



Otty Lake Shoreline Assessment Summary Report

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Submitted to the Otty Lake Association by Watersheds Canada

Love Your Lake is a program of Watersheds Canada and the Canadian Wildlife Federation and delivered in Eastern Ontario by Watersheds Canada.



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The Love Your Lake program on Otty Lake is supported by the Township of Drummond/North Elmsley, Tay Valley Township, Rideau Valley Conservation Authority and the Otty Lake Association.

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Executive Summary

Healthy shorelines are some of the most biologically rich and ecologically productive places on earth, supporting a diverse range of plants and animals. Healthy shorelines are also critical in filtering pollutants and protecting against erosion, two areas of major concern for shoreline property owners. As shorelines become more developed over time, the role of shoreline property owners to be stewards of their land is increasingly important.

In 2010, the Centre for Sustainable Watersheds (now Watersheds Canada) and the Rideau Valley Conservation Authority partnered with the Otty Lake Association to support the lake association in the development of the Otty Lake Shoreline Handbook. This Handbook provides shoreline residents with significant resource information on how to be good stewards of their shoreline properties.

To further the understanding of the Otty Lake shoreline, in 2012 the Otty Lake Association approached the Centre for Sustainable Watersheds about becoming involved in the Love Your Lake program. The purpose of the Love Your Lake program is to provide shoreline property owners with individualized property reports about the state of their shoreline and recommendations for maintaining a healthy waterfront property. These individualized reports are intended to provide useful information and resources for landowners, raise their awareness and understanding of the importance of shorelines, and encourage them to become engaged lake stewards.

In late June and early July of 2013, 474 properties, totaling 38,643 meters (93.3%) of shoreline, were assessed on Otty Lake. Trained staff from the Centre for Sustainable Watersheds (now Watersheds Canada) assessed each individual property using the Shoreline Survey Datasheet (Appendix A). Land owned by conservation agencies or government, such as the Rideau Valley Conservation Authority, and some Crown Land, were not included in this assessment. Some islands were not assessed because they were not identified on the mapping provided. On Otty Lake, 2,768 metres (6.7%) of shoreline were not assessed.

This report presents the data collected per property into a lake level summary on shoreline classifications, building setbacks, development (including structures and docks), retaining walls, erosion, aquatic cover, aquatic substrate, other shoreline observations, slope, lawns, and buffers. This report is also intended to be a resource for the Otty Lake Association and community to use as a source of baseline shoreline data with which they can compare future shoreline data.

Each shoreline property included in the program was given percentage classifications in four possible classes (natural, regenerative, ornamental, and degraded), rounded to the nearest ten percent, based on shoreline development, retaining walls, and shoreline vegetation. Table 1 (page 7) summarizes these classifications with descriptions and photographs.

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

The classification results show that of the total shoreline assessed on Otty Lake:

- 13,470 meters or 35% were classified as natural;
- 14,894 meters or 39% were classified as regenerative;
- 10,243 meters or 27% were classified as ornamental; and,
- 25 metres or 0.1% were classified as degraded.

Of the properties assessed, 290 properties or 61% were set back less than 30 metres from the shoreline and 129 or 27% were set back 30 metres or more from the shoreline. Ten properties or 2% had buildings that were not visible from the shore and 45 or 10% were vacant properties. There were 5,934 metres or 15% of the total shoreline that was developed with structures and/or docks, and 2,639 meters or 7% with retaining walls. Of the 474 properties assessed, 391 had observable erosion, and nine had observable erosion requiring action. Aquatic cover observed on Otty Lake included emergent, floating, and submergent vegetation, as well as algal blooms. Aquatic substrate observed on Otty Lake included bedrock, boulder, cobble, rubble, gravel, sand, silt, clay, muck, and pelagic substrate.

Other shoreline property observations included development type, buffer landscapes, and invasive species. On Otty Lake, one property or 0.2% of properties assessed was identified as a commercial property, zero properties or 0% of properties assessed were identified as farming properties, six properties or 1.3% of properties assessed were identified as properties for sale, and nine properties or 2% of properties assessed were identified as island properties. 62 properties or 13% of properties assessed had exposed bedrock shorelines; and five properties or 1% of properties assessed had thin soils. Invasive species identified on Otty Lake included Purple Loosestrife, Eurasian Milfoil, and Zebra Mussels. Average slopes were observed: 34 properties or 7% of properties assessed had steep slopes, 253 properties or 53% of properties assessed had moderately steep slopes, and 187 properties or 40% of properties assessed had gentle or flat slopes. Mowed lawns were observed on 247 properties or 52% of properties assessed, and 59 properties or 12% of properties assessed had regenerative lawns.

Properties were assigned naturalization priorities on a scale of one through three, and calculated from their ornamental classification percentages combined with their buffer recommendations. Of the 474 properties on Otty Lake:

- 120 properties or 25.3% of properties assessed were assigned Priority 1;
- 41 properties or 8.6% of properties assessed were assigned Priority 2;
- 80 properties 16.9% of properties assessed were assigned Priority 3;
- 233 properties or 49.2% of properties assessed were not in need of naturalization and not assigned a prioritization.

Positive change over time can be realized by reducing the percentage of properties that are assigned a priority ranking of either 1 or 2. This will not only serve to further help maintain or improve water quality and prevent soil erosion, but also reduce impacts of flooding, provide wildlife with additional food and habitat, and increase recreational opportunities and property values (which have been tied to water quality in other lakes). Property owners can accomplish this by creating or expanding buffer strips (a permanent strip of trees, shrubs, grasses and groundcover at the water's edge) to protect and stabilize the shoreline. By actively planting a buffer strip, property owners can increase the naturalization process with positive impacts for their shoreline and their lake.

Introduction

A healthy shoreline is important to the overall health of a lake, as well as to individual property owners. A healthy shoreline is defined as one that contains a variety of native vegetation and different layers of vegetation, ranging from ground cover and grasses, to wildflowers, herbaceous plants, aquatic plants, shrubs, and trees. It is also important to have structural complexity, such as fallen logs and different sizes of stones and rocks to provide habitat for wildlife. The functions of a healthy shoreline are numerous. Shoreline vegetation helps maintain good water quality by reducing nutrient inputs to the lake, and prevent soil erosion through root stabilization. Well-vegetated shorelines also reduce impacts of flooding by providing natural barriers against moving water. A natural shoreline attracts and provides wildlife with food and habitat, which creates recreational opportunities (i.e., fishing). An abundance of wildlife living within an area is a good indicator of a healthy shoreline.

Alternatively, less healthy shorelines experience problems, such as shoreline erosion, and negatively impact the lake by contributing to poor water quality, algal blooms and excessive weed growth. Less healthy shorelines are typically observed to have 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, that have replaced natural vegetation.

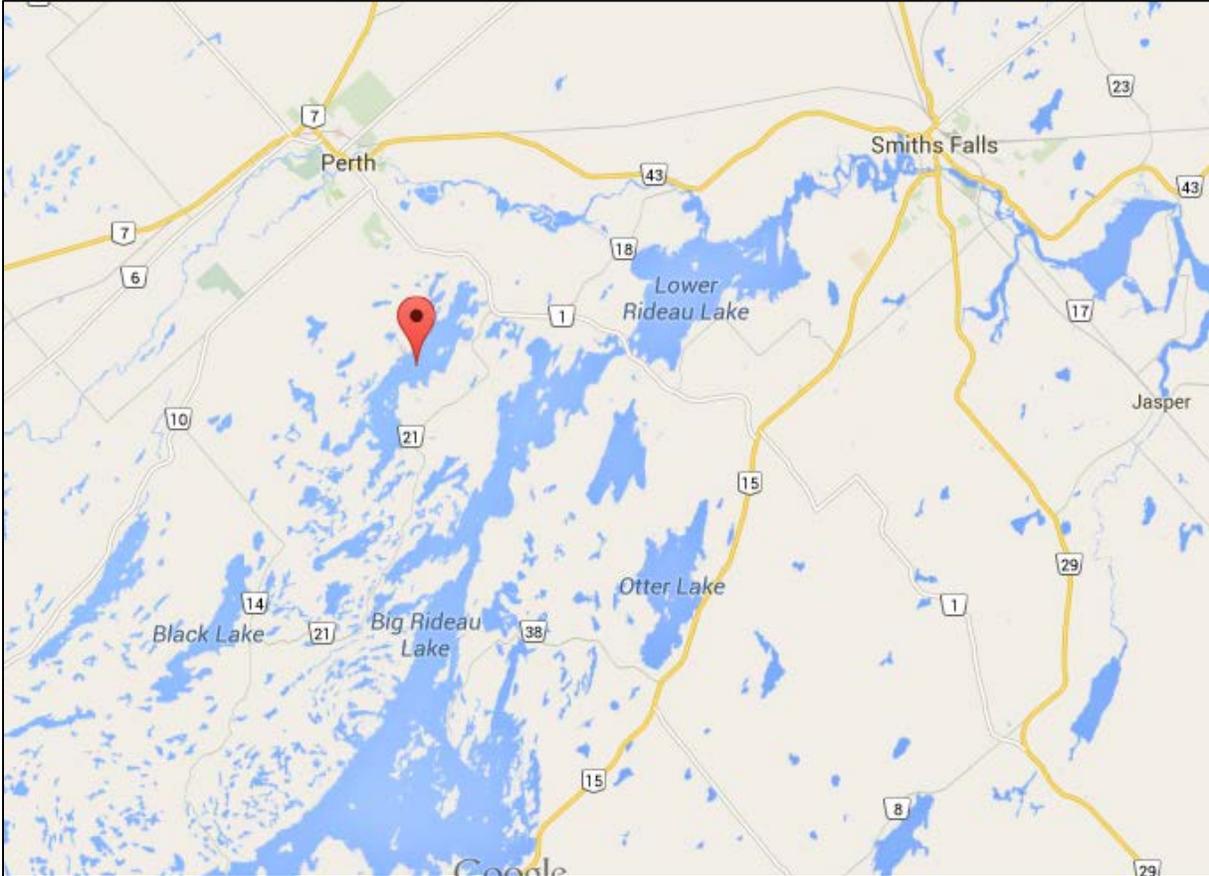
Watersheds Canada, the Canadian Wildlife Federation, and regional partners (including Lakeland Alliance, Bonnechere River Watershed Project, Muskoka Watershed Council and City of Greater Sudbury) developed the Love Your Lake program in 2012 to promote shoreline stewardship and help landowners protect and restore their shorelines, thereby improving the health of their lake.

The Love Your Lake program is a modified and updated version of a scientific protocol developed by MAPLE (Mutual Association for the Protection of Lake Environments) in the 1980s. Watersheds Canada and other organizations in eastern Ontario had been using a modified shoreline assessment protocol for over ten years to assess thirteen lakes in Eastern Ontario. In 2012 Watersheds Canada partnered with the CWF to officially brand and broaden the program into the Love Your Lake program today.

Locally trained staff assess the health of shoreline properties on a lake using the standardized Love Your Lake Shoreline Assessment Protocol and Love Your Lake Shoreline Survey Datasheet. This data is then used to produce a personalized, confidential report for each landowner that accurately 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. Landowners generally have a common interest to manage their properties in ways that maintain property values and lake quality and this program provides the information and support to do so.

In the summer of 2013, trained staff of the Centre for Sustainable Watersheds (now Watersheds Canada) used the Love Your Lake Shoreline Survey Datasheet (Appendix A) to assess Otty Lake, which is located within both the Township of Drummond/North Elmsley and the Tay Valley Township. Otty Lake is a landlocked lake located just south of Perth and Smiths Falls, as shown in Map 1.

This report is a further effort to provide the Otty Lake Association with a summary of the information collected by the Love Your Lake assessment effort. This report presents the data collected per property into a lake level summary on shoreline classifications, building setbacks, development (including structures and docks), retaining walls, erosion, aquatic cover, aquatic substrate, other shoreline observations, slope, lawns, and buffers. This report is also intended to be a resource for the Otty Lake Association and community to use as a source of baseline shoreline data with which they can compare future shoreline data. This report can also be used to encourage stewardship activities for more natural shorelines.



Map1. Google Maps image showing the location of Otty Lake relative to Perth and Smiths Falls.

Methodology

A total of 474 shoreline properties were assessed on Otty Lake by staff trained in the Love Your Lake Shoreline Assessment Protocol. A datasheet was completed for each property assessed. This data was entered into a database to generate an individualized property report for the property landowner. For this lake level summary report, the data in the database was exported to a spreadsheet for analysis.

Each shoreline property included in the program was given percentage classifications in four possible classes (natural, regenerative, ornamental, and degraded), rounded to the nearest ten percent, based on shoreline development, retaining walls, and shoreline vegetation. Table 1 below summarizes these classes with descriptions and photographs.

Table 1. Shoreline Class Descriptions and Photographs

Class & Description	Photograph Example*
<p>Natural – A healthy buffer of vegetation and/or a natural shoreline of sand or exposed rock that is undisturbed and undeveloped.</p>	
<p>Regenerative – Natural vegetation has been removed in the past, but is in the process of growing back towards a natural state.</p>	
<p>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.</p>	
<p>Degraded – Natural vegetation has been lost; soil erosion, undercutting of the bank, and/or exposed roots of shrubs and trees are significant.</p>	
<p>*Note: These photographs are examples of shoreline classes, not representing any specific shoreline property on Otty Lake. There can be a range of variation in the classifications depending on the type of shoreline.</p>	

Shoreline lengths for each property were obtained from parcel data provided by the townships. For properties without this data, lengths were estimated using Global Imaging Systems (GIS) software. Shoreline lengths for each property were multiplied by each of the class percentages to yield an estimated total length of shoreline in each class for each property. These lengths were then summed and divided by the total length of assessed shoreline to yield the total lake level length of assessed shoreline in each class. Likewise, shoreline development percentages and shoreline retaining wall percentages were also multiplied by the shoreline lengths to yield an estimated total length of development and retaining walls for each property. These lengths were then summed and divided by the total length of assessed shoreline to yield the total lake level length of shoreline development and retaining walls.

The following information was also summarized for the entire lake, by counting the number of properties and calculating the resulting percentages of properties with the presence of each observable shoreline feature:

- Number and percentage of properties assessed with various building setback ranges (including: setback not visible, less than or equal to five metres, five to 10 metres, 10 to 30 metres, and greater than or equal to 30 metres);
- Number and percentage of properties assessed with shoreline development, by each structure type (including: decks, boat launches, boat ramps, boat houses, boat lifts, boat slips, buildings, other structures, stairs and manmade beaches);
- Number and percentage of properties assessed with docks, by each dock type (including: cantilever, floating, post non-permanent, post-permanent, crib-wood, crib-steel, solid, raft, combo - post/floating, combo - post/solid, combo - solid/floating, and/or combo - other);
- Number and percentage of properties assessed with shoreline retaining walls, by each retaining wall type (including: wood, gabion basket, armour stone, concrete, steel, riprap, loose rock, and/or other retaining wall materials) and other retaining wall observations (including: wall failing, railroad ties, treated wood, other structure acting as a retaining wall, and upland retaining wall);
- Number and percentage of properties assessed with presence of erosion, by each erosion type (including: surface, mass movement/slumping, and undercut bank);
- Number and percentage of properties assessed with presence of erosion requiring action, by each erosion type (including: surface, mass movement/slumping, and undercut bank). This erosion is considered significant and could potentially contribute to degradation of the shoreline;
- Number and percentage of properties assessed with presence of aquatic cover along their shoreline (including: emergent, floating, and submergent vegetation, no cover, algal blooms, and evidence of aquatic vegetation removal);
- Number and percentage of properties assessed with presence of observable aquatic substrate, by each substrate type (including: bedrock, boulder, cobble, rubble, gravel, sand, silt, clay, muck/organic, hardpan, pelagic). If no substrate is observable, field staff indicate that no data was recorded;
- Number and percentage of properties assessed with other observations (including development observations [commercial property, farm, for sale, island], landscape observations [cliff, bedrock, thin soil]; and presence of invasive species);
- Number and percentage of properties assessed with various average slopes (including, from most steep to least steep: greater than 1:1, 1:1, 2:1, and less than or equal to 3:1); and,
- Number and percentage of properties assessed with lawn presence, by each lawn type (including: mowed lawn, regenerative lawn, and pine needles).

*It should be noted that the total quantities and percentages calculated for various parameters in the charts and graphs may not add up to the total or 100% because often a property will either have no data or have multiple parameters on a single property.

In addition, naturalization priorities are assigned to properties using a combination of the shoreline classification data (namely the ornamental percentages) and the buffer recommendations. There are three possible priorities that each property is assigned: Please see page 22 for further information on naturalization priorities.

- Priority 1: The best candidates for naturalization efforts. These properties have more than 50% of their shoreline classified as ornamental. And, these properties have at least 30 metres of space between the water's edge and their main building (house/cottage). These properties are recommended to either create a buffer or expand their current buffer.
 - Landowners of these properties are greatly encouraged to naturalize their shorelines, because their efforts would make the most overall impact to the health of their shoreline and the lake. They have an opportunity to plant a healthy buffer of native vegetation that could be 30 metres wide. When designing a planting plan, they can still maintain room for access to the water (via raised wooden staircases or covered, curved pathways). Lower growing vegetation can be chosen to maintain views to the water, and taller vegetation can be trimmed when it grows to substantial height.
- Priority 2: The second best candidates for naturalization efforts. These properties have more than 25% of their shoreline classified as ornamental. However, some of these properties have less than 30 metres of space between the water's edge and their main building (house/cottage), which could make planting more difficult or less substantial. These properties are also recommended to either create a buffer or expand their current buffer.
 - Landowners of these properties are still encouraged to plant vegetation where they can; i.e., around decks, docks, boathouses, stairs, and pathways. Although 30 metres of space between the water's edge and the main building may not be available, increasing the amount of native vegetation within the available room would still contribute to a healthier shoreline and lake.
- Priority 3: These are the third best candidates for naturalization efforts. These properties are already mostly natural or regenerative, and less than 25% ornamental. However, some of these properties have less than 30 metres of space between the water's edge and their main building (house/cottage), which could make planting more difficult or less substantial.
 - If landowners of these properties wish to enhance their native vegetation to even further reduce their ornamental classification, their efforts would still contribute to an even healthier shoreline and lake.

Results

Shoreline Classifications

Of the 474 properties assessed on Otty Lake, the overall percentages and estimated lengths per shoreline class were:

- 13,470 meters or 35% natural;
- 14,894 meters or 39% regenerative;
- 10,243 meters or 27% ornamental; and,
- 25 meters or 0.1% degraded.

Figure 1 shows the percentage of the entire assessed shoreline in each classification. The overall estimated length and percentage of shoreline development on Otty Lake is 5,934 meters or 15%. The overall estimated length and percentage of retaining walls on Otty Lake is 2,639 meters or 7%. Table 2 summarizes these results.

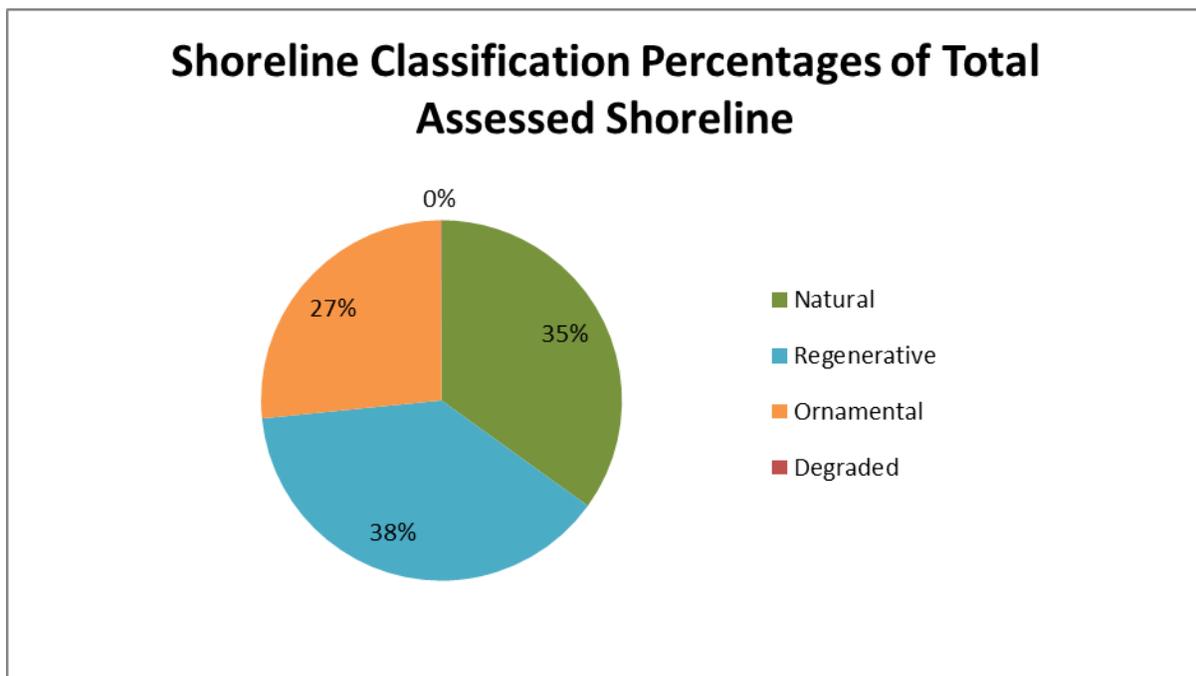


Figure 1. Total classification percentages of all assessed shoreline properties on Otty Lake.

Assessment Parameter	m	%
Natural Class	13,470	35
Regenerative Class	14,894	39
Ornamental Class	10,243	27
Degraded Class	25	0.1
Shoreline Development	5,934	15
Retaining Walls	2,639	7
Total Assessed Shoreline	38,643	94

Table 2. Shoreline classification, development, and retaining wall lengths of all shoreline properties assessed on Otty Lake.

Stewardship Message

Generally, 25% of a property's shoreline can be developed for access to the lake and for recreational space. The remaining 75% should be left in a natural state, or be regenerating back to a natural state to benefit the lake and wildlife. However, depending on the size of a property's waterfront, this percentage may not be appropriate. For example, 25% of a shoreline property with 25 metres of waterfront would mean five metres of the length of the waterfront could be developed for access to the lake or for recreational room. Whereas 25% of a shoreline property with 1,000 meters of waterfront would mean 25 metres could be developed for access to the lake or for recreational room. Therefore, the ultimate suggestion is to manage properties as naturally as possible, whereby development should be considerate of the space required for access to the lake or for recreational room, regardless of the overall length of waterfront.

On Otty Lake, the majority of the shoreline (39%) is classified as regenerative, followed by 35% being natural and 27% being ornamental. It is recommended that landowners engage in naturalization projects to further decrease the ornamental percentage and increase the regenerative and natural percentages.

This finding presents an opportunity for residents of Otty Lake to enhance the overall quality of the lake by maintaining more natural shorelines. To restore shorelines to more natural states, landowners are encouraged to take action! The following resources are locally available for Otty Lake shoreline property owners:

- Watersheds Canada offers a shoreline naturalization program, *The Natural Edge*, which offers landowners the opportunity to have a free site visit, and participate in having their shoreline planted with native trees and shrubs for only 25% cost to them. For more information, visit www.watersheds.ca.

Rideau Valley Conservation Authority offers a shoreline naturalization program with a complimentary site visit, subsidized plant costs, and project planning assistance. For more information, visit www.rvca/programs/shoreline_naturalization_program.

Building Setbacks

On Otty Lake, the number of properties with various building setback ranges were observed and recorded. As shown in Figure 2, the following numbers and percentages of properties assessed on Otty Lake had the following building setbacks:

- 10 properties or 2.1% of properties assessed had building setbacks that were not visible;
- 30 properties or 6.3% of properties assessed were less than or equal to five metres from the shoreline;

- 64 properties or 13.5% of properties assessed were between five and 10 metres from the shoreline;
- 196 properties or 41.4% of properties assessed were between 10 and 30 metres from the shoreline; and,
- 129 properties or 27.2% of properties assessed were greater than or equal to 30 metres from the shoreline.
- There were 45 properties or 9.5% of properties assessed on Otty Lake without a main building.

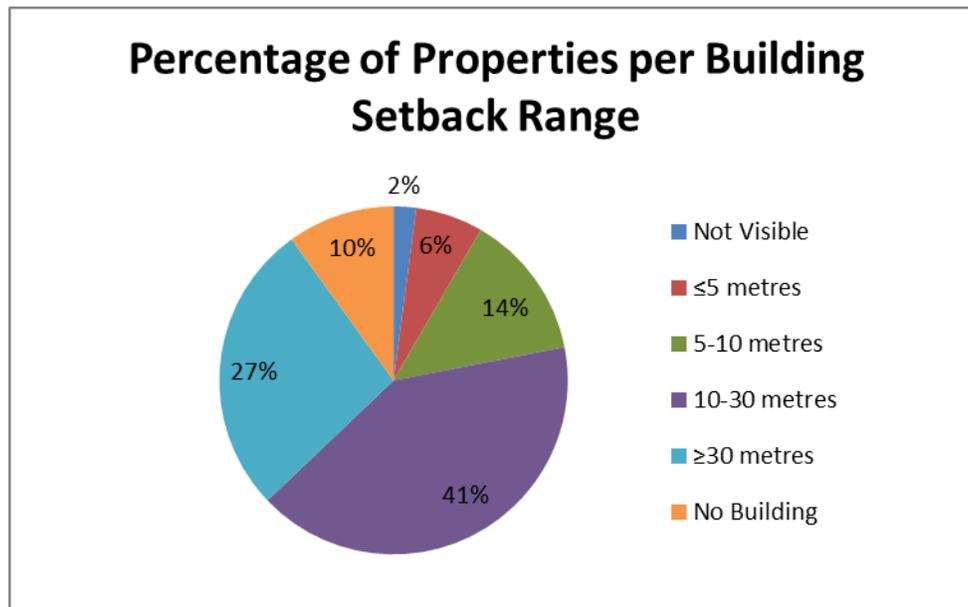


Figure 2. Main building setback ranges of all shoreline properties assessed on Otty Lake.

Stewardship Message

Building setbacks for new shoreline developments in Ontario should be at least 30 metres from the high water mark; however, older cottage buildings may have been constructed closer to the high water mark. On Otty Lake, over 60% of the properties assessed were observed to be closer than 30 metres to the shoreline. These tend to be cottages or cottages re-developed into homes originally built when cottage developments were permitted closer to the water's edge. The primary problem associated with near-shore building setbacks is the insufficient area to buffer or filter contaminated runoff and wastewater from the main dwelling. While moving these buildings further back from the shoreline is not a feasible nor realistic option, naturalizing the shorelines of these properties would help address this issue.

Naturalized shorelines on properties with near-shore building setbacks would help by reducing harmful compounds from leaching into Otty Lake, which could 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 eaves troughs with downspouts directed at natural or stone catch basins or rain barrels, as well as ensuring they have an adequate septic system or alternative sewage treatment system to process wastewater before it enters the lake.

Shoreline Development

On Otty Lake, the number of properties with shoreline development features were observed and recorded. Shoreline development includes the presence of man-made structures on the land or in the water within the first three metres of the shoreline.

The overall estimated length and percentage of shoreline development on Otty Lake is 5,934 meters or 15% of the total shoreline assessed. Figure 3 shows the ranges of shoreline development of the properties assessed on Otty Lake. As shown in Figures 4 and 5, the following numbers and percentages of properties assessed on Otty Lake had shoreline development by each structure type and each dock type:

- Structures:
 - 167 properties or 35% of properties assessed had decks;
 - 14 properties or 3% of properties assessed had boat launches;
 - 45 properties or 9% of properties assessed had boat ramps;
 - 31 properties or 6% of properties assessed had boat houses;
 - 63 properties or 13% of properties assessed had boat lifts;
 - 3 properties or 1% of properties assessed had boat slips;
 - 25 properties or 5% of properties assessed had building(s) that were not the main dwelling;
 - 30 properties or 6% of properties assessed had other structures;
 - 254 properties or 54% of properties assessed had stairs;
 - 10 properties or 2% of properties assessed had manmade beaches;

- Docks:
 - 4 properties or 1% of properties assessed had cantilever docks;
 - 57 properties or 12% of properties assessed had floating docks;
 - 297 properties or 63% of properties assessed had post non-permanent docks;
 - 50 properties or 10% of properties assessed had post permanent docks;
 - 11 properties or 2% of properties assessed had crib-wood docks;
 - 0 properties or 0% of properties assessed had crib-steel docks;
 - 9 properties or 2% of properties assessed had solid docks;
 - 53 properties or 11% of properties assessed had rafts;
 - 8 properties or 2% of properties assessed had combo – post/floating docks;
 - 6 properties or 1% of properties assessed had combo – post/solid docks;
 - 1 properties or 0.2% of properties assessed had combo – solid/floating docks;
 - 0 properties or 0% of properties assessed had combo – other docks
 - 2 properties or 0.4% of properties assessed had permanent dock systems; and,
 - 8 properties or 1.7% of properties assessed had non-permanent dock systems.

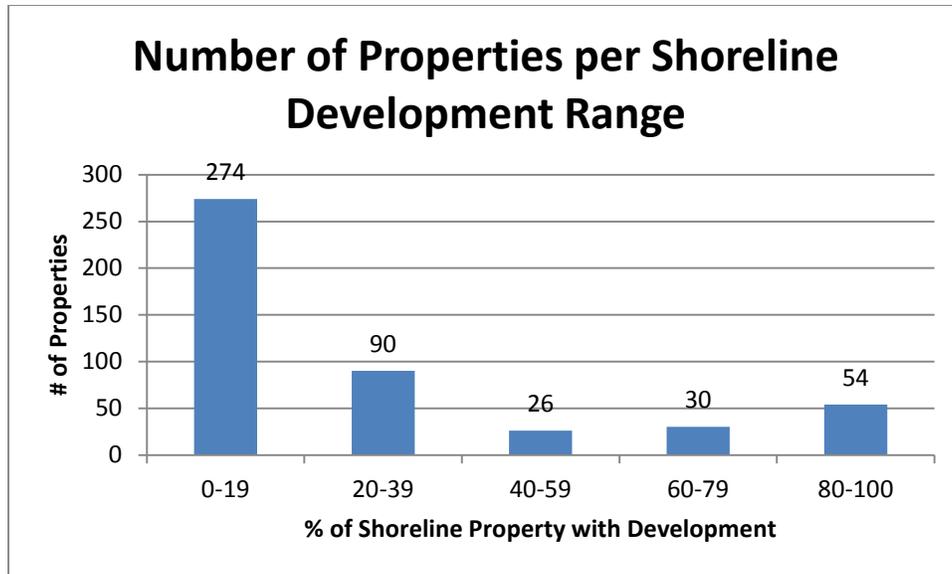


Figure 3. Shoreline development ranges per property of all shoreline properties assessed on Otty Lake.

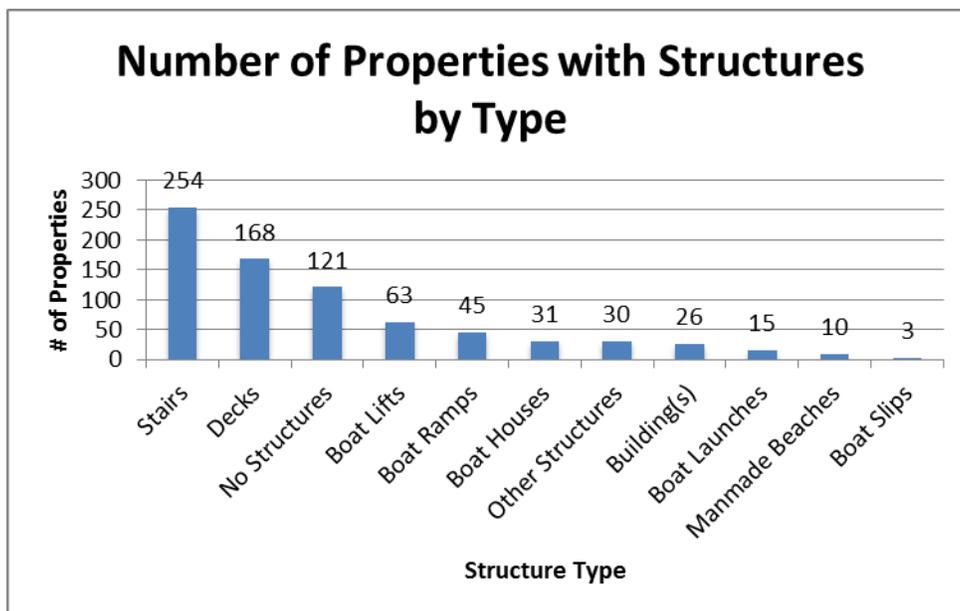


Figure 4. Shoreline development by structure type of all shoreline properties assessed on Otty Lake.

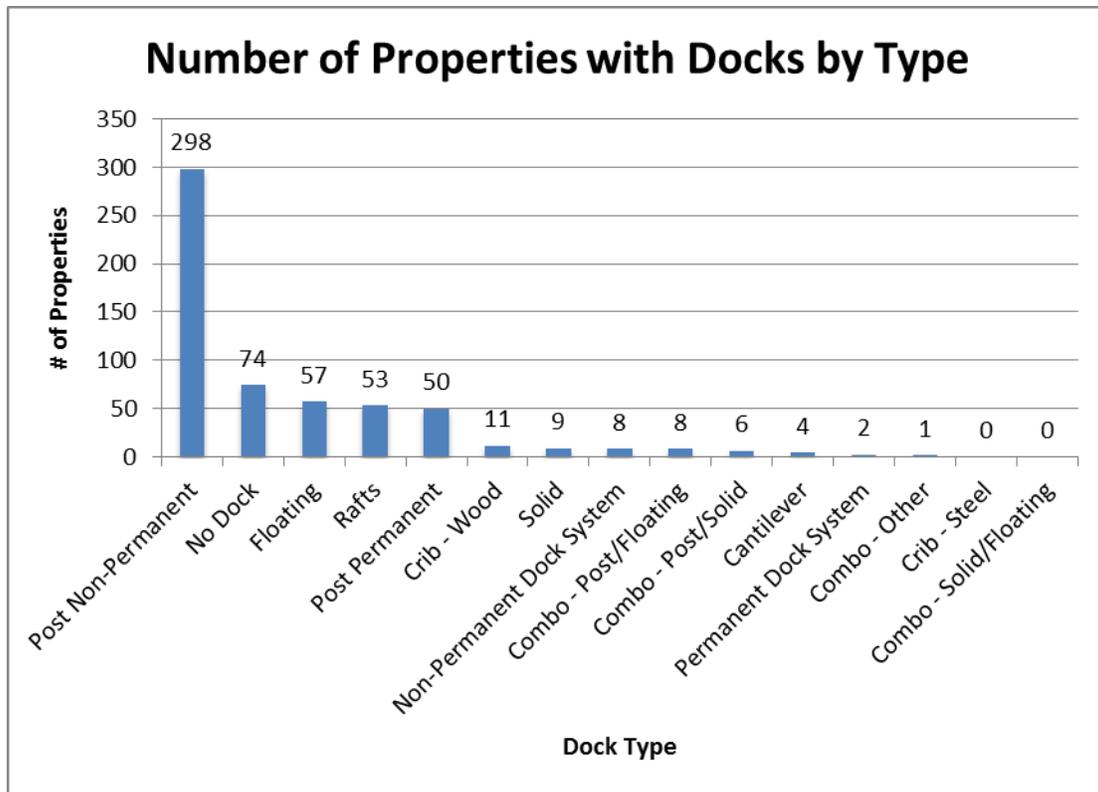


Figure 5. Types of docks of all shoreline properties assessed on Otty Lake.

Stewardship Message

The majority of properties on Otty Lake, 274 properties or 57% of properties assessed, have less than 20% of development along their shorelines, which is great. Structures observed on Otty Lake included mostly stairs and decks. Landowners are encouraged to ensure native vegetation is planted or maintained along the sides of these structures, with the main benefit of preventing or reducing erosion.

Shoreline development structures can be harmful to local plants, contribute to erosion, and can restrict wildlife access to and from land and water. Although some of these types of structures can have negative environmental impacts because they cover habitat, this can be mitigated by allowing vegetation to grow around the decks, boathouses, sheds, stairs, or other man-made structures.

Small floating or post docks are the best choice of docks as they have minimal contact with the lake bottom, and sit on or out of the water, which reduces the impact they have on the surrounding environment. In the future, if shoreline property owners need to replace their old or failing permanent post, solid, or crib docks, they could consider a non-permanent post dock or floating dock, thereby limiting impacts to fish habitat and ensuring the natural flow of water remains unrestricted.

Retaining Walls

On Otty Lake, the number of properties with retaining walls was counted and the percentage of retaining wall development was calculated for each shoreline property and summarized below. Retaining walls, originally built to protect against erosion, are a common feature on many lakes.

The overall estimated length and percentage of retaining walls on Otty Lake is 2,639metres or 7% of the total assessed shoreline. As shown in Figure 6, the following numbers and percentages of properties on Otty Lake had retaining walls, by each retaining wall type:

- 15 properties or 3% of properties assessed had wood retaining walls;
- 3 properties or 0.6% of properties assessed had gabion basket retaining walls;
- 7 properties or 2% of properties assessed had armour stone retaining walls;
- 46 properties or 10% of properties assessed had concrete retaining walls;
- 0 properties or 0% of properties assessed had steel retaining walls;
- 4 properties or 0.8% of properties assessed had riprap retaining walls;
- 98 properties or 21% of properties assessed had loose rock retaining walls;
- 18 properties or 4% of properties assessed had other types of retaining walls; and,
- 329 properties or 69% of properties assessed were without retaining walls.

As shown in Figure 6 as well, the following numbers and percentages of properties on Otty Lake had retaining walls with additional observations:

- 6 properties or 1.3% of properties assessed had a failing retaining wall;
- 15 properties or 3% of properties assessed had railroad ties used as a wood retaining wall;
- 2 properties or 0.4% of properties assessed had treated wood used as a wood retaining wall;
- 9 properties or 2% of properties assessed had another structure (deck/dock) acting as a retaining wall; and,
- 96 properties or 20% of properties assessed had an upland retaining wall not on the immediate shoreline.

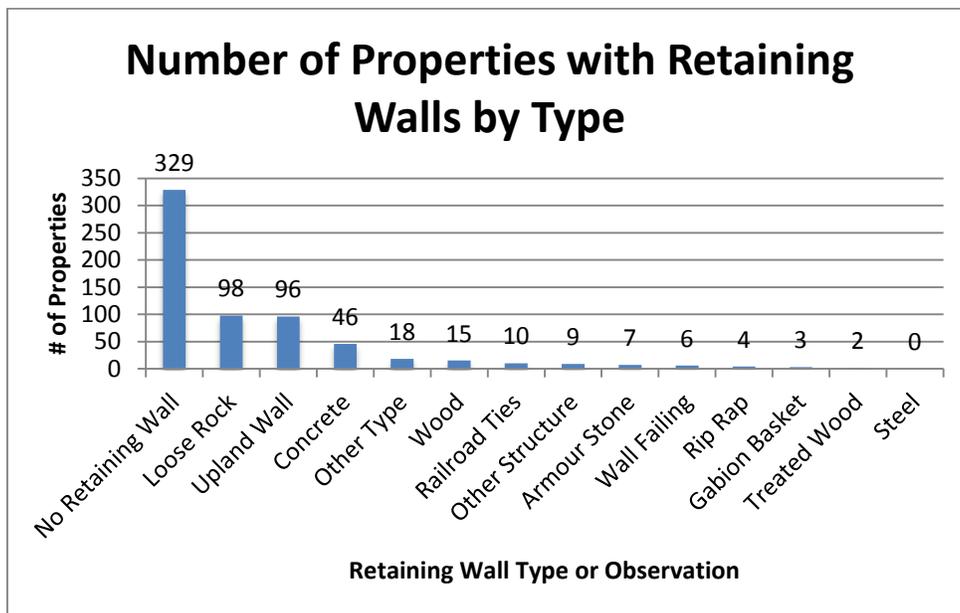


Figure 6. Retaining wall types and observations of all assessed properties on Otty Lake.

Stewardship Message

Most properties on Otty Lake, 329 properties or 69% of properties assessed, do not have a retaining wall. Of the retaining walls that are present along properties on Otty Lake, the most common choice was loose rock (98 properties or 21% of properties assessed), followed by concrete (46 properties or 9.7% of properties assessed).

While retaining walls were a common choice in the past, we now know about their impact to the natural environment. Waves and wakes are reflected back from flat, hard surfaces with the same vigour as they strike the wall. This causes 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 local wildlife from reaching the water. Although some retaining walls (like rip rap) have fewer impacts than other retaining walls (like armour stone), shoreline property owners could consider alternative erosion control methods (like planting vegetated buffers or shoreline bioengineering) if they ever wish to replace their current, old, or failing retaining wall. In the meantime, maintaining vegetation around the wall and allowing new vegetation to establish and grow, will help reduce runoff and erosion.

Erosion

On Otty Lake, the number of properties with observed erosion were counted and summarized into Table 3 below. Erosion can contribute to shoreline destabilization, reduce the water quality of the lake, and therefore indirectly reduce property value and recreation opportunities.

As shown in Table 3, 393 properties or 82.9% of properties assessed on Otty Lake had some form of observable erosion (including surface, mass movement/slumping, or undercut bank); and, nine properties or 1.9% of properties assessed had significant erosion with recommended action. Each property can have more than one type of erosion. Figure 7 shows the percentage of each type of erosion present on assessed shoreline properties on Otty Lake.

Category	# Properties	% of Properties
Erosion presence		
Surface	289	61
Mass movement/slumping	0	0
Undercut bank	207	43.7
Erosion requiring action		
Surface	7	1.5
Mass movement/slumping	0	0
Undercut bank	2	0.4
No erosion	81	17.1

Table 3. Erosion observed by type on shoreline properties assessed on Otty Lake.

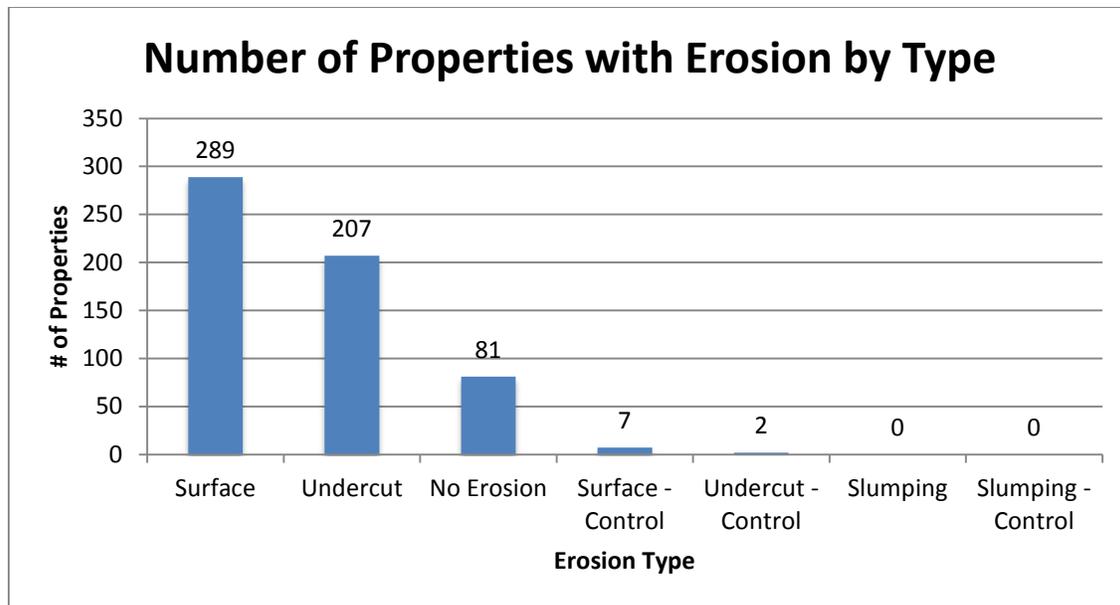


Figure 7. Erosion presence observed on shoreline properties assessed on Otty Lake.

Stewardship Message

While erosion is a naturally occurring process, the removal or lack of natural vegetation can contribute to shoreline destabilization, reduce the water quality of the lake, and therefore indirectly reduce property value and recreation opportunities. To mitigate this, shoreline property owners could consider re-naturalizing bare areas by establishing native vegetation. Surface erosion was identified on 289 properties or 61% of properties assessed, and undercut erosion along the water's edge was identified on 207 properties or 44% of properties assessed. By simply allowing vegetation to regenerate on its own, or by actively seeding or planting native trees, shrubs, grasses, or groundcover, landowners will improve the state of their shoreline. The roots of the vegetation will grip the soil, while the leaves will reduce the velocity of surface water flow and rain fall, thereby reducing further erosion.

Aquatic Cover

On Otty Lake, the number of properties with aquatic cover were counted and summarized. The presence and abundance of aquatic cover can vary throughout the year. Each assessed property could have one or more types of aquatic cover. The following numbers and percentages of properties on Otty Lake had aquatic cover by aquatic cover type observed along their shoreline during the time of the assessments:

- 158 properties or 33.3% of properties assessed had emergent aquatic cover;
- 226 properties or 47.7% of properties assessed had floating aquatic cover;
- 472 properties or 99.6% of properties assessed had submergent aquatic cover;
- 0 properties or 0% of properties assessed had no aquatic cover;
- 59 properties or 12.4% of properties assessed had algal blooms; and,
- 1 property or 0.2% of properties assessed had evidence of aquatic cover removal.

Stewardship Message

Aquatic vegetation can provide important habitat for fish and other aquatic wildlife; however, an overabundance of it may be an indicator of high nutrient levels entering the lake. By having a well-vegetated shoreline to intercept and filter excess nutrients and fertilizers from runoff before entering the lake, landowners may be able to influence the amount of excess aquatic cover growing along their shorelines.

Aquatic cover on Otty Lake does not represent a concern at this point, as there seems to be normal and healthy amounts of emergent, submergent, and floating vegetation. However, algal blooms were identified on Otty Lake during the time of the assessments, which indicates an increased rate of nutrient input into the lake. Shoreline property owners on Otty Lake are encouraged to continue to monitor the abundance of aquatic cover along their shorelines, as it is an important indicator for nutrient pollution and also provides important biological services such as serving as a habitat and food source for native organisms.

Aquatic Substrate

On Otty Lake, the number of properties with aquatic substrate types were counted and summarized. The following numbers and percentages of properties on Otty Lake had aquatic substrate by aquatic substrate type:

- 194 properties or 40.9% of properties assessed had exposed bedrock;
- 46 properties or 9.7% of properties assessed had boulders (rocks greater than 25 centimetres in diameter);
- 50 properties or 10.5% of properties assessed had cobble (rocks 17-25 centimetres in diameter);
- 48 properties or 10.1% of properties assessed had rubble (rocks 6.4 to 16.9 centimetres in diameter);
- 77 properties or 16.2% of properties assessed had gravel (rocks or pebbles 0.2 to 6.39 centimetres in diameter);
- 74 properties or 15.6% of properties assessed had sand (small, gritty rock particles 0.05 to 0.19 centimetres in diameter);
- 77 properties or 16.2% of properties assessed had silt (fine, powdery rock particles less than 0.05 centimetres in diameter);
- 56 properties or 11.8% of properties assessed had clay (fine, greasy rock particles about 0.01 centimetres in diameter);
- 44 properties or 9.3% of properties assessed had muck/organic (black earth or mud and/or decaying organic material);
- 0 properties or 0% of properties assessed had hardpan (clay-rich soil cemented or compacted into impervious, hardened layer) ;
- 161 properties or 34% of properties assessed had no visible substrate due to pelagic zone (sudden drop in depth); and,
- 163 properties or 34.4% of properties assessed had no visible data recorded.

Stewardship Message

Aquatic substrate can be important habitat for fish and other aquatic wildlife, and it is useful to document this feature to better inform future restoration projects on the lake. Otty Lake was found to have a good variety of aquatic substrate throughout the lake, which is ideal for supporting aquatic biodiversity. For example, rubble and cobble provide great habitat for crayfish and spawning grounds for various species of fish.

Other Observations

On Otty Lake, additional property observations were recorded and summarized. These observations may have changed since the time of the survey. Additional observations were recorded about: land development, including commercial properties, farming properties, properties for sale, and island properties; landscape types for buffers, including cliffs, bedrock, and thin soils; and invasive species.

The following numbers and percentages of properties on Otty Lake had additional shoreline property observations:

- Development:
 - 1 properties or 0.2% of properties assessed were identified as commercial properties;
 - 0 properties or 0% of properties assessed were identified as farming properties;
 - 6 properties or 1.3% of properties assessed were identified as for sale; and,
 - 9 properties or 1.9% of properties assessed were identified as island properties.

- Landscape types for buffers:
 - 0 properties or 0% of properties assessed had cliff faces;
 - 62 properties or 13.1% of properties assessed had bedrock; and,
 - 5 properties or 1.1% of properties assessed had thin soils.

Invasive species observed on Otty Lake included Eurasian Milfoil, Purple Loosestrife, and Zebra Mussels.

Stewardship Message

Shorelines with exposed bedrock were observed on 62 properties or 13% of properties assessed on Otty Lake. These shorelines are among the hardest to naturalize with trees and shrubs, often due to thin or absent soils. However, shoreline property owners are encouraged to leave the bedrock in a natural state to encourage the growth of lichen and mosses. Soils and seeds are often blown into and trapped in crevasses or depressions within the bedrock, and plants with short root systems requiring low amounts of water can take root and thrive in these environments.

The lake community usually already knows about the presence of invasive species in their lake before the shoreline assessments take place. Invasive species travel and will spread throughout a waterway. They are difficult to control once already present. On Otty Lake, Eurasian Milfoil, Purple Loosestrife, and Zebra Mussels were observed. It is important to help prevent the spread of invasive species to other water bodies by properly washing and drying all boats and before travelling to another water body.

Slopes

On Otty Lake, each shoreline property was observed for its average slope and summarized below. The steepest slope is greater than or equal to 1:1, meaning the steepness of the land for every metre inland from the shoreline equals every metre upland from the surface of the water; or, the minimum incline of the slope is at least 45 degrees. The least steep slope is less than or equal to 3:1, meaning the steepness of the land for every three metres inland from the shoreline is equal to one metre upland from the surface of the water. Slopes indicated as greater than or equal to 3:1 include “flat” properties.

The following numbers and percentages of properties on Otty Lake had various average slopes:

- 34 properties or 7% of properties assessed had steep slopes, 1:1;

- 253 properties or 53% of properties assessed had moderately steep slopes, 2:1; and
- 187 properties or 39% of properties assessed had gentle to flat slopes, $\leq 3:1$.

Stewardship Message

On Otty Lake, the majority of properties, 440 properties or 92.8% of properties assessed, had flat, gentle, or moderate slopes. The slope of shorelines influences the gravitational pull of runoff downslope into the water. Steeper shorelines often suffer with more 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 Otty Lake, the number of properties with lawns, either mowed or regenerative, were counted and summarized below.

As shown in Figure 8, the following numbers and percentages of properties on Otty Lake had lawns, by lawn type:

- 247 properties or 52.1% of properties assessed had mowed lawns;
- 59 properties or 12.4% of properties assessed had regenerative lawns;
- 117 properties or 24.7% of properties assessed had pine needles; and,
- 227 properties or 47.9% of properties assessed had no lawn.

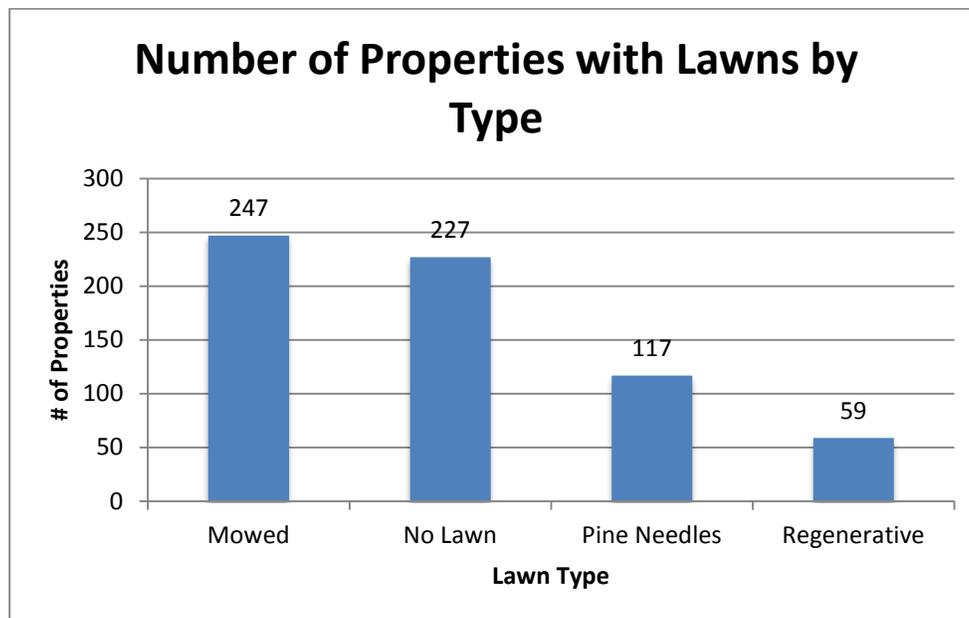


Figure 8. Presence of lawns observed on shoreline properties assessed on Otty Lake.

Stewardship Message

In areas close to the shoreline, a lawn is generally not a good choice of ground cover because over 55% of precipitation runs off mowed grass directly into the lake, instead of returning to the underground water cycle by filtering through the soil. On Otty Lake, 249 properties or 52% of properties assessed were observed to have a

mowed lawn. Natural ground cover and native vegetation, in comparison, slow the runoff and allow filtration, removing many contaminants, pollutants, nutrients, fertilizers and other substances. These substances can be carried into the lake by runoff and can harm water quality and upset the natural ecosystem. Lawn grasses also have short root systems and therefore do not bind the soil well, which can lead to problems with erosion.

If shoreline property owners wish to mitigate this, they could consider naturalizing this area by simply 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 further 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 landowners are encouraged to enhance regeneration by planting native shrubs and trees.

Naturalization Priorities

The ornamental classification percentages and the buffer status/recommended restoration opportunity data has been analyzed to produce a naturalization priority scale with values one through three. Each value on the scale has different criteria and properties that meet the criteria were then summarized into a table. Properties can decrease their priority ranking by increasing the amount of natural vegetation along their shoreline. This will both decrease their ornamental classification percentage and contribute to a healthier buffer.

Naturalization priorities are assigned to properties using a combination of the shoreline classification data (namely the ornamental percentages) and the buffer recommendations. There are three possible priorities that each property is assigned as defined on page 9.

Properties were assigned naturalization priorities on a scale of one through three, and calculated from their ornamental classification percentages combined with their buffer recommendations. Of the 474 properties on Otty Lake:

Of the 474 properties on Otty Lake, 120 properties or 25.3% of properties assessed were assigned Priority 1, 41 properties or 8.6% of properties assessed were assigned Priority 2, and 233 properties or 49.2% of properties assessed were assigned Priority 3. Table 4 below summarizes the number and percentages properties per priority ranking. Figure 9 shows the percentages of properties in each priority ranking.

Naturalization Priority	# Properties	% of Properties
Priority #1	120	25.3
Priority #2	41	8.6
Priority #3	233	49.2

Table 4. Priority Naturalization Rankings of Properties Assessed on Otty Lake.

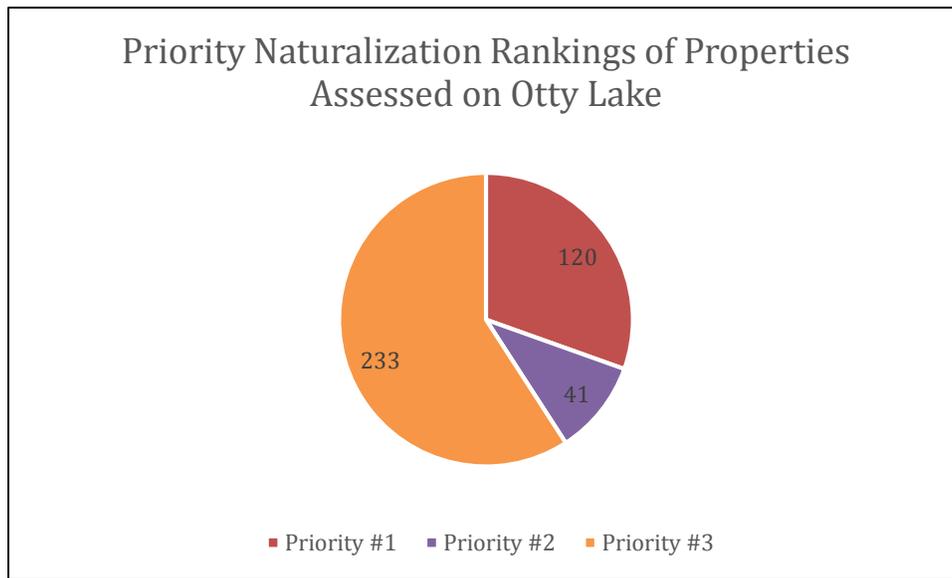


Figure 9. Priority Naturalization Ranking of Properties Assessed on Otty Lake.

Stewardship Message

Otty Lake can benefit from shoreline naturalization efforts to further increase the health of shorelines and the overall lake quality. Over half of the properties on Otty Lake are ranked as either Priority 1 or Priority 2 for naturalization projects. Positive change over time can be realized by further reducing the percentage of properties that are assigned a priority ranking of either 1 or 2.

Buffers are a vital area of the shoreline, for plenty of reasons as already discussed. Buffer zones are the ribbon of life, providing over 90% of aquatic and terrestrial wildlife with essential habitat needed at some point throughout their various life stages, to mate, rear young, find food, or take shelter. Property owners who do not have 30 meters of space inland from the water's edge are encouraged to plant where they can.

Conclusions

This report summarized the shoreline assessment data that was collected in June and early July of 2013, as part of the Love Your Lake program on Otty Lake, providing an overview of the state of the total shoreline.

This report is intended to be a resource for the Otty Lake Association and community to use as a source of baseline shoreline data with which they can compare future shoreline data. It further serves to encourage the Otty Lake Association to continue their efforts to engage shoreline property owners in naturalization projects, with hopes of increasing the percentage of regenerative and natural shorelines, and decreasing the percentage of ornamental shorelines. Natural shorelines are shown to contribute positively to water quality, wildlife habitat, recreational opportunities, and property values. With positive individual and community actions to protect shoreline health, all lake users, cottagers, and residents will benefit by enjoying a healthier lake.

This report can also be used by property owners to see how their property measures up against others on the lake while maintaining individual property privacy as to the specific contents of each report. Each individual property owner's shoreline report is written largely based on the majority classification of their shoreline. For ornamental properties, the reports encourage the introduction of native shoreline vegetation. For regenerative properties, the reports encourage the continued growth of existing shoreline vegetation and/or recommend increasing buffer size. For natural properties, the reports recommend to maintain the existing shoreline buffer. And for degraded properties, the reports recommend to create any type of buffer or allow native ground cover to establish itself in order to decrease overland runoff.

Ultimately, the more native shoreline vegetation a lake has, the healthier the lake system. Natural shorelines in some other areas may include exposed bedrock, cliff faces, sand, or other landscape features that is not suitable for native vegetation to thrive, or is difficult or dangerous to establish vegetation. In these locations, keeping the shorelines in their natural state is recommended. While shoreline vegetation aids in soil stabilization, pollutant filtration, and overall lake health, it is also the best defense against most erosion problems. A good underground root network keeps soil in place, while a healthy buffer of shrubbery prevents topsoil from being exposed and washed away. Shoreline vegetation nearest to and even in the water, such as aquatic and wetland plants, absorbs wave energy before it reaches the shoreline, further reducing the impact of erosion through wave action, undercutting and washing away the bank. Natural buffers also provide habitat for wildlife, both aquatic and terrestrial, and they improve habitat for fish by shading and cooling the water. They also provide protective cover for birds, mammals and other wildlife that feed, breed and rear young near water. Local wildlife has also been known to aid natural buffer creation by spreading native plant seeds from neighboring forests (via their fur, feathers, or excrement), which also adds genetic diversity and strengthens these natural buffers. Otty Lake property owners are encouraged to use their Otty Lake Shoreline Handbooks as a resource to learn more about how to best protect their shoreline properties. By maintaining the natural shoreline, and with a few simple improvements, residents of Otty Lake can enjoy the benefits of the lake for years to come.

Appendix A: Love Your Lake Shoreline Classification Protocol Datasheet



Shoreline Survey Datasheet

Lake Name: _____										Address: _____															
Datasheet #:		GPS UTM (NAD83)															Digital Photo Ref #s:								
Property #/ Pin Number:																									
Property Assessment #:		Start of Property					End of Property																		
		N					N																		
		E					E																		
Classification (%)										Erosion check all that apply <input checked="" type="checkbox"/>															
Degraded		Ornamental		Regenerative		Natural		Surface (rill, gully, rain, exposed soil)		Mass Mvmt/ Slumping (angled veg)		Undercut Bk (scouring, wave/boat/ice)													
%		%		%		%		%		%		%		%		%									
Building Setback check the field that applies <input checked="" type="checkbox"/>										<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>											
Can't see		≤ 5 meters		5-10 meters		10-30 meters		>30 meters		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		Erosion control (if required)									
<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		Aquatic Cover check if present <input checked="" type="checkbox"/>															
Shoreline Development: (%)										Emergent		Floating		Submergent		No cover		Algal Bloom		Removing aq veg					
%										<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>					
Structures enter # of each applicable										Aquatic Substrate check if present <input checked="" type="checkbox"/>															
Deck		Boat Launch		Boat Ramp		Boat house		Boat Lift		Boat Slip		Build ing(s)		Other		Man-made Beach		Stairs							
#		#		#		#		#		#		#		#		#		#							
Dock enter # of each applicable										Bedrock (exposed) <input type="checkbox"/>		Silt(<0.05 cm) <input type="checkbox"/>													
Cantilever		Floating		Post Non Perm		Post Perm		Crib Wood		Crib Steel		Solid		Raft											
#		#		#		#		#		#		#		#											
Combo Post & Fitting		Combo Post & Solid		Combo Solid & Fitting		Combo Other		Dock System		# Sections		Permanent		Non-Perm											
#		#		#		#		#		#		#		#											
										Gravel (0.2 - 6.4cm) <input type="checkbox"/>		Pelagic <input type="checkbox"/>													
										Sand (0.05 - 0.10 cm) <input type="checkbox"/>		No Data Recorded (not visible) <input type="checkbox"/>													
Shoreline Retaining Wall										Other Observations															
Length of all walls (% of shoreline)										Development		Commercial <input type="checkbox"/>		Farm <input type="checkbox"/>		For sale <input type="checkbox"/>		Island <input type="checkbox"/>							
%										Landscape for buffer		Cliff <input type="checkbox"/>		Bedrock <input type="checkbox"/>		Thin soil <input type="checkbox"/>									
Wood		Gbn Basket		Armour stone		Concrete		Steel		Riprap		Loose Rock		Other**											
#		#		#		#		#		#		#		#											
**If other please specify:										Invasives:															
Wall failing <input type="checkbox"/>										Railroad ties <input type="checkbox"/>		Treated wood <input type="checkbox"/>													
Other structure (deck/dock) acting like ret wall <input type="checkbox"/>										Eur. Milfoil <input type="checkbox"/>		Purpl Loosest rifle <input type="checkbox"/>		Spiny water flea <input type="checkbox"/>		Zebra Mussel <input type="checkbox"/>		Eur. Frog-Bit <input type="checkbox"/>		Water soldier <input type="checkbox"/>		Fern-wort <input type="checkbox"/>		Phragmites <input type="checkbox"/>	
Upland Retaining Wall check if present <input checked="" type="checkbox"/>										<input type="checkbox"/>		Slope: >1:1													
Recommendations/ Restoration Opportunities																									
Buffer		Rec create <input type="checkbox"/>		30m size difficult here <input type="checkbox"/>		Rec expand <input type="checkbox"/>		Great buffer as is <input type="checkbox"/>																	
Lawn		Mowed lawn <input type="checkbox"/>		Pine Needles <input type="checkbox"/>		Lawn is regenerative <input type="checkbox"/>																			
Land use		Stop raking organic <input type="checkbox"/>		Garden <input type="checkbox"/>		Rec young trees <input type="checkbox"/>		Rec boat racks <input type="checkbox"/>		Using boat racks <input type="checkbox"/>															
Pathway		Rec create on slope <input type="checkbox"/>		Rec create no slope <input type="checkbox"/>		Rec S & Rec cover <input type="checkbox"/>		Rec S & is covered <input type="checkbox"/>		Good S & Rec cover <input type="checkbox"/>		Good S & good covered <input type="checkbox"/>		X S & rec cover <input type="checkbox"/>		X S & Good cover <input type="checkbox"/>									
Stairs		Rec install stairs <input type="checkbox"/>		In retaining wall <input type="checkbox"/>		Stone steps <input type="checkbox"/>																			
		In ground, closed <input type="checkbox"/>		In ground, open <input type="checkbox"/>		Raised, closed <input type="checkbox"/>		Good - raised, open <input type="checkbox"/>																	
Drainage		Can't see <input type="checkbox"/>		No eaves <input type="checkbox"/>		Eaves to surface <input type="checkbox"/>		Eaves to ? <input type="checkbox"/>		Eaves to nat area <input type="checkbox"/>		Eaves to rain brl <input type="checkbox"/>													
Habitat		Cavity tree <input type="checkbox"/>		Dead standing tree <input type="checkbox"/>		Terr logs <input type="checkbox"/>		Aq logs <input type="checkbox"/>		Overhanging <input type="checkbox"/>		Upland forest <input type="checkbox"/>		Wetland <input type="checkbox"/>		Other <input type="checkbox"/>		Brush Piles <input type="checkbox"/>							
Surveyed By: _____										Entered By: _____															
Survey Date: MM/DD/YYYY										Date Data Entered: MM/DD/YYYY															

Version 8, May 2013, Canadian Wildlife Federation, Muskoka Watershed Council, Lakeland Alliance, City of Greater Sudbury and Centre for Sustainable Watersheds