is in the process of growing back towards a natural state.

Ornamental – All natural vegetation has been removed and replaced with mowed lawn and other non-native vegetation; structures such as docks, decks, boathouses and boat ramps are predominantly present at the shore.

Degraded – Natural vegetation has been lost; soil erosion, undercutting of the bank and/or exposed roots of shrubs and trees are significant.

Photograph Example*



***Note:** These photographs are examples of shoreline classes, not representing any specific shoreline property on Muskrat Lake. There can be a range of variation in the classifications depending on the type of shoreline.

Shoreline lengths for each property were obtained from municipal property information. For properties without this data, lengths were estimated. Results were based upon the number of properties within each shoreline

classification. Properties were assigned an overall category corresponding to the classification that made up the largest portion of the shoreline.

Figure 1 shows the counts of property classifications on the lake. For example, a property that was 60% Natural, 20% Ornamental and 20% Regenerative would be classified as Natural. Alternatively, a property that was classified as 40% Ornamental, 30% Regenerative and 30% Natural would be classified as Ornamental.

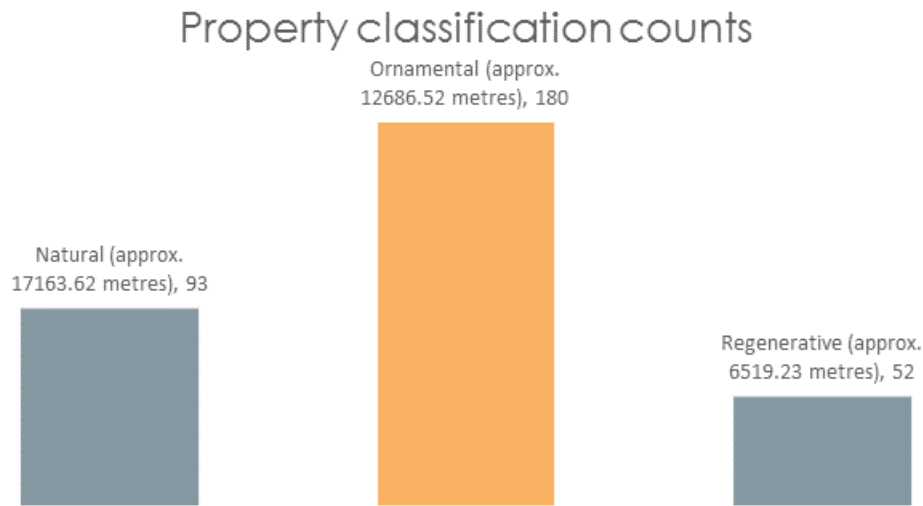


Figure 1 Property Classifications

Stewardship Message

On Muskrat Lake, 93 shoreline properties were classified as majority natural, 180 majority ornamental and 52 were considered majority regenerative. It is recommended that shoreline property owners engage in naturalization projects to further decrease the ornamental percentage and increase the regenerative and natural percentages.

This presents an opportunity for residents of Muskrat Lake to increase the overall quality of the lake by maintaining, protecting and enhancing natural shorelines. To restore shorelines to a more natural state, property owners are encouraged to take action. Regenerative properties should also be encouraged to maintain their properties in a natural state by allowing their vegetation on their property to continue to regenerate and grow naturally.

Shoreline Restoration

One important way to improve water quality in lakes and rivers is to ensure that there is a natural buffer of vegetation along the shoreline. Natural and vegetated buffers are some of the most productive and diverse habitats on the planet. Vegetated areas are also important for filtering contaminants and sediments before they enter the lake. Deep rooted trees and shrubs help to capture nutrients moving from the surrounding landscape. Shallow rooted vegetation such as grass lawns, are unable to capture these nutrients with the same effectiveness as their natural counterparts. A well vegetated shoreline can capture sediment before it is able to enter the lake and potentially affect water quality and lake bottom habitat.

The survey of Muskrat Lake characterized the types of restoration opportunities that exist around the lake on individual properties. Figure 2 summarizes the number of properties that were assigned a buffer recommendation during the survey. Each shoreline property can receive more than one recommendation.

Shoreline buffer recommendations

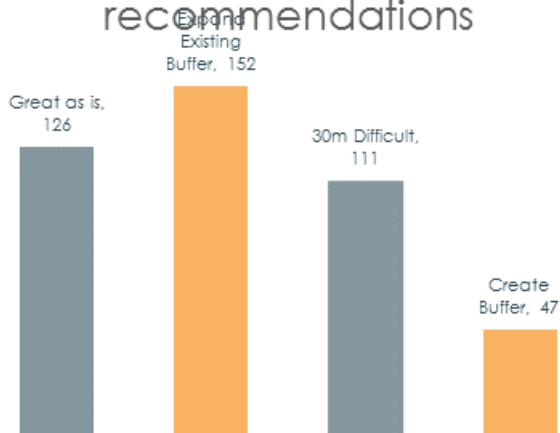


Figure 2 Buffer Recommendations

Please note that 30m difficult is checked off during the assessment when it is difficult to create or expand an existing buffer. Limitations may be caused by the close proximity of a structure, cliff, rocky terrain/bedrock, or other factors that would make planting a buffer difficult.

In order to determine restoration opportunities on the lake, properties that were assigned a recommendation to expand or create a vegetated buffer were identified and ranked according to their potential for restoration as follows.

Ranking of Properties that Would Benefit from Naturalization

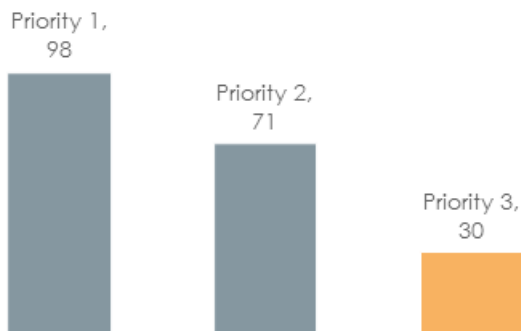


Figure 3 Shoreline Naturalization Property Rankings

Priority 1: Properties that have an ornamental or degraded shoreline proportion of greater than 75%, potentially offering an opportunity for significant areas of naturalization.

Priority 2: Properties that have an ornamental or degraded between 50% and 75%.

Priority 3: Properties where the ornamental or degraded shoreline proportion is between 25% and 50%. These properties

still have areas where there is opportunity for restoration; however they are likely already in a fairly natural condition.

It is recommended for the health of a lake that 75% of the shoreline of each property remains natural, leaving 25% for shoreline development opportunity. Working towards keeping 75% of the shoreline of each property in a natural state will greatly benefit the health of the lake.

Currently 199 properties would benefit from shoreline naturalization. Of these 199 properties, 98 or 49% of properties are a top priority.

Stewardship Message

Shoreline naturalization is a voluntary action by landowners. While naturalization of the more ornamental or degraded properties may produce greater benefits, increasing the natural shoreline on any property is a positive stewardship action.

Erosion

Shoreline erosion is a common and natural process that affects many shoreline properties. The process of erosion from ice, wind or water is natural and normally occurs at a very slow rate. However, altering the natural features of properties can accelerate this process and create unsafe conditions.

Sediments deposited as a result of erosion are considered pollutants when excessive levels due to human activities occur. Shoreline erosion affects water quality, wildlife habitat and shoreline stability.

Figure 4 shows the counts for each type of erosion data that was collected on Muskrat Lake

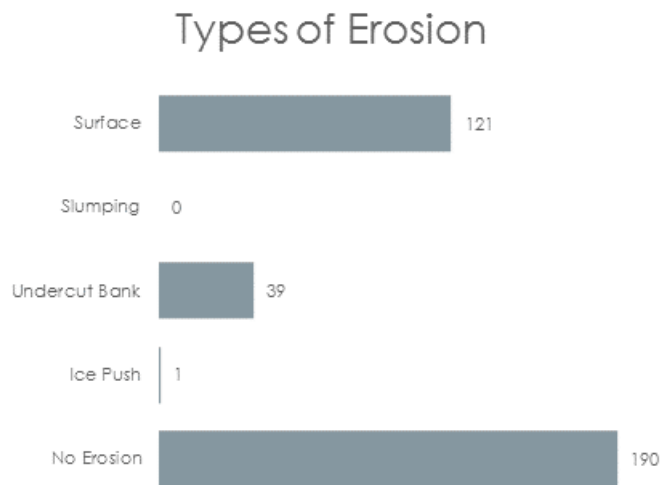


Figure 4 Types of Erosion

Stewardship Message

There are a number of steps that can be taken to protect Muskrat Lake. Protect the natural shoreline by planting or maintaining native vegetation and leaving in place stones, boulders, snags and dead branches found along the shoreline, when it is safe to do so. Reduce runoff by maintaining native vegetative buffers and have rain barrels to collect runoff from roofs. Also, minimize wake from boats, take precautions during construction and use pathways and stairs to limit foot traffic to the shoreline.

Building Setbacks

The primary issue associated with shoreline building setbacks less than 30 metres, is the limited area to buffer or filter contaminated runoff and wastewater from the main dwelling. Buildings can also disrupt the nearshore habitat corridor that many different animals use to move around the lake environment and into upland areas. While moving these buildings further back from the shoreline may not be a feasible or realistic option, naturalizing the shorelines of these properties would help address the issue.

Shown in Figure 5 is the range of building setbacks for properties on the lake, not including vacant properties, buildings under construction and unidentifiable properties. Building setbacks for shoreline developments in Ontario should be at least 30 metres from the high water mark; however, older cottage buildings were

permitted closer to the high water mark. On Muskrat Lake, 53% of the properties surveyed were observed to be closer than 30 metres to the shoreline.

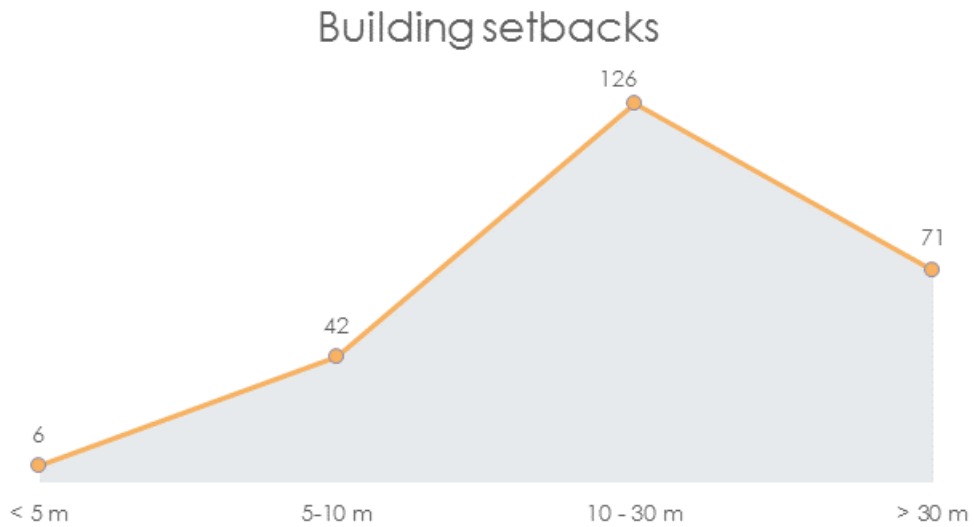


Figure 5 Building Setback Ranges

Stewardship Message

A potential area of concern with building setbacks is having septic systems installed close to shore. Regular inspections and maintenance of septic systems can help prevent excess nutrients from entering the lake. Nutrients entering the lake can contribute to eutrophication, resulting in increased aquatic vegetation, low oxygen levels, turbid water and algal blooms. Excess nutrient loading is one of the largest threats to water quality in lakes and rivers; it is everyone’s responsibility to do something to help protect the lake.

Runoff

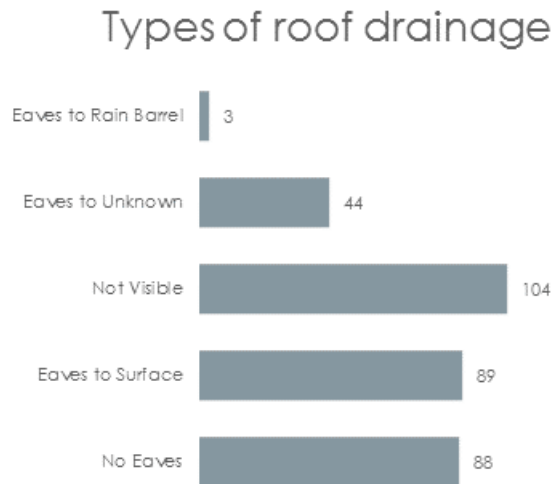


Figure 6 Roof Drainage types around lake

Naturalizing shorelines on properties with near-shore building setbacks would help reduce runoff from entering into Muskrat Lake, which could help reduce potential problems such as algae blooms and loss of oxygen in the water. Property owners can also manage this problem by ensuring they have eave troughs with downspouts directed at natural or stone catch basins or rain barrels, as well as ensuring they have a properly functioning septic to process wastewater before it enters the lake. It is also important to use phosphate free products. Figure 6 shows the types of roof drainage that were recorded from the shoreline assessments.

Shoreline Development

Shoreline development is defined as the presence of man-made structures in the water or along the shoreline within three metres of the shore. Development along a shoreline can be done sustainably and in an environmentally sensitive fashion, providing structures are well maintained and kept to a minimal footprint. Figure 7 and 8 illustrate the common structures present on Muskrat Lake.

On average property owners have developed 28% of their shoreline within a few metres of the water's edge. Different types of structures can have negative environmental impacts, due to their ability to remove habitat, store contaminants and nutrients, and eventually release them into the aquatic environment.

Small floating or non-permanent post docks are the most environmentally friendly choice, they allow natural water flow, have limited contact with the lake bottom, and reduce the overall potential for disturbance to aquatic life.

In the future, if shoreline property owners need to replace their old or failing permanent post, solid, or crib docks, they could consider choosing non-permanent post or floating docks. By selecting these types of docks,

people can reduce the potential impacts to fish and other aquatic species, which can help protect the overall health of the lake environment.

Stewardship Message

When shoreline development structures are present, keep structures clean and organized to prevent possible soil and water contamination. Consider planting native species to provide additional habitat between man-made structures and the shoreline. If an older structure is present and no longer functioning, consider retiring the building, shed or other man-made structure, this will provide more habitat potential for wildlife.

When creating shoreline access, there are a few things to take into account. Limiting access to one area of the shoreline can help maintain a healthy buffer for wildlife habitat and runoff filtration. By creating a well formed pathway that follows the contours of the slope or constructing raised, open-backed stairs, you can direct the foot traffic leading to the waterfront. This will limit possible erosion in high traffic areas. Covering pathways with wood chips or gravel will also help reduce soil loss on pathways and raised, open-backed stairs will allow vegetation to grow underneath, helping to hold soils in place.

Number of docks by type

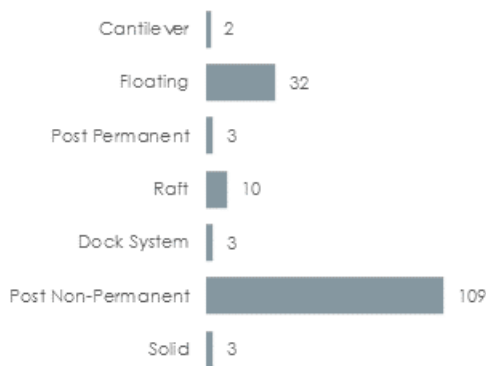


Figure 7 Docks On Lake

Number of structures by type

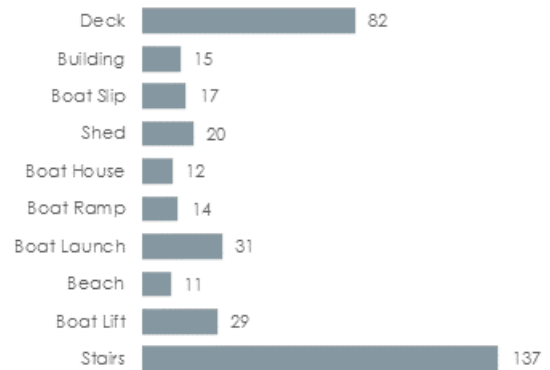


Figure 8 Structures on Lake

Retaining Walls

Retaining walls made out of rock, concrete, metal and other materials were once commonly used when it was thought that the only way to combat erosion was to take a hard, aggressive approach. Consequently, people began putting in concrete walls and gabion baskets. These structures only work in the short term to prevent erosion, but they ultimately do much more harm than good. On Muskrat Lake, the number of properties with retaining walls was observed and the results are summarized below in Figure 9.

Stewardship Message

108 properties on Muskrat Lake, or 33% of the properties assessed have a retaining wall. Of the retaining walls that are present, the most common choice was Riprap.

While retaining walls were an option to combat erosion for property owners in the past, we now know about their impact on the natural environment. Wave energy is reflected back from these hard, flat surfaces with the same force as which they strike the wall. This can cause excess turbulence in the water, which scours the sediments from the lake bottom.

Solid walls also eliminate shoreline habitat and act as a barrier,

preventing wildlife from reaching the water. Although some retaining walls such as rip rap or loose rock have fewer impacts than other retaining walls, shoreline property owners could consider alternative erosion control methods such as planting native vegetated buffers. In the meantime, maintaining vegetation around the wall and allowing new vegetation to establish and grow will help reduce runoff and provide habitat for wildlife. For more information contact the provincial government regarding erosion control and necessary work permit requirements.

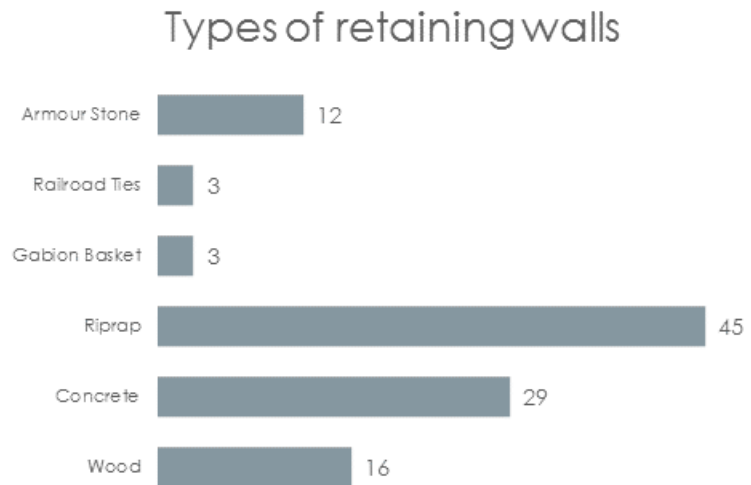


Figure 9 Retaining Walls on Lake

Aquatic Plants:

On Muskrat Lake, shorelines were surveyed for their presence of aquatic plants. The presence of aquatic plants was further summarized into aquatic vegetation types; emergent, submergent, floating and algal blooms. Figure 10 shows the number of properties on Muskrat Lake that had aquatic plants along their shoreline properties. The majority of aquatic vegetation that was present on Muskrat Lake was categorized as algae bloom. Emergent vegetation, submergent vegetation and floating vegetation were also found on Muskrat Lake. Emergent, submergent and floating vegetation are an important part of the aquatic ecosystem; giving habitat to birds, frogs, dragonflies and other wildlife.

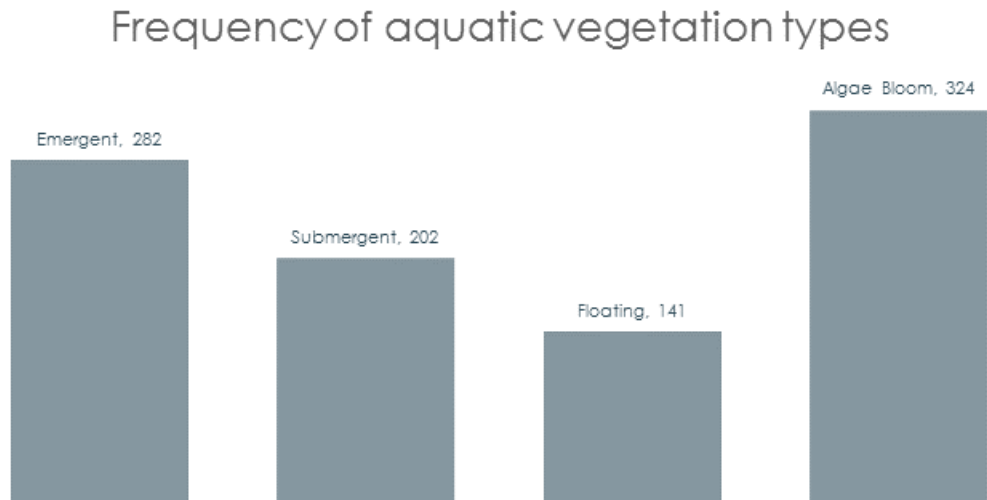


Figure 10 Aquatic Vegetation

Stewardship Message

When aquatic vegetation is removed, the integrity of the shoreline is lost. This negatively impacts the health of the waterbody by decreasing the quality of the water and reducing biodiversity. Eventually, a waterbody can become unusable, affecting the hundreds of species that rely on it. Fortunately, there are some easy steps that can be taken to help protect and restore your shoreline. By planting native species and allowing natural aquatic vegetation to grow, you can help provide habitat for wildlife to flourish.

Sediment:

On Muskrat Lake, the type of sediment present on the lake bottom was observed. The benthic zone which is located on the lake bottom is classified as the ecological region at the lowest level of a body of water. It starts at the shoreline and continues down until it reaches the floor, encompassing the sediment surface and subsurface layers. Although this zone may appear barren, it plays a vital role in the health of aquatic ecosystems. Tiny, microscopic organisms which cycle nutrients live in this zone and act as a source of food for bottom feeding animals.

Sediment distribution

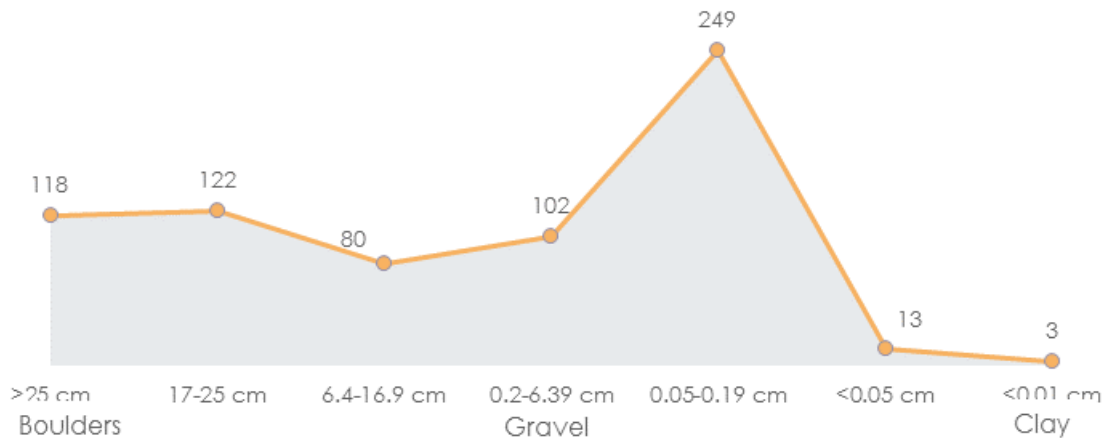


Figure 11 Sediment Distribution

Invasive Species:

Zebra Mussels were identified on your lake. Invasive species can have large negative impacts on an ecosystem by significantly altering food chain dynamics, reducing native species populations, and degrading water quality.

Zebra Mussels are freshwater bivalves that typically grow around hardened structures such as docks, boats and retaining walls. Zebra Mussels filter nutrients out of water, ultimately altering food webs. Zebra Mussels can also result in harmful algal blooms, affect fish spawning habitat and can be a nuisance to recreational activities. To help prevent the spread of Zebra Mussels, carefully inspect and clean your boats, trailers or other recreational equipment before entering a new waterbody to remove any plants, animals and substrate. Drain excess water while on land from motors, live wells, bilges and transom wells. Don't forget to rinse recreational equipment at a high pressure with hot water and allow your equipment to dry on land.

Stewardship Message

You can help prevent the spread of invasive species to and from Muskrat Lake. These species disrupt the ecosystem and can lead to declines in favorite native species, like Lake Trout. Species such as Zebra Mussels, Spiny Waterflea, Round Goby and Common Reed are rapidly spreading throughout Ontario. These species can be spread by dumping bait buckets, trailering your boat from one lake to another before proper cleaning, and planting non-native species or seed mixtures along your shoreline. If you use live bait, be sure to dispose of unused bait and packaging material including soil in the garbage. Water from minnow buckets, bilges and livewells can contain a variety of tiny invaders, and should be dumped on shore. When removing your boat from the water, be sure to dispose of any weeds or mud. If you are going to use the boat in another waterbody, clean it thoroughly and allow it to dry for 2-7 days.

Visit <http://www.invadingspecies.com/stop-the-spread/boaters-anglers/> for detailed cleaning instructions. Shoreline property owners are invited to join the Invading Species Watch Program operated by Ontario Federation of Anglers and Hunters and the Ontario Ministry of Natural Resources and Forestry.

Wildlife Habitat:

The most common type of nearshore habitat on Muskrat Lake was identified as overhanging vegetation, followed by dead standing trees. Wildlife provides us with many enjoyable and beneficial activities from bird

watching and wildlife photography to pest control, seed dispersal, nutrient cycling and pollination, just to name a few. It is important for there to be a rich and diverse range of habitats along the lakeshore in order to ensure a healthy lake environment. Figure 12 summarizes the nearshore habitat.

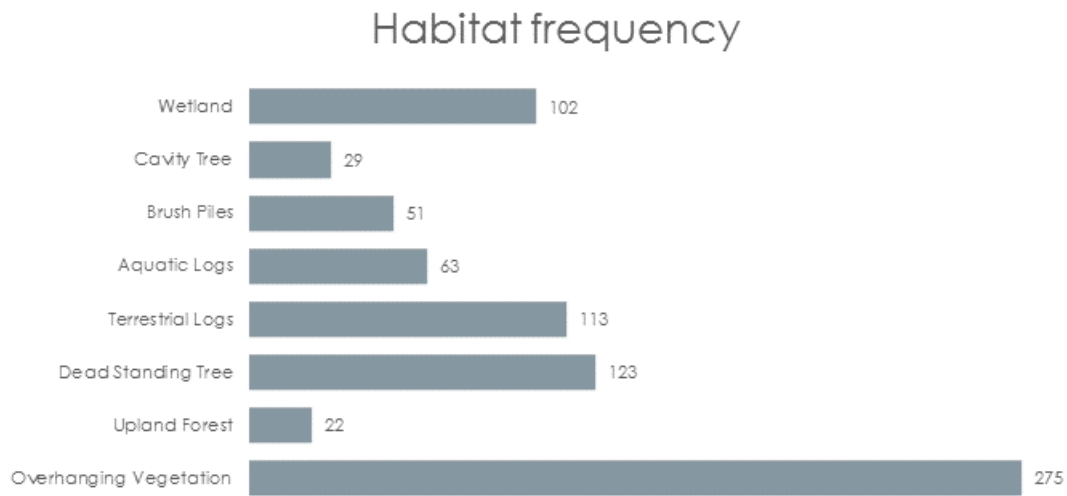


Figure 12 Habitat Present

Stewardship Message

It is important to leave large trees that are dead and dying in place, if it is safe to do so. They provide important habitat for a number of different wildlife species. In Ontario, more than 50 species of birds and mammals depend on cavity trees for nesting, rearing young, roosting, feeding, storing food, escaping predators and hibernating. Fallen logs on land provide habitat for small mammals such as moles, woodpeckers, toads and insects. As the log decomposes, reptiles and amphibians lay their eggs in the moist wood. A decaying log is also great habitat for beetles and ants that burrow under the bark and lay eggs. In the water, logs provide important fish habitat by providing refuge for small fish and spaces for ambush predators such as pike to conceal themselves. By leaving dead and decaying brush and logs in place, you are helping contribute to a healthy and vibrant species community.

Property Slopes

On Muskrat Lake, 92% of properties assessed had flat or moderate slopes. 8% of assessed properties were categorized as cliffs.

Stewardship Message

The slope of shorelines can influence the energy of runoff and its ability to transport sediment. Steeper shorelines often suffer greater erosion problems. While shoreline buffers of healthy trees and shrubs are important on all properties, steeper properties would yield even greater benefit from well-vegetated slopes to reduce the impacts of erosion from runoff.

Lawns

On Muskrat Lake, the number of properties with lawns, either mowed or regenerative, was observed. 28% of properties had lawns that were mowed to the water's edge. When lawn is maintained to the water's edge, natural ground cover and native vegetation are no longer present to slow runoff and allow nutrient filtration.

Nutrients, contaminants, pollutants and other harmful substances can be easily carried into the lake by runoff and can harm water quality and local ecological integrity. Lawn grasses also have short root systems and do not bind the soil well, which can lead to problems with erosion and increased sediment deposition.

Types of lawns around lake

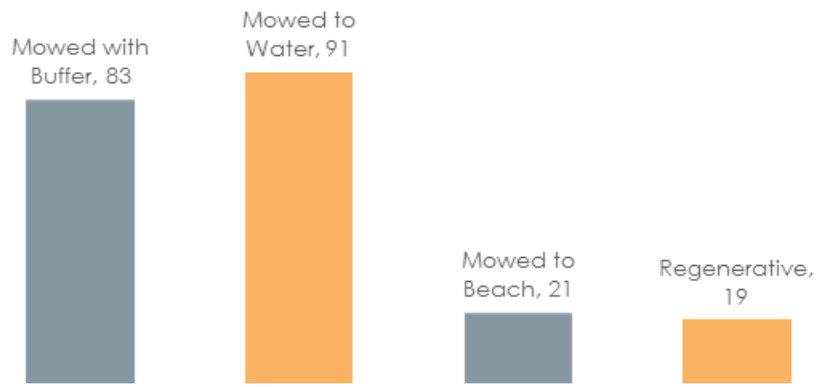


Figure 13 Lawn types

Stewardship Message

In areas close to shore, a lawn is generally not a good choice of ground cover. Half of precipitation runs off a mowed lawn directly into the lake, instead of returning to a natural groundwater source. If shoreline property owners wish to mitigate this, they could consider allowing vegetation to regenerate on its own or by actively planting native trees, shrubs, grasses, or alternative ground cover. The roots of the vegetation will grip the soil which can help prevent erosion. Allowing mowed lawns to regenerate to a more natural state promotes water conservation and protects surface and groundwater resources. Properties with regenerative lawns are encouraged to allow this natural process to continue and to enhance regeneration by planting native trees and shrubs.

Next steps

The shoreline is the convergence zone between the land and water, commonly referred to as the ribbon of life. This area provides tremendous importance not only to humans for recreational purposes, but also to wildlife and the overall health of a lake. These shoreline areas present a unique opportunity for people to help protect the environment and reduce their footprint.

The benefits of natural shorelines are immense. The presence of native plant species help to stabilize soil, reduce erosion and improve water quality. A good underground root network helps to keep soil in place, while a healthy buffer of vegetation prevents topsoil from being exposed and washed away. Shoreline vegetation, such as aquatic plants have the ability to absorb wave energy. This reduces the impact of erosion created by waves, therefore limiting the need for hardened materials such as retaining walls. Natural vegetation along your shoreline can also provide privacy from neighboring properties and can lessen the amount of noise generated by boats and other recreational activities. Trees and other native vegetation improve air quality, lower temperatures and minimize extra energy costs associated with cooling.

Natural buffers also provide critical habitat for wildlife, both aquatic and terrestrial. They improve habitat for fish by shading and cooling water and also provide protective cover for birds, mammals and other wildlife that feed, breed and rear young near water. Allowing a natural buffer to grow can cut down on the time required for yard maintenance and alleviate the financial expense associated with landscaping.

It is important when naturalizing areas to choose only native species. Exotic species which are not native to the area can be extremely invasive, reproduce rapidly and remove wildlife habitat by choking out large natural areas. It is critical to understand how invasive species can affect the overall health of a lake by threatening the livelihood of native fish, plants and animals. The lake community must work together to raise public awareness and help promote responsible stewardship. By practicing prevention and continual education efforts, the community can reduce the spread of additional invasive species.

This report has been created for the lake association and community to utilize as an environmental stewardship guide. Muskrat Lake property owners are encouraged to continue to use their shoreline property report as an additional individualized resource to learn more about how to protect their shoreline properties and reduce their environmental footprint. Following the stewardship actions outlined in this report and working to maintain natural shorelines, residents can unite and make a positive change for the greater good of their lake.