Shoreline Vegetative Buffers

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Introduction

Picture an idyllic lake setting. The sun is glimmering on clear, clean water; children are wading and swimming along the shore; a fisherman is casting for the elusive bass. Chances are this view also includes lushly vegetated shorelines blending into the surrounding landscape.

The interrelationship between a lake and its shoreline is important. The shoreline zone is the last line of defence against the forces that may otherwise destroy a healthy lake. A naturally-vegetated shoreline filters runoff generated by surrounding land uses, removing harmful chemicals and nutrients. At the same time, shoreline vegetation protects the lake edges from the onslaught of erosion caused by waves and ice. The shoreline zone also provides critical habitat for aquatic insects, microorganisms, fish, and other animals, thereby helping to maintain a balance in sensitive aquatic ecosystems.

Unfortunately, as lake landscapes are developed, natural shorelines often are damaged or destroyed. Beneficial natural vegetation is cut, mowed, or replaced. This often leads to eroded shorelines, degraded water quality and aquatic habitat, impaired aesthetics, and a reduction in property values.

Lakes are not the only water bodies affected by development, and cottages are not the only land use of interest in Muskoka. This document is intended to apply to all land uses, including seasonal cottages, permanent residences, woodlots, farms and other land uses that may border or contain wetlands, creeks, rivers and lakes. The applicable options and expected benefits described will therefore vary depending upon the land use and the particular site characteristics (slope, soil quality, etc) of a property.

What are Shoreline Buffers?

Shoreline buffers refer to forested or vegetated strips of land that border creeks, rivers and lakes. These buffers can help filter sediment and other pollutants (such as fertilizers and pesticides) from runoff that flows from the land into waterways, thus protecting these waters from various nearby land uses.

A buffer is different than a building setback from a waterbody, as defined through a zoning by-law. A buffer is a vegetated or strip of land adjacent to a waterbody. A building setback does not include a specific requirement in a zoning bylaw to maintain vegetation.

- A buffer is vegetated
- A setback is the distance of the building from the lake and may or may not be vegetated

Why is it Important to Maintain Shoreline Vegetation?

> The shoreline produces the ultimate "Edge" effect upon which 70% of land-based animals and 90% of the aquatic plants and animals rely.

Development around lakes has resulted in the removal of trees, shrubs and other protective vegetation and an increase in the amount of impervious area in the lakeside landscape. Native vegetation, with its deep root systems and natural duff layer, act like a sponge to hold stormwater runoff and associated nutrients. Impervious surfaces result in more stormwater running directly into the lake. Stormwater runoff picks up pollutants like soil sediment, nutrients and chemicals that can be detrimental to lake water quality. These enter lakes and can affect the nutrient balance of the water creating a environment suitable for invasive or nuisance aquatic plants to root. Silt can cover fish eggs and habitat as well. Maintenance and restoration of shoreline vegetation allows native plants to fill in the shoreland zone and increase biodiversity, wildlife habitat and protect property values.

Table 1 provides a detailed listing of various benefits that can result from shoreline buffers. Although the stated benefits may not apply equally to all land uses, some overall objectives and guiding principles can be identified:

- Minimizing or delaying stormwater runoff from a site will control erosion, and will improve the effectiveness of the natural soil and vegetation in preventing ammonia, phosphorus, and harmful bacteria from entering our lakes and rivers. As we add roofs and driveways to our properties, we are also adding new sources and higher volumes of stormwater runoff to be managed.
- Native species provide many benefits when compared to non-native species, the first and foremost of which is elimination of the need for fertilizers, herbicides and pesticides that are typically required for flower gardens and manicured lawns.
- Septic tanks and leaching beds are designed to break down our wastes into simple forms of nitrogen, carbon and phosphorus, and to substantially remove disease-causing bacteria. These systems however also depend upon the natural actions of soil organisms and plant life to prevent those simple nutrients and bacteria from reaching our water sources and water bodies.
- Native birds, fish and animals rely upon continuous vegetative habitat along the shoreline for breeding, feeding, and protection from predators.

Table 1: The Benefits of Buffers *(from On The Living Edge)*

Benefit	How Buffers Help
Protection of Water Quality	• Buffers help purify water by filtering toxic substances and some pollutants (fertilizers, pesticides, bacteria, heavy metals and septic leachate) out of runoff from roads, fields, yards and septic fields, before these substances reach waterbodies. Younger and middle-age trees do a better job than older trees. Some selected forest management practices will ensure on-going rejuvenation of the buffer. • Vegetation helps keep water clear by trapping soil particles in runoff. • On a property with extensive native vegetation, you can avoid the use of fertilizers and pesticides and further help protect water quality; these substances are not required to grow native plants. • If properly established and maintained, a full riparian buffer can remove at least: o 50 percent of chemical fertilizers and pesticides. o 60 percent of some bacteria. o 75 percent of sediment.
Protection from Erosion	• The roots of riparian and aquatic buffer vegetation act like "rebar" in concrete, to reinforce soil and sand and help hold them together. • Buffers help prevent land loss by protecting your bank or shoreline from slumping or being washed away. • The leaves of plants reduce the energy of waves and currents, break the force of falling rain, and slow water as it runs downhill. Since shoreline properties are commonly on the receiving end of drainage, the more vegetation cover, the more your property will benefit.
Protection of Property Value	• By protecting water quality and preventing erosion along the shoreline, a buffer zone helps maintain the value of your property. • Buffers help protect buildings and trees on your property from damage due to wind and water.

Benefit	How Buffers Help
Protection from Flooding	• Vegetation, logs and rocks in streams or along the shoreline slow down flood waters, reducing damage to your property. • Riparian vegetation acts like a sponge, helping to increase the soil's ability to absorb water and to lessen the impacts of flooding.
Quality of Life	• Trees and other vegetation provide cooling and shade in summer, protection from wind in winter, and clean and freshen the air. • Vegetation along the shoreline can provide privacy from other dwellings and from noisy activities on the water. • Natural landscaping can help put you in touch with the seasonal cycles of plants and wildlife, and the beauty of nature.
Protection of Water Supply	• Riparian vegetation helps the ground absorb more water in fall, winter and spring, and during storms. The ground can then slowly release water into streams in the summer to help maintain flows during dry periods.
Protection of fish and Wildlife	• Vegetation provides food, nesting cover, and shelter for fish and other wildlife, including species at risk. • Vegetation alongside and overhanging waterways provides shade to help keep water cool for fish. • Vegetation along shorelines provides connecting corridors, enabling wildlife to move safely from one area to another.

How Wide Should a Buffer Be?

Factors to consider when designing a shoreline buffer are lake sensitivity, land use, groundwater and flood hydrology, the desired function, the structural characteristics of the shoreline vegetation, and the slope of the land.

A buffer on a cottage lot should ideally be at least 30 metres wide.

Table 2: Functions of Vegetative Buffers and Typical Widths

Function	Typical Buffer Width
Bank Stability	Minimum 20-30 metres depending on wave action, soil, river flow
Maintenance of Benthic Communities	Minimum 30 metres dependant on slope, soil type, and land use
Reduce Fecal Coliform and E. coli	Minimum 30 metres as recommended by the Ministry of the Environment and dependant on soil make-up
Nutrient Reduction	> 30 metres as recommended by the Ministry of the Environment and dependant on soil make-up
Sediment Removal	3 m (sand), 15 m (silt) 122 m (clay) 75% removal in 30 -38 metres dependant on slope, soils and water velocity
Wildlife Habitat	Buffer width depends on land use, frequency of property use, and animal species of concern • 30 metres (various fish) • 75-200 metres (birds, large mammals, small mammals) • 30 - 100 metres (beaver)

In general, buffer width needs to increase as land use intensity and slope increase and as the infiltration rate and soil porosity decrease. Soil characteristics determine in large part whether or not overland flow occurs, how fast water and contaminants move to the waterbody, and other factors relevant to the effectiveness of shoreline buffers. In general, as soils become finer (clay) a wider buffer is required to remove sediment and nutrients (Wilson et al., 1967). Determination of soil characteristics must be undertaken on a site-specific basis.

Ontario Experience

Where the proposed land use adjacent to a waterbody is residential, the Ministry of Natural Resources recommends a minimum 15-metre buffer for water quality protection around lakes and streams supporting warm water species of aquatic life and a 30-metre buffer where the waterbody supports coldwater species (OMNR, 1994). On Crown land, where the proposed adjacent land use is forestry, the Ministry has established a 120-metre area of concern with a minimum 30-metre no cut zone and a 90-metre modified cut zone depending on slope (Operational Prescriptions for Areas of Concern, Forest Management Plan 1999-2003).

What Should a Buffer Look Like?

A shoreline vegetative buffer should generally be a broad corridor of undisturbed vegetation adjacent to a lake, river, stream or other surface water. In a lake-based recreational environment such as Muskoka, it is unrealistic to believe that no clearing or vegetation removal will occur in this area. It is, therefore, important to develop a buffer that substantially maintains the function of the buffer while recognizing the need for water access and views.

A three-zone shoreline buffer provides a framework through which water quality, habitat and other objectives can be accomplished.

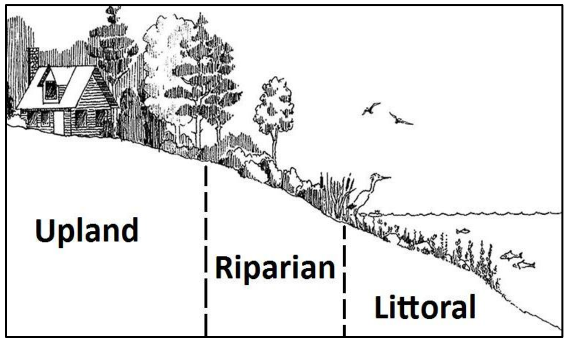

Figure 1: A Healthy Riparian Buffer

Zone 1 – provides habitat, reduces flood effects, stabilizes the bank, and removes some sediments and nutrients.

Zone 1 (Littoral): This zone begins in the water with submergent and emergent plants and continues up on the land immediately adjacent to the waterbody with shrubs and herbaceous plants. It is often referred to as the "Ribbon of Life". These aquatic plants break the energy from waves and provide streambank stabilization and habitat for both aquatic and terrestrial organisms while the shoreline shrubs provide shade and detritus and large woody debris to the lake.

This zone should be a 'no touch' zone, however, limited shoreline access and use are to be expected. Where a path is proposed within the natural vegetative buffer, it should meander to the shoreline and be constructed of permeable material or be raised off the ground allowing growth beneath the structure. Pruning of trees for viewing purposes, or the removal of trees for safety reasons is also acceptable. The principle of development in the vegetative buffer is to minimize disturbance of the ground, shrub and canopy layers.

Table 3: Plants in Zone 1 - The Littoral

Shallow water species	Arrowhead, Common rush, Pickerelweed, Cattail
Herbaceous plants	Spotted joe-pye weed, Large blue flag iris, Sensitive fern
Drier herbaceous plants	Cardinal flower, Bunchberry, Solomon's seal, Butterfly weed
Shrubs and shrubby trees	Red-osier dogwood, Willow, Nannyberry, Highbush cranberry, Meadowsweet, Spirea
Trees	Balsam fir, Red maple, Tamarack, White pine, Eastern hemlock, White cedar, White birch, Alder

Zone 2 - removes sediment, nutrients and other pollutants from surface and groundwater. In combination with Zone 1, it also provides most of the enhanced habitat benefits, and allows for recreation and aesthetic benefits.

Zone 2 (Riparian): This zone extends inland from Zone 1 for a minimum of 3 metres up to several hundred metres, depending on the objective, lake type, soil type, slope or topography, and land use. See Table 2 above for guidance on buffer widths. The objective of this zone is to provide a natural area with vegetation composition and character similar to other natural areas in the area. Similar to Zone 1, limited and well-constructed paths that do not significantly increase overland flow to the lake are generally acceptable.

Table 4: Plants in Zone 2 - The Riparian

Herbaceous plants	Virginia creeper, Solomon's seal, Bunchberry, Trillium
Shrubs and shrubby trees	Hawthorn, Choke cherry, Nannyberry, Highbush cranberry
Trees	White birch, White spruce, White pine, White cedar, Eastern hemlock

Zone 3 (Upland): This zone is typically a grass or herbaceous area that serves as a filter strip. The minimum recommended width of Zone 3 is 5 metres. Greater widths will increase the amount of run-off that soaks into the ground and is cooled and cleaned before reaching the lake. The primary function of this zone is initial protection of the lake from overland flow of non-point source pollutants such as fertilizers and pesticides applied to lawns and timber stands. Properly designed grassy and herbaceous buffer strips also provide quality habitat for several upland wildlife species.

Zone 3 - provides the greatest water quality benefits by slowing runoff, infiltrating water, and filtering sediment and its associated chemicals.

Table 5: Plants in Zone 3 - The Upland

Herbaceous plants	Sedum, Canada anemone, Lady fern, Thyme, Sweet woodruff
Shrubs and shrubby trees	Hawthorn, Choke cherry, Nannyberry, Highbush cranberry
Trees	White pine, Sugar maple, Oak

Additional Resources

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