

Appendix A  
to  
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File No.

A SHORELINE OWNER'S GUIDE TO

# Lakeland Living



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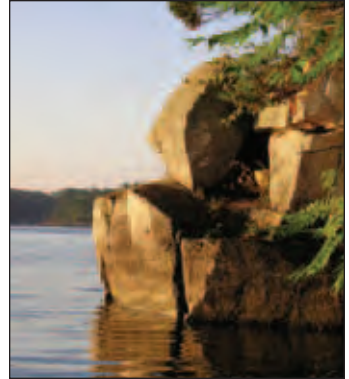


## Introduction

For generations, picturesque lakes have lured families from across Ontario to fish, boat and swim. At the lake, people discover the enchanting call of the loon, the sight of painted turtles basking on logs and the magnificent sight of osprey soaring above crisp blue waters.

The appeal of retreating to Ontario's lakes for rest and recreation is growing in popularity. As a result, development on the shorelines of our lakes is taking place at an unprecedented rate. In addition to this increased development, more and more people are extending their time at the cottage to live there year round. To preserve the lake environment that brought us there in the first place, it is imperative for us to understand our impacts and to know how to reduce them.

This guide offers you the information that you'll need to make the most of your shoreline property while living in cooperation with your lake's fragile ecosystem.



## What is a Watershed?

Lakes are part of a larger system called a watershed. A watershed is defined as all of the land area drained by a river and its tributaries. You could look at it as the path of a raindrop once it hits the ground. That path is shaped by the contours of the land and by climate and vegetation. These factors moderate the flow of water from land to streams and lakes.

Land use has an important impact on the water that moves through a watershed. As human activity reduces forestation, fills wetlands and paves over open land, less water gets filtered back into the watershed. Unfiltered surface runoff increases, and nutrient and contaminant concentrations in bodies of water may reach levels that pose a concern for the health of aquatic ecosystems. It is important to recognize that our lifestyle choices may contribute to the declining health of our lakes. The impact of lakeshore activities is not confined to the legal boundaries of one lakeshore lot. A lake benefits – or suffers – from the cumulative actions of all the lake users within the watershed.

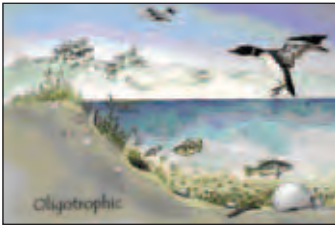




## What Type of Lake Do You Live By?

There are three types of lakes found in Ontario. You can learn more about your lake's unique characteristics by contacting your local Conservation Authority, Ontario Ministry of Natural Resources (MNR) or cottage association.

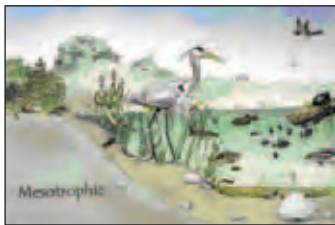
### Oligotrophic Lakes



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- Generally deep
- Minimal aquatic plant growth
- Low nutrient levels
- Support cold-water fish such as trout and whitefish
- Low levels of phosphorus and chlorophyll
- Most lakes on the Canadian shield are oligotrophic (Halls, Boshkung and Dickie) with some exceptions (Brady, Esson and Salmon Trout)

### Mesotrophic Lakes



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- Medium depth
- Usually good for fishing; support a wide variety of fish such as walleye and bass
- More nutrients than oligotrophic lakes, but not nearly as much as eutrophic lakes
- Occasional algae bloom at the surface
- Buckhorn, Stony and Chandos Lakes are mesotrophic

### Eutrophic Lakes



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- Generally shallow with abundant vegetation
- Support warm-water fish such as perch, bass and pan fish
- Frequent algae blooms
- Susceptible to oxygen depletion
- High phosphorus or chlorophyll readings
- On average, Rice and Scugog Lakes are eutrophic

Eutrophication is a lake's aging process. Sediments, erosion and the growth and decomposition of aquatic plants eventually leads to the lake bottom being filled in. Over time the lake is converted to a wetland (e.g., a bog or marsh) and later, dry land. This process normally takes tens of thousands of years to progress.

Human activity can accelerate lake-eutrophication. Excessive amounts of nutrients, particularly phosphorus, enter a water body from a variety of sources: from fertilized lawns and golf courses, as runoff from urban or agricultural areas, and from septic waste.







## Water Quality Impacts Associated With Eutrophication

- Frequent blooms of undesirable algae\* (toxic, giving water poor taste and odour)
- Excessive growth of aquatic plants leading to a loss of open water
- Decrease in water clarity
- Lower levels of dissolved oxygen, which may lead to fish kills and affect fish diversity
- Increased levels of coliform and E. coli bacteria present in surface waters
- Possible increase in the presence of carcinogens, such as chloroform, resulting from increased organic matter reacting with disinfectants such as chlorine

\*Note that nutrients are only one of the variables that influence algal blooms. Blooms are also exacerbated by temperature and water column stability.

To find out more information about the water quality of your particular lake or to participate in water quality sampling on your lake contact the MOE Lake Partner Program at 1-800-470-8322 or visit them on the Web at [www.ene.gov.on.ca](http://www.ene.gov.on.ca)

## Lake Health Dynamics

### Climate Change

It is uncertain how climate change will impact Ontario's lakes. Some common weather changes attributed to climate change include drought and higher temperatures. These weather variables control such things as water temperature, water levels (through evaporation), number of ice-free days, and nutrient input from watersheds into lakes. For example, increased water temperatures in lakes will change the numbers and types of bacteria and algae in lakes though it is not known how this will affect water quality. These factors also control certain physical aspects of the lake such as mixing depths and other elements that control biological functions like the length of growing season. In addition, the timing of seasonal events that are used to regulate ecosystem function may be offset from their "normal" dates (such as fish spawning).



Another major issue that we will certainly all face as property owners will be the increase in extreme weather events. These intense storms bring high winds and heavy rainfall. Large amounts of water running off the land into lakes will increase the affects of erosion and may affect shoreline infrastructure. As we will learn in later chapters, the best defense against these forces of nature is a well-established and well-rooted naturalized shoreline along with thoughtfully designed dock systems. Accompanying the rain will be high winds that will damage trees, buildings and power lines. It is always important to be prepared for emergency situations like power outages at the cottage. Be sure to have adequate supplies of drinking water, extra food and alternative light sources to get you through.

To see projected changes due to climate change in Ontario under different scenarios of change, visit:  
[www.gogreenontario.ca/maptool.php](http://www.gogreenontario.ca/maptool.php)



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### Characteristics of a Healthy Lake:

- Natural shorelines providing a buffer that filters runoff and pollutants
- Well vegetated to provide shade (trees, shrubs, etc.)
- Good water quality that has low levels of pollutants or excess nutrients
- Water clarity remains constant or normal
- Relative absence of invasive species around or within the lake
- Abundant and healthy fish and wildlife
- Lake conditions changing gradually and naturally over time, not rapidly



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### Characteristics of an Unhealthy Lake:

- Lack of natural shoreline (advanced shoreline development, erosion and hardened shorelines)
- Poor water quality, with high levels of E. coli, phosphorus and other pollutants
- Frequent changes in water clarity
- Consistently excessive aquatic plant and algae growth, possibly due to high levels of phosphorus
- Invasive species affecting lake health, native species and human use
- Loss of fish and wildlife habitat with declining populations





## A Healthy Lake Makes For Healthy Fish Habitat

Each alteration to the natural landscape leaves an imprint along the water's edge, where 90 percent of all the lake and river life is born, raised and fed. These ribbons of life foster cattails, pickerelweed, ferns and reeds. They also provide habitat for fish and wildlife. A stable fish population is not only a valuable recreational resource, but also an indicator of a healthy lake ecosystem.

### Factors affecting declining fish populations

#### **Loss of fish habitat**

Removal of rocks, weeds and woody debris, to "clean up" the shoreline or provide more suitable swimming areas, can be devastating to fish populations. Underwater structures such as logs and rock piles not only allow fish to have a place to rest, feed, and spawn, but also provide them with protection from predators.

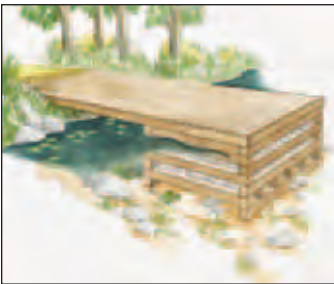
#### **Shoreline erosion**

Shorelines may begin to wash away or become susceptible to erosion with the absence of natural vegetation. Sediment carried away by wind or water reduces the size of waterfront properties and buries spawning beds, negatively impacting the reproductive potential of fish in your lake.

#### **Harmful substances**

What goes on your lawn and down your drain goes into your lake! For tips on how to keep other pollutants out of your lake check out the "Low Impact Lake Living" chapter.





## Fish Friendly Dock Structures

Choose a dock design that best suits your needs. Work done in and around water may require an approval or a permit. Fisheries and Oceans Canada has produced "Operational Statements" which provide advice on activities that include Dock Construction and aquatic weed removal. There is often no need for Fisheries and Oceans Canada (DFO) to review the project provided the conditions and measures in the Operational Statements are followed. You can also contact your local Conservation Authority or local office of the MNR when planning to install a dock. They can direct your inquiry and let you know what steps you need to consider prior to beginning any construction on the shoreline.

### Floating Dock

- Simply designed and easy to build
- Causes minimal direct disruption of lake bed
- Minimal shading of aquatic plants
- Free flow of water underneath
- Least environmental impact

### Pipe Dock

- Little contact with lake bed
- Minimal shading of aquatic plants
- Adjustable to water fluctuations
- Free flow of water underneath
- Minimal environmental impact

### Crib Dock

- Imported rubble and rock in crib bed
- Covers large area of submerged ground, smothering everything beneath
- May provide structure in otherwise sterile lake bed environments

### Permanent Pile Dock

- Requires professional installation
- Minimal contact with lake bed
- Free flow of water underneath



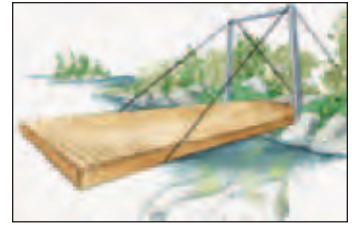


### Cantilever and suspension or lift dock

- Not suitable for areas with extreme water fluctuations
- Both types cause the least amount of destruction to lake bed
- Sunlight to aquatic plants is restricted
- Installed properly can cause minimal shoreline damage

Work done in or around the water (including building a beach, dredging, constructing a pond, removing sunken logs, building a dock, or controlling aquatic plants) must not result in the harmful alteration, disruption, or destruction of fish habitat and it is important to plan your project with these things in mind.

To ensure the protection of fish habitat, contact your local Conservation Authority, the Ontario Ministry of Natural Resources, and Fisheries and Oceans Canada. If your lot fronts onto the Trent Severn Waterway or any of its associated lakes, please contact Parks Canada.



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## Low Impact Lake Living

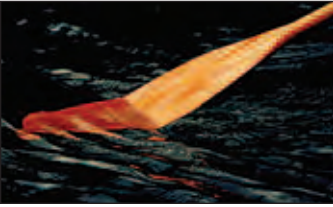
### Leave No Trace

After camping and shoreline meals, be sure to leave your site looking as though no one had been there. This will benefit wildlife as well as future outdoor enthusiasts. By cooking with gas stoves and by practicing good outdoor etiquette, we can minimize our impact on lake ecosystems. The “Leave No Trace” principles are:

- Plan ahead and prepare
- Travel and camp on durable surfaces
- Dispose of waste properly
- Leave what you find
- Minimize campfire impacts
- Respect wildlife
- Be considerate of other visitors

*“If you pack it in, pack it out.”*





## On the Water

The primary impacts of human activity—for example, boating—on lakeshore ecology include wake effects, wildlife disturbance, noise and pollution. Many animals respond to human disruptions by altering their behavior and location. In particular, breeding birds such as loons are often affected by the wake of boats and other personal watercraft. Many waterfowl nests are located at the waters edge. A high wake can swamp nests, destroying or damaging nests and eggs. Disturbances such as noise can result in the abandonment of young chicks.

### “Clean Marine”

It is equally important to prevent avoidable pollution, such as oil and gas spills and chemical contamination, from entering our lakes. It is vital that boat operators take appropriate precautions and use the appropriate facilities when refilling tanks or discharging used water. Remember to use absorbent pads to soak up oil, fuel or anti-freeze spills before discharging your bilge water. Also consider installing a bilge filter. For more information regarding Ontario’s Clean Marine program, please look for the Eco-Rated Clean Marina nearest you or contact the Ontario Marine Operators Association (OMOA).



### “Watch Your Wake!”

Here are some important reminders the next time you are out on the lake:

- 10 km/h within 30 metres of the shoreline is the law!
- Always avoid waterfowl nests and other sensitive wildlife habitat.
- Always follow safe refueling guidelines to avoid polluting water.
- Consider using non-lead fishing tackle.
- Obey posted speed limits and “No Wake” zones and know your boat’s wake-free speed.
- Remember that operating your boat on plane creates a smaller wake than when ‘plowing’ through the water at lower speeds.

The impact of our recreational activities on lake ecosystems can be small or large depending on the choices we make. By limiting the negative effects of our actions and choosing low impact recreation activities, lake users will enjoy a better relationship with their human and wildlife neighbors.



# Invasive Species

Non-native, exotic or invasive species are all terms used to describe organisms that have been introduced into habitats where they are not native and do not belong. Exotic introductions are a problem around the world and a serious threat to biodiversity. They can cause widespread and unpredictable changes to the habitats that they invade which results not only in damage to the ecosystem but also to the native fish and wildlife species that depend on them. Aquatic ecosystems are especially vulnerable and at risk from invasive species. Once established in an aquatic ecosystem, an invasive species is almost impossible to eliminate and measures to control the invasion can be costly.

## Common Aquatic Invaders of Ontario

### Zebra Mussels

Tolerant of a wide range of environmental conditions, these mussels have managed to spread throughout all of the Great Lakes as well as into many inland lakes. They filter the water and because of their high numbers rid the lake of not only pollutants but also much needed nutrients, resulting in a change in the lake's physical attributes. This can destroy the habitat of some native species while making the lake better suited for other native species. In addition, mussel introductions can also cause considerable damage to property and significant changes to the recreational quality of the waterfront.



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### Spiny Water Flea

Because it has an extremely sharp tail spine, this invasive crustacean has very few predators. Spiny water fleas can out-compete native zooplankton species and reduce the availability of food for small fish.



Peter Johnson

### Round Goby

Accidentally introduced into the Great Lakes by way of ballast water from ships, the round goby is an aggressive competitor to native species. It consumes large numbers of toxic snails and mussels. When other animals eat the goby, the toxins perpetuate within the food chain.



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## Preventing the Spread of Aquatic Invasive Species

With over 180 non-native species already established in the Great Lakes and a new one arriving every 8 months, preventing their spread can seem like an overwhelming task. Yet, there are simple things that you can do to stop their spread.

### Boaters

- When removing your boat from a lake, inspect the boat, trailer and all accessory equipment that has been in the water. Remove all plant and animal material before leaving the launch.
- Drain water from motor, live wells, bilge and transom wells immediately, before leaving water access area.
- Before transporting your boat to another water body, wash your boat, tackle, downrigger cables, trailer, and other equipment with hot water, or spray with high-pressure water; or, let your boat dry out in the sun for five days.



### Anglers

- Empty bait buckets on land. Never dump a bait bucket into a lake if it has water from another water body in it, and never dump live fish from one water body into another. Not only can this result in the introduction of a new species into a lake, it is also **illegal**.
- Learn to identify the different species of baitfish and distinguish them from invasive fish such as the round goby. Buy your bait where you fish and dispose of unused bait and water on land or in the trash.

### Gardeners

- Exotic plants can add beauty and variety to your garden. But take care – some species can become invasive if they escape to our natural waters or woodlands.
- Learn how to identify exotic/invasive species. Remember that they thrive in disturbed areas; so wherever possible, keep it natural.
- Choose contained areas for your exotic plants; or, better yet, use native plants.





Call the Ontario Federation of Anglers and Hunters' Invading Species Hotline @ 1-800-563-7711 (toll-free in Ontario) to report a sighting or to obtain more information on how to protect your lake against invading species.

To learn more about invasive exotic plant species, check out Peterborough Green-Up's "Invasive Exotic Plants in Ontario" factsheet at [www.greenup.on.ca](http://www.greenup.on.ca).

## When Aquatic Plants Become a Nuisance

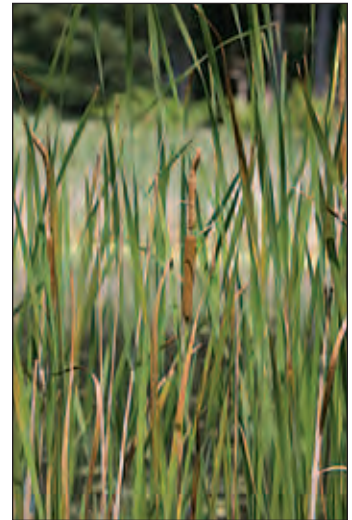
Aquatic plants do more than just tangle up in boat propellers or swimmer's feet. They support the microorganisms that fish require for food and they provide natural habitat and are a primary food source for aquatic birds.

### **Aquatic Plants are Essential to the Life of a Lake**

In addition to providing a source of oxygen in the water, aquatic plants help stabilize loose sediment and are an effective natural breakwater, keeping waves from eroding the shoreline. The spread of aquatic plants can be a natural process of lake evolution. As a lake gets older, an accumulation of nutrients in the sediment causes an increased growth in aquatic plants (eutrophication). Some lakes are naturally eutrophic; it is important to consider this before attempting to control vegetation growth.

### **Pollution and Erosion**

Pollution and erosion are two reasons for excessive plant and algae growth in lakes. When a lake receives an overload of nutrients from either sewage, added fertilizers leaching through the soil, or erosion, aquatic plants and algae tend to overgrow. This effect is multiplied in lakes that are already old and eutrophic, or naturally high in nutrients with a wide littoral (shoreline) zone where aquatic plants can grow. Eliminating sources of pollution and reducing erosion can help prevent the over-fertilization of plants in the lake.





### **A Special Note on the Use of Fertilizers**

Remember, what goes on the lawn goes into the lake! That includes fertilizers applied to lawns near the water. Rain and irrigating will carry these fertilizers into the lake and encourage rapid and prolific growth of aquatic plants and algae.

### **Water Temperature**

Water temperature also has a profound effect on aquatic plant growth. If the water temperature of the lake increases, aquatic plants will grow more rapidly. Increases in water temperature are mainly caused by the destruction of natural shoreline vegetation, which shades shallow waters from the heat of the sun. If the streams and rivers that feed a lake have unprotected banks, pre-warmed water entering the lake adds to the increase in temperature.

## Controlling the Growth of Aquatic Plants

**Cutting** is an expensive and labour intensive method of controlling aquatic vegetation; it may not even be productive, as cutting can stimulate growth. Fragments left in the water can re-root and create a denser patch of vegetation than was originally there. In smaller areas, plants might be pulled out, rather than cut.

**Toxic herbicides should be avoided!** They may control aquatic plants quickly in the short term, but they are expensive, must be used often to be effective, and have negative side effects. Herbicides are especially discouraged within a wide area where children and young people will be swimming. Using these chemicals has health and environmental risks, and always requires a Ministry of the Environment and/or Trent Severn Waterway permit.

**Maintain a lakeside buffer zone** by using trees to shade the shores and tributaries. This can reduce erosion as well as stop any excess nutrients from entering the lake.







**Reduce or eliminate the use of fertilizers. For every 1 pound of phosphorus in the water, 500 pounds of aquatic vegetation is produced.**

**Maintain your septic system.** Have your septic system pumped and then inspected in 2 years. That should provide you with information on the volume and patterns of use and guidance on frequency of pumping.

**Be careful with soap.** The use of soaps and other detergents – even those that are biodegradable – can kill some wildlife species and create algae blooms if the suds directly enter the water. Soaps should always be phosphate-free and all dishwashing and bathing should be done on land, far away from shore.

For more information on dealing with aquatic plants, acquiring permits or any other shoreline related questions, please contact the Department of Fisheries and Oceans, or your local Conservation Authority.



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## Wildlife Management

Wherever you live in “Lakeland,” chances are you have had many experiences with wildlife. Most often, these encounters are peaceful and awe inspiring. Unfortunately, you may be noticing that these chance encounters with some species are becoming increasingly rare. On the other hand however, the wildlife we share habitat with may visit us often and may become a nuisance. The information in this chapter will help you to protect those species at risk, deal effectively with “pesky” raccoons who keep you up all night, and offer ways to attract birds and butterflies to your home and garden.

### Species at Risk

As our natural landscape is altered through development, pollution and the spread of invasive species, many native species are finding it difficult to cope. In most cases, a loss of habitat forces some species out of their natural range and can result in declining populations. Those species that are especially sensitive may begin to disappear. These stresses are felt by mammals, fish, reptiles and plant species alike. There are now several species whose existence is threatened but, with careful consideration for their habitat requirements and an awareness of what we can do to alleviate their challenges, we can make a difference on our own individual properties.



Mark Peck

#### The Black Tern

The Black Tern is a small, boldly marked tern with black head and underparts during the breeding season. They are mainly insect predators, hovering just above the water as they pick their prey off the surface. They build floating nests in loose colonies in shallow marshes, especially in cattails.

Black tern population declines have been occurring since the 1980s. Threats include wetland drainage and alteration, water pollution and human disturbance at nesting colonies due particularly to boat traffic that can swamp the floating nests.

You can help protect the Black Tern by respecting their habitat requirements. Do your part to keep pollution out of our lakes and wetlands and keep your boat speed to 10km/h within 30 metres of the shoreline – it’s the law.





### **Northern Map Turtle**

The Northern Map Turtle is a shy medium sized turtle that gets its name from the irregular yellow or light brown markings along the shell that resemble the markings of a contour map. A distinctive yellow blotch is located behind each eye. The Northern Map Turtle can be found in large soft bottomed bodies of water such as lakes and rivers.

Increased shoreline development, the decline in habitat quality and increased human disturbance has caused population declines. In addition, the invasion of zebra mussels has caused declines in traditional prey species of the Map turtle. The pet trade may also be unwittingly contributing to population declines.

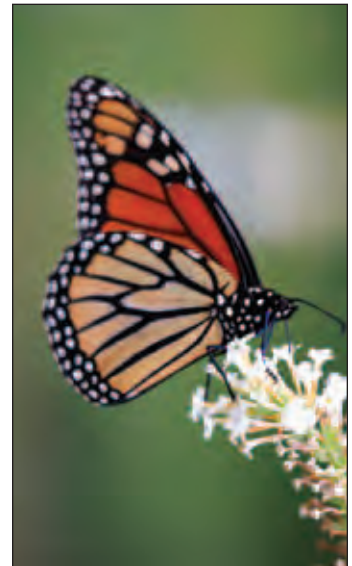
Help protect the Northern Map Turtle by keeping your shoreline natural!

### **Monarch Butterfly**

The Monarch Butterfly can be found in Ontario wherever there are milkweed plants for its caterpillars and wildflowers for a nectar source.

Declines in the Ontario populations of Monarchs are due to logging of the overwintering sites in Mexico, and the widespread use of pesticides and herbicides in Ontario.

To help protect the Monarch Butterfly do not remove milkweed plants from your property or shoreline. Avoid using pesticides and herbicides. In other words, keep it natural!



To report turtle sightings, call the Trent Severn Waterway (TSW) Turtle Hotline at 705-875-2240 or, to learn more, visit the TSW's Green Pages at [www.tswgreenpages.ca](http://www.tswgreenpages.ca).

To get help for injured turtles contact the Kawartha Turtle Trauma Centre at 705-292-0691 or visit [www.kawarthaturtle.org](http://www.kawarthaturtle.org).

For more species at risk information and how to help, visit the Royal Ontario Museum's website at [www.rom.on.ca/ontario/risk.php](http://www.rom.on.ca/ontario/risk.php).





## Nuisance Wildlife

### Animal-proof your home or cottage

Squirrels, raccoons, chipmunks and other rodents can invade your home or cottage by way of tree limbs and cracks in the ceiling, walls and floors. To discourage these animals, simply remove tree limbs that give access to your home and seal up all openings with wire mesh, metal flashing or caulking. Don't forget to check for any young (or any other adults) that might be still inside before you seal the access point. The parents will try everything to back inside! Small mammals such as skunks and mice make their homes in and around woodpiles, so be sure to store your wood a good distance away from your home.



If **geese** are your problem, you can make your yard less attractive by allowing the naturally occurring tall sedges and grasses to grow. Geese prefer fertilized short grass that provides them with an open view of the water to keep an eye out for predators. Vegetation along a shoreline needs to be about 60 cm (24 inches) high, and dense enough to keep geese from seeing through.

To discourage **nuisance bear** visits, securely store garbage inside, and don't leave pet food outdoors. Thoroughly clean outdoor grills after use and don't put meat, fish or sweet food (including fruit) in your household composter.

## Beneficial Wildlife

Attracting wildlife to your property can have positive effects. Consider the natural beauty of a leaping deer, and the important role in pest control of bats and dragonflies.



### Enhance the Natural Habitat

Be sure to leave specific areas "untouched." Keep some large rocks, fallen tree limbs and aquatic vegetation wherever possible, to provide habitat for a diversity of wildlife. Hawks and owls will keep your rodent population to a minimum if you allow some dead trees to remain standing. Cavities (holes) in the trees will provide nesting and resting habitat. Rocks and debris from trees create perfect habitat for reptiles, mammals and amphibians, all of which play an important role in maintaining a diverse population of wildlife.





## Gardening and Birdfeeding

When gardening, be sure to **plant native flowering vegetation** that will attract the birds and butterflies native to your area. Flowering plants left in the garden after the summer provide food for seed-eating birds throughout the fall and winter, keeping some species around your property year-round—a natural birdfeeder. Proper maintenance and care are the most important aspects of an installed birdfeeder. A bird will return to your feeder each day providing there is a consistent amount of food and the feeder is cleaned regularly to avoid transmitting disease and bacteria.

To learn more about native plants and trees contact  
Peterborough Green-Up

## Mosquitoes and the West Nile Virus

West Nile Virus can be transmitted by a mosquito bite. Although the chances of contracting the virus are quite low, people who live in mosquito infested areas may feel better protected if certain precautionary measures are taken. Repellents containing DEET and mosquito netting are among the best forms of protection from mosquito bites. To further discourage mosquitoes on your property, you should consider draining sources of standing water in places like buckets, barrels, tires, bird baths to reduce the amount of mosquitoes that breed around your home. At the cottage, make sure you store small boats and canoes upside down, cover large boats to prevent accumulation of water, and keep drains open. Consider staying indoors during peak times for mosquitoes (dawn, dusk and in the early evening). Mosquitoes begin laying eggs in mid-May, so this is the right time to eliminate these breeding areas.



University of Wisconsin

To learn more about West Nile Virus, contact your  
local Health Unit or Public Health Department







## Water Quality and Testing

Untreated surface water should never be ingested! Even healthy lakes can harbour harmful bacteria and parasites that can affect human health. Drinking contaminated water can make you sick and may even be fatal. Bacterial contamination, such as *E. coli*, causes stomach cramps and diarrhea, along with other problems. Harmful bacteria such as *Giardia* (which causes the illness known as “beaver fever”) and *cryptosporidium* will cause major gastrointestinal problems. Chemical contamination can be just as dangerous to your health. You can have the surface water of your lake tested by an accredited private lab for a fee.

Test your well water for bacteria at least three times a year and after any major plumbing work. Testing for excess nitrates and phosphorus is also recommended. If you are near an agricultural or urban area, you may want to test for other contaminants such as pesticides, gasoline and/or solvents.

Unusual tastes in your drinking water may indicate excess amounts of iron, chlorine, bacteria and other substances. Strange smells may indicate sewage overflow (after excessive rainfall or flooding), or other pollutants. But water contamination isn’t always noticeable. The only way to make sure your drinking water is safe is to have it tested regularly.

Your local public health unit or the Ministry of Health will test well water and treated lake water. Water bottles for testing are supplied by the Ministry of Health and are available for pick-up at the public health unit. Be sure to follow the directions explicitly as there is a high possibility for cross contamination. This could lead to an inaccurate test of your water.

## Water Conservation Tips

- Install water-saving plumbing fixtures; e.g., low flow aerators
- Use laundry and dishwashers only with full loads
- Take shorter showers, rather than full baths
- Fix leaky faucets
- Avoid using sink situated garbage disposal units
- Consider installing a composting toilet



James Wilkes





## Simple Steps to Improve Water Quality

- Clean debris from your well, make sure the lid is vermin proof and fits tight, and check for erosion or other problems in a 50ft. radius of your well.
- Properly decommission unused wells and ensure maintenance of existing wells.
- Ensure that your well is at least 100 feet away from your septic bed (and your neighbours' septic beds).
- Confirm that your aquifer is not affected by septic runoff through regular testing.
- Monitor the water levels of your well on a regular basis. This will give you an idea of your daily usage and of your aquifer's recharge time.
- Install and maintain catch basins for storm water runoff from parking lots.
- Never dispose of any toxic chemical waste down the toilet or drain. Paints, oil, gasoline, antifreeze or chlorine can be disposed of at your local hazardous waste centre — for free!
- Prevent the loitering of Canada geese by planting and maintaining a buffer zone of thick and tall vegetation around shorelines.
- Avoid using any fertilizers or pesticides near a lake or water source. Choose eco-alternatives such as organics, naturalized and native lawns and gardens.
- Be conscious of what substances you flush down the drain or toilet: avoid putting fats, oils or antibacterial products into your septic system.
- Use less water whenever possible. The amount of water that goes through your septic system affects the amount of nutrients or pollutants being washed into the lake.



Well/Aware





## Maintain Your Septic System

- First pump your septic system then have it inspected in 2 year's time. This will provide the qualified technician with sufficient information to recommend how often your septic system should be pumped. (Frequency will depend on use and household size)
- Avoid the construction of patios, decks, parking areas or tennis courts in the area of the septic tile bed. Extra weight could crush pipes or compact the soil, limiting its permeability.
- Do not use snowmobiles over the leaching bed area in winter; this will reduce the snow cover's insulating effect. In addition, ATVs and snowmobiles can also compact filtration material.
- Have an effluent filter installed in your septic tank, to reduce the amount of solids entering the leaching bed, which prevents clogging.
- Ensure access to the septic tank for proper maintenance and servicing.
- Avoid planting certain species of trees around the leaching bed area. Willow roots can clog pipes and shade the septic area, slowing evaporation.
- Do not water your lawn around leaching bed area; extra water can reduce the bed's ability to absorb and treat waste water from the house.
- Direct rainwater from roofs, patios and driveways away from the leaching bed to avoid system overload.

Contact your local health unit for more information and visit  
[www.wellaware.ca](http://www.wellaware.ca) .



## Shoreline Erosion and Stabilization

Caring for your shoreline means less work, not more! You will help preserve water quality and safeguard your family's health. You will also help protect the beauty of your paradise, maintaining its investment value. Extra benefits include more time to relax and enjoy!

– Waterfront Living, [www.livingbywater.ca](http://www.livingbywater.ca)

Shorelines erode for various reasons: natural wave and wind action, ice action (freezing and thawing) and such human activities as altering the waterfront with lawns, docks and break walls. When soil is exposed and vegetation is cleared or kept mowed to the water's edge, the stabilizing effect of root systems is lost, which in turn opens the land to the power of the waves, ice and surface runoff. It is important to remember that erosion is a natural process and no shoreline treatment will stop it. At best we can implement practices that will reduce the impacts of erosion.

Despite their popularity, natural erosion cannot be prevented with concrete shore walls or sloped rock. Both of these measures are expensive and temporary fixes. Major storms, ice damage and the effects of time eventually cause these to fail. Hardened shores in one place may also mean more erosion problems at neighbouring shoreline areas, when wave, flow and ice energy is deflected elsewhere.

Although simple sloped rock protection may offer small feeding and refuge spaces for fish and aquatic invertebrates, a fully naturalized shoreline is generally considered the best multi-purpose approach to protecting the lake's edge. Water and ice energy is easily dissipated as it washes up the shore slope, and deep-rooted vegetation acts to further stabilize near-shore soils. Restoring your shoreline or leaving it in a fairly natural state is the best strategy for shoreline property owners to use against shoreline erosion.



Kawertha Conservation



Before



Kawartha Conservation

After



Kawartha Conservation

Joe Fowler Park, Port Perry, Ontario. Restoration undertaken by Scugog Lake Stewards.

## Techniques to Reduce Shoreline Erosion

- Encourage a buffer zone of native vegetation. The buffer zone can be as little as three metres wide, as long as it contains a variety of native species.
- Maintain a smaller lawn away from the waterfront; a pathway may be mowed for access down to the water, but keep any development well back from the lake.
- “Rip rap” (stabilizing a shoreline with rocks) can be expensive and in certain situations may reduce fish habitat.
- Existing armour stone or gabion baskets can be modified to incorporate some slope and natural vegetation to extend the life of your retaining wall and improve habitat.

## Restoring Developed or Damaged Shorelines

### **Vegetated Buffer Zone**

Plant native species of trees and shrubs with a variety of other aquatic and upland plants. Biodegradable erosion-control fabric can be effective when used with native plants; it holds the soil while allowing plants to grow through it.



Kawartha Conservation

### **Loose Rock Buffer Zone**

In some instances, loose rocks can be placed on a gradual slope and used to stabilize an eroding shoreline. Native shrubs and vines should be planted among rocks and will provide natural protection to absorb and dissipate wave action.



Kawartha Conservation

### **Bioengineering Techniques**

Vegetated geogrids and bundles of branches, or “wattles,” staked into the bank will protect the shoreline from eroding. (See photo at right) Live stakes or posts of willow or red osier dogwood also work to stabilize eroding shorelines. Brush layers can be used on steeper banks where deeper reinforcement of the soil is needed.



Kawartha Conservation



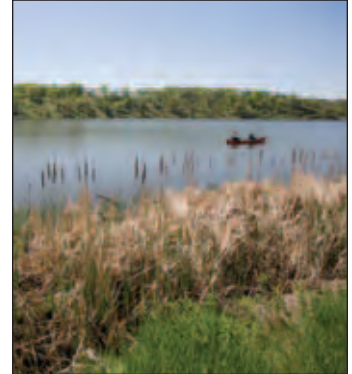


## Buffer Zones Help Protect Our Lakes

There are many benefits of maintaining a shoreline buffer zone:

- Provides food and shelter for many fish and wildlife species
- Protects your property and investment
- Prevents Canada geese from becoming a nuisance animal
- Holds onto fine bottom sediments, keeping them in place
- Absorbs wave energy, preventing shoreline erosion and ice damage
- Takes less work to maintain than a larger lawn
- Prevents surface runoff and contaminants from entering lake water
- Restores the ecological functions of the lake's ecosystem
- Protects your health

Protect the natural shoreline by replanting areas that lack trees and shrubs, and maintaining those areas that already exist. Keep a smaller lawn and leave a wide buffer area of trees, shrubs and indigenous vegetation around all shoreline areas. All development should be kept at least 30 metres away from the shoreline.



Consult with your local authorities whenever you plan to restore or alter the aquatic area of a shoreline buffer. For more information, check with your local Conservation Authority, Ministry of Natural Resources (OMNR) or Trent-Severn Waterway (TSW) before making any changes or restorations to your shoreline. Your restoration project may even be eligible for government funding and free assistance!

Other agencies who may be able to help include Peterborough Green-Up, the Department of Fisheries & Oceans Canada, the Federation of Ontario Cottagers' Association, your local stewardship council, the Gaming Centre for Sustainable Lakeshore Living, the Kawartha Lake Stewards and the Scugog Lake Stewards.

(Please refer to the Contact Information page.)







## Planting Local Native Species

“Native plants are an important part of our natural heritage. They have adapted to our soils and climate, and they provide homes and shelter for many other types of life. This in turn fosters a healthy, balanced ecosystem, which is more resistant to damage by pests and diseases.”

– Peterborough Green-Up, Native Plants Factsheet

### “Why Should I Plant Native Species?”

Native (indigenous) plants thrive on minimal care and maintenance. They are so well adapted to living in their natural ecosystems that they do not need the chemical support their exotic counterparts depend on to survive. Native plants will even withstand moderate drought conditions.

By providing shelter to local wildlife species that are losing their natural habitat, native plants contribute to biodiversity and the preservation of local gene pools. Native plants also give your property a sense of place. Indigenous wildlife species such as birds, bees and butterflies all help to bring a native plant garden to life. With a wide variety of beautiful wildflowers, such as the black-eyed susan (left), your landscape will be a splendour of colours throughout the seasons.



Ask for native plants at your local garden centre and make sure that the plants you purchase are native to the immediate area. Never dig plants from the wild. The risk of damaging a flourishing natural area is unnecessary when many sources of cultured native plants are becoming available. Some native species to consider would be Virginia Creeper, Highbush Cranberry, Red Osier Dogwood, Wild Grape, Shrubby Willow, Meadowsweet, Sweetgale, Sumac, and Alder. Take a look at what species grow naturally in your area. Those species should do well on your site as well. Be sure to also check out Peterborough Green-Up's ([www.greenup.on.ca](http://www.greenup.on.ca)) "Restoring Healthy Shorelines" factsheet for a comprehensive list of native trees, shrubs and grasses. You'll also find a list of local area suppliers.





# Lake Management Planning

“There is an amazing amount of knowledge and experience around every lake.”

– Don and Ruth Benson, Mountain Lake, Minden

If there isn't a lake management plan in place already for your lake, consider getting one started. Lake management plans give you the big picture, helping you to recognize and protect the unique character of a lake while you consider land use and larger watershed matters. A well-developed plan empowers the community and brings the public together around the sustainable future use of our lakes.

## Lake management plans

- Encourage partnerships between concerned citizens, lake users, resource managers, municipalities and other special interest groups
- Identify concerns that people feel are important to address
- Set realistic goals, objectives, and action plans

The main role of the lake management planning advisory committee is to make sure all viewpoints and interests are considered during the planning process. A comprehensive management plan includes information about the size of the watershed, hydrology and precipitation patterns. It should also address key issues including:

- |                     |                             |
|---------------------|-----------------------------|
| Water quality       | Exotic species              |
| Land use and zoning | Surface water use conflicts |
| Public water access | Fisheries management        |
| Aquatic vegetation  | Wildlife                    |





## Securing Your Shoreline Property for the Future

More and more waterfront owners want to leave a legacy for the health of their lake or river. There are several options for doing so, each with potential for significant tax benefits. These options include:

- donating all or a part of the land to a conservation organization
- leaving it to such a group in your will, or now with rights to still use it
- transferring it to a good steward or with conservation conditions, and
- entering into a conservation agreement that allows your continued enjoyment of the property but puts conditions on use to ensure your stewardship efforts will be maintained long into the future, regardless of who may come to own it.



James Wilkes

New tax rules now allow a donation of ecological land, conservation agreement or securities to a conservation charity to be exempt from capital gains tax and qualify for enhanced claim limits. In some cases, such arrangements can reduce your property or other taxes or make it easier for a purchaser to acquire land. U.S. residents may also be able to benefit from U.S. tax incentives. These options can allow creative arrangements to meet owners' specific needs. To explore these further, it is helpful to contact a local conservation organization with experience, such as the Kawartha Heritage Conservancy, Haliburton Highlands Land Trust or your local conservation authority. With the right option, your shoreline stewardship can become a long-term legacy for your lake or river and your community.

**Kawartha Heritage Conservancy: 705-743-5599**

**Website: [www.kawarthaheritage.org](http://www.kawarthaheritage.org)**

**Haliburton Highlands Land Trust: [www.haliburtonlandtrust.ca](http://www.haliburtonlandtrust.ca)**

**705-754-2532**





## Best Management Practices for Lake Stewardship

- Maintain a smaller lawn, or get rid of the lawn and avoid mowing altogether.
- Plant and maintain a buffer zone of native vegetation around the shoreline and avoid removing vegetation that is close to water.
- Eliminate the use of toxic pesticides, herbicides and fertilizers. If absolutely necessary, use organic and low impact products.
- Plant only native species of flowers, shrubs and trees.
- Clean and inspect your boat before moving it to other lakes to control the spread of invasive aquatic species.
- Contact your local conservation authority, Ministry of Natural Resources or Trent-Severn Waterway office if you intend to build on or near the water's edge.
- Maintain your septic system.
- Practise water conservation both inside and outside your cottage.
- Use caution with the storage and use of gas, oils and other chemicals.
- Keep your speed under 10 km/h within 30 metres of shorelines to protect fish habitat and limit erosion.



James Wilkes

Take care of your lake so future generations can enjoy it too!

**In addition to this using this valuable resource, we encourage you to learn more, to attend events and to get involved in lake stewardship. Contact our partners or visit their websites frequently for details.**

"When one tugs at a single thing in nature, he finds it attached to the rest of the world."

- John Muir





## Glossary

**Aquifer:** an underground layer yielding groundwater for wells and springs

**Ballast water:** water taken up or released by boats to keep steady when lightly loaded

**Buffer zone:** a strip of vegetation, including native vegetation, located between developed land and a lake, stream or wetland. A buffer zone protects the water, adds beauty and provides habitat for wildlife.

**Dissolved oxygen:** the amount of free oxygen dissolved in the water. This is used by aquatic organisms to “breathe.”

**Exotic species:** plants or animals that are not native to an area

**Gabion:** a cylindrical wire basket filled with earth and stones

**Invasive species:** exotic plants or animals that compete with (and overtake) native species

**Littoral:** the area of shallow water along the lake edge

**Permeable:** porous; allows water to pass through

**Rip rap:** small pieces of blast rock, usually limestone, placed to prevent erosion

**Sediment:** material that has settled at the bottom of a body of water

**Vegetated geogrid:** natural or synthetic material wrapped around soil with live branch cuttings placed in it



# Contributors

The Lakeland Living Guide has been produced by the



“Natural Shorelines, Healthy Waters.”

The Lakeland Alliance is a collaboration of the following organizations and government agencies that are working together for natural shorelines and healthy waters throughout the greater Kawartha Lakes watershed.

- Bancroft Area Stewardship Council
- Federation of Ontario Cottagers' Associations
- Fisheries and Oceans Canada
- Haliburton Highlands Stewardship Council
- Kawartha Conservation
- Ministry of the Environment- Lake Partner Program
- Otonabee Conservation
- Peterborough County Stewardship Council
- Peterborough Green-Up
- Victoria Land and Water Stewardship Council

Information and material for this guide was composed and assembled by students of the Ecosystem Management Technology program at



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## Contact Information

### Stewardship Councils [www.ontariostewardship.org](http://www.ontariostewardship.org)

Bancroft Area Stewardship Council 613-332-3940 xt. 260  
Haliburton Highlands Stewardship 705-286-5206  
Peterborough County Stewardship 705-755-1951  
Victoria Land and Water Stewardship Council 705-755-3362 or 705-324-1478

### Conservation Authorities

Kawartha Conservation [www.kawarthaconservation.com](http://www.kawarthaconservation.com) 1-800-668-5722  
Otonabee Conservation [www.otonabee.com](http://www.otonabee.com) 705-745-5791

### Provincial Government

Ministry of the Environment's Lake Partner Program  
[www.ene.gov.on.ca/envision/water/lake\\_partner/](http://www.ene.gov.on.ca/envision/water/lake_partner/) 1-800-470-8322

### Federal Government

Fisheries and Oceans Canada [www.dfo-mpo.gc.ca](http://www.dfo-mpo.gc.ca) 705-750-4012  
Trent-Severn Waterway  
[www.pc.gc.ca/lhn-nhs/on/trentsevern/index\\_e.asp](http://www.pc.gc.ca/lhn-nhs/on/trentsevern/index_e.asp) 705-750-4900

### Other Organizations

Federation of Ontario Cottagers' Associations (FOCA)  
[www.foca.on.ca](http://www.foca.on.ca) 416-429-0444.  
Gaming: Centre for Sustainable Lakeshore Living  
[www.Gaming.org](http://www.Gaming.org) 705.799.7083  
Kawartha Lake Stewards Association  
[www.trentu.ca/academic/oliver/KLSA.shtml](http://www.trentu.ca/academic/oliver/KLSA.shtml)  
[kawarthalakestewards@yahoo.ca](mailto:kawarthalakestewards@yahoo.ca)  
Peterborough Green-Up [www.greenup.on.ca](http://www.greenup.on.ca) 705-745-3238  
Scugog Lake Stewards [scugoglakestewards@yahoo.ca](mailto:scugoglakestewards@yahoo.ca)



The Lakeland Alliance would like to acknowledge the financial support of the Ontario Trillium Foundation.







# *Landowner Guide* to Protecting Water Quality in the Kawarthas

*The tips provided in this handbook are intended to help you identify sources of nutrients, such as phosphorus and nitrogen, while providing information on best management practices for your property. At the same time, we believe that these practices have the potential to improve your property value, enhance personal enjoyment of our urban, shoreline, and rural environments, and contribute to healthier lifestyles.*



**KAWARTHA  
CONSERVATION**

Discover • Protect • Restore





# How to use this guide

This guide uses a seasonal approach to the implementation of best management practices (BMPs). You will find information throughout the booklet to help you reduce your impact on local lakes and rivers. Good water quality and a healthy, sustainable environment are a result of responsible home and property management choices. Evaluate the current activities on your property as you read through the guide. You will find easy ways to make a positive change to your land use practices. Other options are presented that may be more challenging, but your actions will have multiple benefits, including saving you additional effort, time, and money, and protecting the long-term quality of water.

Production of this guide has been supported by:



Funds provided by RBC Foundation



Reviewed by:

*Cedar Point Cottagers Association  
City of Kawartha Lakes - Economic Development  
Federation of Ontario Cottagers' Association*

*North Pigeon Lake Rate Payers Association  
Scugog Lake Stewards Inc.  
Victoria Stewardship Council*

Proud to work in association with our municipal partners:



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# The Value of our environment

The natural world is too often taken for granted and undervalued. A healthy, resilient natural environment is the basis of sustained economic growth, flourishing urban and rural communities, and the personal well-being of its residents and visitors.

When properly managed, ecosystems provide us with vital goods, such as agricultural products and fisheries, life sustaining services, such as pollination and water purification, and life-enriching contributions that include beautiful surroundings and healthy people. Often, the important ecosystem services are only appreciated after they stop being productive or impact our ability to use our lakes and waterways!



***Clean water and a healthy environment are critical for our own health, and the sustainability of our local economy. It is the foundation of tourism, agriculture, recreational opportunities and the quality of life in the Kawartha region.***



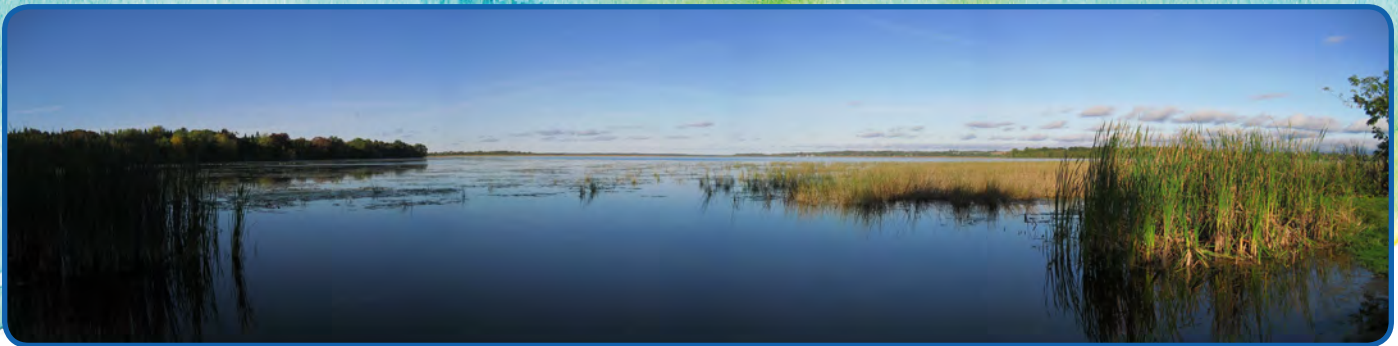
Waterfront properties in the Kawartha region represent hundreds of millions of dollars in real estate, with tourists as well as seasonal and permanent residents stimulating significant economic activity. A healthy Kawartha watershed supports:

- One of the most significant fishing destinations in Ontario
- Marinas and many other businesses that depend on healthy lakes
- A strong and vital agricultural sector
- Waterfront land values on hundreds of kilometres of shoreline
- Four-season recreational opportunities
- Wildlife and their habitats
- A major source of drinking water.





This handbook is supported by research undertaken by Kawartha Conservation lake management planning. Our studies are showing that relatively small urban areas and lakeside communities are responsible for a large percentage of the nutrients impacting our lakes, rivers, and streams.



McLarens Creek Wetland in Ken Reid Conservation Area, Sturgeon Lake. Wetlands filter and clean water, prevent flooding, and provide vital wildlife habitat.

## Nutrients

Nutrients, such as phosphorus and nitrogen, contribute to eutrophication in water bodies. Eutrophication is a process of increased productivity of a lake as it ages. This process can be greatly accelerated by human influence and is then termed 'cultural eutrophication.' In effect, our actions can cause lakes to get old quickly. It's important that we reduce our impact, so that we can extend the life of our lakes.

### What happens in human-influenced eutrophic lakes?

- Increased amounts of algae
- Increased growth of aquatic plants and weeds
- More fish kills (due to less oxygen in the water)
- Bad colour, smell, and appearance of water.



Excess aquatic plants can take most of the oxygen from the water through respiration and decomposition. This creates a low-oxygen environment which can lead to the death of fish and other aquatic wildlife.

## Where do the nutrients in our lakes come from?

<b>Residential and urban runoff</b>	Fertilizers, pet waste, and organic material picked up by rain and snow melt that enters ditches and storm drains, or flows directly into the lake
<b>Soil erosion</b>	Soils contain nutrients and cover up important fish spawning sites
<b>Agricultural runoff</b>	Livestock waste, fertilizers and soil picked up by rainwater runoff, and outdated ploughing methods instead of recommended tillage practices
<b>Rural road runoff</b>	Road, ditch, and bridge maintenance and erosion during construction
<b>Feces from birds</b>	Canada geese, ducks (especially large groups which gather to be fed by people), and other wildlife
<b>Atmospheric deposition</b>	Nutrients in rain and dust that fall from the sky
<b>Septic systems</b>	Effluent that seeps through the ground
<b>Sewage treatment plants</b>	Treated effluent released into lakes and rivers



# Spring

*We can protect water quality, and reduce our impact on the environment by how we care for our home and property. Trees, shrubs, and other plants help clean the air we breathe and filter the water we drink. Maintaining your yard and property with water quality in mind can contribute to a healthier and more livable community for you and your family.*

## Your lawn

While grass-free landscaping is becoming more popular, people may still maintain grassy areas for various activities, while others just want that perfect, green lawn. The basic requirement for a healthy lawn is good soil. There are excellent natural solutions you can use to improve your soil.

**Let it grow.** Longer grass (6 cm to 8 cm in length) will contribute to a healthier lawn by absorbing more water and nutrients, leading to improved root and soil structure.

**Let your lawn breathe!** Aeration creates small holes, loosens the soil, and removes thatch (dead grass) to allow water, nutrients, and oxygen reach the root system. Try wearing spiked golf shoes while pushing your mower. This will help ensure a lush, thick, green lawn that can out-compete most weeds.

**Over-seeding.** The thicker the grass, the less chance the weeds will have to survive. Use grass species that are suitable to your growing area. Species such as rye and fescue grass are native and drought tolerant. They are also more pest-resistant, hardy, and develop strong root systems that help reduce erosion.



**Apply compost to your lawn.** A thin layer of compost (or soil containing compost) applied each spring will contribute to a healthy lawn by nourishing the grass and increasing the organic matter in the soil.

**Reduce foot traffic during wet periods.** Compacted soils decrease the ability of roots to grow. Consider foot paths or stepping stones in high traffic areas.

*The thicker the grass, the less chance weeds will have to survive.*



## If you fertilize...fertilize responsibly

Nitrogen is the only nutrient which may need to be applied each year. Phosphorus and potassium can remain in the soil for years. Over-applying fertilizer translates to a waste of personal effort, loss of money, minimal effect on your grass, potential damage to lake and river ecosystems, and an overall negative effect on the watershed.

If you feel that fertilizing is necessary, please minimize the amount you use:

- Determine what nutrients are needed and how much by getting a soil test.
- Be accurate with your applications – fertilizer particles that end up on the sidewalk or other hardened surfaces will find their way to the storm drain, and then into our lakes and rivers.

The Ontario Ministry of Agriculture, Food and Rural Affairs offer a list of Accredited Soil Testing Laboratories in Ontario. See <http://www.omafra.gov.on.ca/english/crops/resource/soillabs.htm> or call 1.877.424.1300.



*Choose Zero  
Phosphorus  
Fertilizer*

### *The 3 main nutrients required by lawns*

Nitrogen (N)	Phosphorus (P)	Potassium (K)
Promotes green colour	Supports root development	Fights drought
Encourages growth	Improves longevity	Ensures thickness

## Using natural pest solutions

If you have a pest problem, avoid releasing harmful chemicals by using these alternatives.

**Diatomaceous earth** is a dust that contains microscopic, razor-like edges that create an obstacle for insects. This type of pest control works well on insects such as aphids, earwigs, and worms.

**Deter snails** by surrounding your plants with coffee grounds, crushed egg shells, sawdust, or rocks. The rough edges of these materials make it uncomfortable for them to get by.

Round up slugs with beer. Bury a glass jar at the same level as the ground. Fill the jar with dark beer almost to the top to trap the slugs. Slugs are attracted to the yeast contained in the beer.

**Research!** Determine which pest you are dealing with and find the appropriate natural treatment.

## What about compost?

Compost is considered a soil amendment, not a fertilizer. It contains limited nutrients. Organic matter will improve the drainage and aeration of clay soil, and help sandy soil hold water and nutrients. Applying compost will improve the condition of your soil, and ideally eliminate the need for any fertilizer product. For more on composting, see page 16.



# Your garden

## Mulching

Mulch can play an important part in establishing a water-efficient garden. It is best done in the late spring, shortly after the soil warms. It will give your plants enough time to sprout and allow you to easily work around them.

### Tips

- Apply the mulch evenly. Avoid direct contact with the stems of plants and the trunks of trees to allow air flow to the base of the plant.
- Organic mulches include any material of natural origin that decomposes naturally, such as bark chips, grass clippings, straw, leaves, compost, rice hulls, or saw dust.



Hardwood mulch

### Why mulching?

- Organic mulches decompose over time and increase the health of your soil, saving you time and money.
- Mulch reduces water loss due to evaporation by up to 70 percent.
- Mulch blocks out the sunlight that certain weed seeds need to germinate. If a weed does sprout, it is much easier to remove from the mulch than the soil.
- Mulch works to moderate the temperature in the soil, and reduces the extremes to which plants are exposed. Plants prefer a steady temperature in order to maintain vigour and maximize growth.



Mulch can inhibit weed germination and growth.



A soaker hose slowly releases water into the soil.

## Watering your garden

**Soaker Hose** - Made from recycled car and truck tires, a soaker hose is round, like a garden hose, but very porous. When it is filled with water, it seeps from small holes, allowing water to soak slowly into the soil around plants. Consider attaching this hose to your rain barrel for effortless and effective watering.

**Drip Irrigation** - Provides water at exact intervals. Plants next to the nozzles get water, while nearby weeds that might compete for the water do not.

## Attracting pollinators

Birds, bees, butterflies, and other native species play a vital role in both our food chain and in nature. By constantly feeding and moving, they are transferring pollen between plants. This is essential to the survival of many plants, including our food sources. Of the foods we consume, one in three requires pollination.

Bees and other pollinator populations face many threats that are contributing to their decline. These threats include parasitic mites, bacteria, pesticides, and a loss of wild space (habitat). It is important to provide a variety of shapes, colours, and flowering periods within the urban garden to offer food and shelter for this important group of species.



Native willows are an important food source for pollinators.



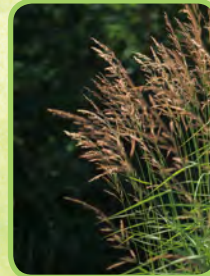
**Native grasses, perennials, shrubs, and trees are attractive, low maintenance, and effective natural filters.**

### Grasses

- Big Bluestem (*Andropogon gerardii*)
- Bottlebrush Grass (*Elymus hystrix*)
- Canada Bluejoint (*Calamagrostis canadensis*)
- Canada Wild Rye (*Elymus canadensis*)
- Prairie Cord Grass (*Spartina pectinata*)
- Indian Grass (*Sorghastrum nutans*)
- Switch Grass (*Panicum virgatum*)



Indiangrass



Bluejoint



Big Bluestem

### Native Perennials for Sunny Areas

- Wild Bergamot (*Monarda fistulosa*)
- Black-eyed Susan (*Rudbeckia hirta*)
- Butterfly Milkweed (*Asclepias tuberosa*)
- Cardinal Flower (*Lobelia cardinalis*)
- Gray-headed Coneflower (*Ratibida pinnata*)
- Joe Pye Weed (*Eupatorium maculatum*)
- New England Aster (*Aster novae-angliae*)
- Spiked Blazing Star (*Liatris spicata*)

*Why choose native grasses, shrubs, and flowers?*

Most lawns in the Kawartha region are planted with non-native turf grasses like Kentucky blue grass. The short roots of turf grasses do not absorb and filter water effectively. This contributes to increased levels of polluted storm water runoff that enters rivers, lakes, and streams.

### Native Perennials for Shady Areas

- Great Lobelia (*Lobelia siphilitica* L.)
- Large-leaved Aster (*Eurybia macrophylla*)
- Ostrich Fern (*Matteuccia struthiopteris*)
- Trout Lily (*Erythronium americanum*)
- Wild Columbine (*Aquilegia canadensis*)
- Woodland Sunflower (*Helianthus divaricatus*)

### Flowering Shrubs and Trees

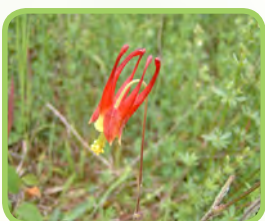
- Bebb's Willow (*Salix bebbiana*)
- Nannyberry (*Viburnum lentago*)
- New Jersey tea (*Ceanothus americanus*)
- Red Maple (*Acer rubrum*)
- Red osier Dogwood (*Cornus sericea*)
- Sage-leaved willow (*Salix candida*)
- Silver Maple (*Acer saccharinum*)
- Smooth Serviceberry (*Amelanchier laevis*)



Black-eyed Susan



Nannyberry



Wild columbine



Joe Pye Weed



Trout Lily



Red-osier Dogwood

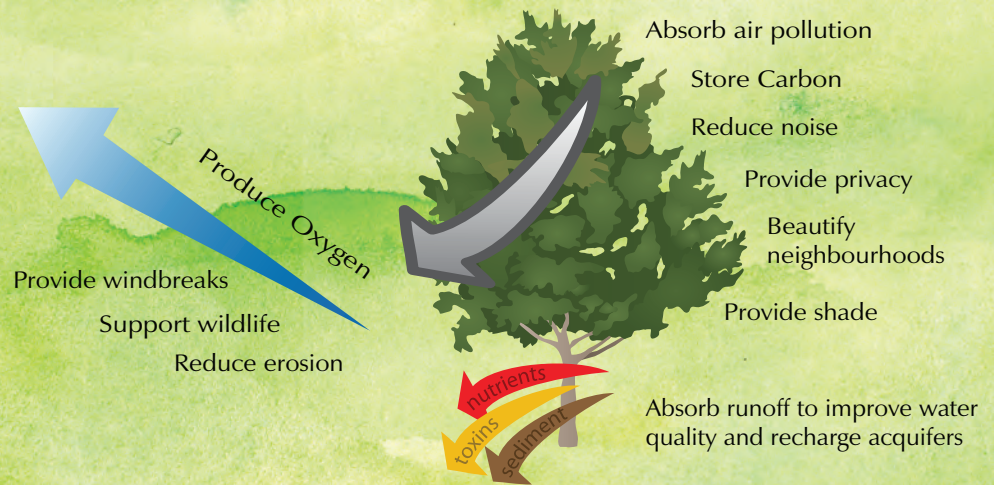


## The urban forest

The cool, wet weather of spring combined with moist soils are the ideal conditions for planting native trees and shrubs.

The trees you own and care for provide important ecological services for you and your community. You can help increase the health and livability of your neighbourhood by planting native trees on your property.

## Why are Trees Valuable?



### Did you know?

- A 10 metre tall tree, properly spaced, reduces annual heating and cooling costs of a typical home from 8 to 12 percent.
- A mature tree canopy reduces air temperatures by about 2 to 4 percent, moderating the internal temperatures of nearby buildings and cooling the surrounding air.
- The canopy of a street tree absorbs rain, reducing the amount of water that will fall on paved or hard surfaces. This helps minimize the amount of runoff entering our lakes and rivers.
- Shrubs and trees also provide habitat, shade, and promote rainwater absorption.
- Planting trees on your property is a simple but effective way to contribute to the health of our watershed. The type of tree is important, too. Native trees are the best choice because they are adapted to our local climate and perform well with minimal care, while providing essential life-giving services.



Valued for its syrup, wood, and beautiful fall colours, Sugar maple is one of the most important trees in Canada.



Mature urban trees help regulate temperatures and reduce the impact of rainfall events.

Staghorn Sumac seeds and fruits are eaten by many species of game birds, songbirds, and mammals.



### Native Trees in the Kawartha Region

- |                         |                                 |                 |
|-------------------------|---------------------------------|-----------------|
| • American mountain-ash | ( <i>Sorbus Americana</i> )     | 8 to 12 metres  |
| • Bur oak               | ( <i>Quercus macrocarpa</i> )   | Up to 10 metres |
| • Cockspur hawthorn     | ( <i>Crataegus crus-galli</i> ) | Up to 8 metres  |
| • Hop-hornbeam          | ( <i>Ostrya virginiana</i> )    | 5 to 2 metres   |
| • Sugar maple           | ( <i>Acer saccharum</i> )       | 20 to 35 metres |
| • White spruce          | ( <i>Picea glauca</i> )         | Up to 30 metres |
| • White birch           | ( <i>Betula papyrifera</i> )    | Up to 25 metres |

### Native Shrubs in the Kawartha Region

- |                  |                                |               |
|------------------|--------------------------------|---------------|
| • Beaked hazel   | ( <i>Corylus cornuta</i> )     | 3 to 4 metres |
| • Chokecherry    | ( <i>Prunus virginiana</i> )   | 2 to 3 metres |
| • Elderberry     | ( <i>Sambucus canadensis</i> ) | 3 to 4 metres |
| • Meadowsweet    | ( <i>Spiraea alba</i> )        | 1 to 2 metres |
| • Speckled alder | ( <i>Alnus incana</i> )        | 3 to 4 metres |
| • Staghorn Sumac | ( <i>Rhus typhina</i> )        | 3 to 4 metres |



# Runoff

## Creating a natural filter

Plants within 3 metres or more of any lake, stream, or ditch can help stabilize soil, absorb excess water and sediments, and use up some of the nutrients. One of the most basic methods of managing runoff beside a small waterway is to simply stop cutting the grass along either side. Even uncut grass acts as a 'natural filter.'

*Unprotected shoreline*



To increase the effectiveness of the filter, use native grasses, herbaceous, and/or woody vegetation with large root systems. Deep roots will help stabilize the bank, reducing potential ice damage and erosion, which can also impact water quality and wildlife habitat. Native plants increase biodiversity (butterflies, dragonflies, frogs, mink, and songbirds) and help cool surface waters by creating some shade. You will be contributing to better fishing opportunities, cleaner water for swimming, and improved water quality.

*Protected shoreline*



## Creating a rain garden



Roofs, driveways, patios, and other impermeable surfaces force a large amount of water to quickly run off into storm drains, ditches, and waterways. A rain garden is a planted depression in the yard that absorbs rain water from hard surfaces. It contains native grasses, wildflowers, and shrubs that thrive in wet conditions.

Rain gardens can reduce the amount of water which flows over the land and into storm drains by as much as 30 percent.

## Tips

- Rain gardens are most effective when curvy in shape and with the longest length running across the slope of the land.
- Start by digging a 4 to 8 inch depression with gradually sloping sides as large in circumference as you like. A good rule of thumb is to size your rain garden at 30 percent of the area of the roof from which it will be collecting water.
- Use the soil you removed for the needed depth of your garden to create a small berm (ridge) around the border of the rain garden to help hold large quantities of runoff.
- A 4" to 8" depth will allow water to be captured, but will commonly remain dry between rain events. If you have a large volume of run off to be captured, dig up to 18" in depth.



## *Suggested species for your rain garden*

- Bayberry*
- Black Chokeberry*
- Blue Flag Iris*
- Blue Vervain*
- Buttonbush*
- Canada Bluejoint*
- Fireweed*
- Porcupine sedge*
- Swamp Milkweed*
- Turtlehead*



## Directing runoff

Controlling the flow of rainwater across your property can help keep it from reaching storm drains, and allow it to percolate into the ground. Directing rainwater to the middle of your lawn will also keep it away from the foundation of your house. Downspouts that are connected to storm water or municipal waste water systems should be disconnected and redirected into the yard to take the pressure off municipal infrastructure.

### *Splash Blocks*

Available in multiple colours, shapes and sizes, splash blocks disperse rainwater over a wider area. Rainwater pouring out of your downspout can erode soil and cause moisture problems around your foundation. To avoid those headaches, splash blocks positioned beneath your downspouts can direct and distribute rainwater.



Splash block



Downspout extension

### *Extensions*

A downspout extension is a handy accessory that helps your downspout and gutters empty water away from your home and your foundation. These extensions are flexible for easy attachment and help to prevent soil erosion. Most are designed for an unobtrusive look and can be covered with mulch, straw, or stones for a subtle appearance.

### *Automatic Downspout Extenders*

These extenders automatically roll out during rain events to disperse water from your gutters, and then rewind on a spool when the rain stops. Moving rainwater away from your home can protect your foundation and prevent erosion.



Automatic downspout extender

## Managing pet waste

When the snow melts or when it rains, pet waste can be washed through storm drains and ditches into local waterways. This waste contains bacteria, potential pathogens, and nutrients. This can reduce opportunities for swimming, fishing, and other lake activities, while contributing to the growth of aquatic plants and blue-green algae. While it may not seem like a big deal if your dog 'contributes' some waste to the neighbourhood environment, consider how many homes have a pet.

**A conservative estimate is that 1/3 of all households in Canada have a dog that produces an average of 1/2 lb of waste per day. For example, if a town of 20,000 has 8,000 households and approximately 1/3 (2,500) are dog owners: 2,500 dogs x 1/2 lb daily = 1,250 lbs or 0.56 tonnes of dog waste per day!**



### *Tips for dog and pet owners*

- Pick up pet waste from your yard on a daily basis.
- Carry disposable bags while walking your dog to pick up and dispose of waste in the garbage.
- Do not add pet waste to your regular compost pile. Although pet waste composters and digesters may be something you would like to consider using on your property, the materials from pet waste composters are not considered appropriate for use in food gardens.



## Collecting rain water for a sunny day

Rain barrels help reduce the flow of storm runoff. When it rains, runoff picks up soil, fertilizer, oil, pesticides, and other contaminants from hard surfaces and landscapes. By using a rain barrel, you will have a ready supply of water for your garden and lawn, save money on your water or utility bill, and reduce large volumes of runoff from entering storm drains and local water bodies.

Rain barrels are now available in different shapes (squares, pyramids) and colours (red, blue, terra-cotta), and can be manufactured to fit any landscape. Using a rain barrel can save you a significant amount of money.

For each inch of rain that falls on 500 square feet (45 m<sup>2</sup>) of roof, you can collect about 300 gallons (1,135 L) of water.

### *Tips for selecting and maintaining a rain barrel*

- Select a barrel that can hold most of the rain that comes off your roof. In some cases, you may want to install one for each downspout or connect more than one together. If the barrel is elevated, a hose can use gravity to transfer water to your garden and lawn.
- Ensure that your rain barrel has a cover and a tight connection where water enters the barrel to prevent mosquito breeding and to limit the amount of debris which will enter the barrel. Most manufactured rain barrels include this feature.
- Keep your eaves troughs and downspouts clear of leaves and debris.
- Drain your rain barrel before the winter, to prevent the barrel from freezing and cracking.



With the barrel elevated, water easily flows out of the hose near the bottom into the watering can. Nearby gardens and lawn areas can also be watered through this hose.



The downspout empties into the top of the barrel, which features a small garden.

***Preventing a large rush of water across the saturated ground during heavy rainfall reduces the amount of sediments and other contaminants that can be picked up and carried into the storm sewer.***



# Summer

*During the summer, dry periods, combined with hot temperatures, can quickly turn that lush spring lawn to beige. Under these conditions, the grass normally becomes dormant. There can also be short periods of heavy rain that washes across hard surfaces and carries nutrients and other contaminants through the storm system into local rivers and lakes.*

## A natural green

Here are some tips for keeping your lawn it's healthiest during the summer and reducing runoff.

**Seven centimetres.** Grass that is longer in length makes for a strong, healthy lawn with fewer weeds. Weeds have a hard time taking root and growing when grass is 6 to 8 cm (2 to 3 inches) in height. In addition, longer grass has deeper roots and is therefore more resistant to dry periods. When it is time to cut the grass, make sure the mower blades are sharp!

**Grass-cycling.** Grass clippings are a free and natural fertilizer. It only takes grass clippings a few days to decompose into valuable food for your lawn. It also provides mulch to keep the roots cool and encourages natural soil aeration with earthworms.

*Keep the clover. It's a great plant to have in your lawn. Clover filters nitrogen from the air and fixes it to the soil, providing nutrients that help grass grow green and healthy. It also acts as a source of nectar for pollinators.*

**Soil testing.** If your lawn isn't looking the way you like, a soil test is an inexpensive and effective way to ensure you are adding the right nutrients to your lawn. These tests can save you time, money, and unnecessary fertilizer application.

**Soil management.** A naturally rich soil that is non-compacted and based on a top-dressing of compost can withstand drought better and allow your lawn to develop deeper roots.

## Applying the right amount of water

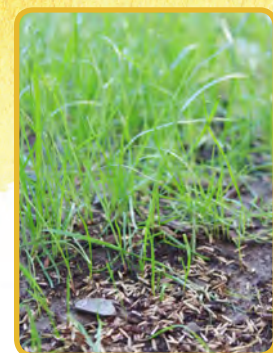
A healthy lawn does not require much water. It only needs 2 to 3 centimetres (1 inch) per week, either by rainfall or watering. Lawns are at their healthiest when they are watered deeply and infrequently.

**Measure it.** Use a rain gauge or place containers in various locations on your lawn while watering to determine when 1 inch or less of water has been applied.

**Monitor.** Sprinklers that shoot low to the ground are better than oscillating or fan type sprinklers which may lose much of their water to evaporation and wind. Be sure the water isn't being applied faster than it can be absorbed by the soil. Either reduce the flow or stagger the watering to ensure none is wasted. One hour of watering can use up to 1,300 litres (300 gallons) of water.

**Timing.** Be sure to water thoroughly but irregularly. This promotes the development of deep roots. Short, frequent watering will lead to short, weak roots. Manual or electric timers can be used to ensure you are watering at the proper times and intervals. Watering is most effective before 7 a.m. or after 8 p.m.

**Be O.K. with 'golden' grass.** Consider your browning lawn your 'golden lawn.' Dormancy is a natural part of the grass life cycle. Use this time to relax and celebrate the savings you are experiencing on your water bill.





**Dry soil.** Let the soil dry out between watering to avoid disease and prevent mould. Early morning is considered the best time for watering, as it will reduce the rate of evaporation. During mid-summer, over-watering the lawn makes it easier for germinating weed seeds to survive. Over-watering also encourages the eggs and grubs of lawn pests.

**Check with your municipality if there are any bans on watering, or specific days on which watering is permitted.**

## Hard surfaces

Residential and urban areas typically represent only a small portion of land use within a watershed, but are a major factor in determining the health of the waterways. For example, in the Lake Scugog watershed, urban areas represent only 3.5 percent of the land use but contribute 18 percent of the phosphorus to Lake Scugog.

As rainwater runs across sidewalks, driveways, and roads, it picks up sediments, nutrients (phosphorus and nitrogen), and other contaminants, such as petroleum and residues. It then makes its way through ditches or storm drains into local waterways—'roads to rivers.'



Hard, impervious surfaces channel rain and snow into water bodies. This runoff can carry high amounts of nutrients and other pollutants.

Many homeowners will attempt to improve drainage around their home by diverting water away from their property. Drainage concerns need to be addressed and fixed. Forcing water towards another property or onto the street only sends more contaminants into the storm water system.

## Letting the water seep through

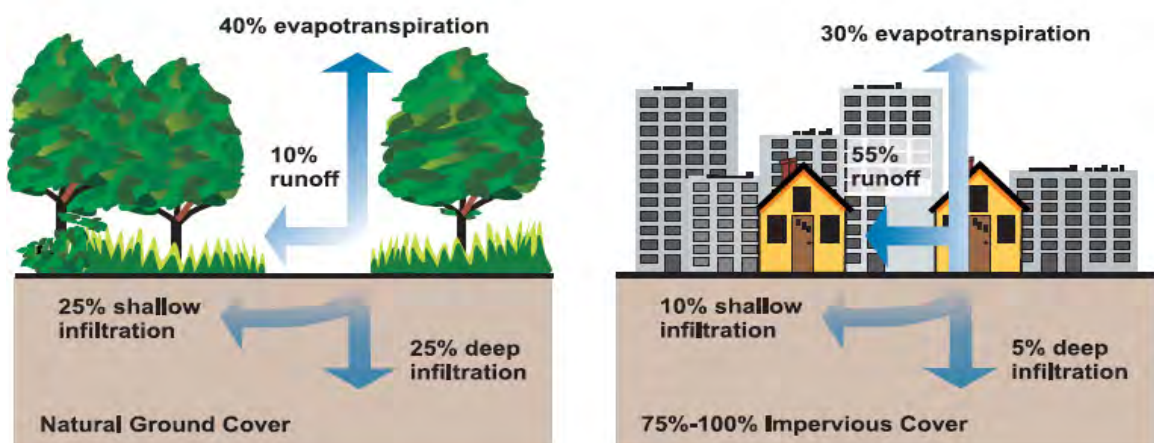
Permeable surfaces are those which allow rainwater to seep into the ground, sometimes as much as 60 percent. They can include grass swales, gardens, forests, as well as special paving materials, called permeable pavers.

The benefits of permeable pavers include:

- Long-term durability
- Recharge of groundwater aquifers
- Reduced water pollution
- Less storm water runoff.

When designing your site with permeable materials, several calculations and considerations must be made. First, it has to support the weight of cars or other loads over the expected lifetime. Always follow the manufacturer's specifications or use a professional installer.

With less hard-surface area, almost all rainfall is either taken up by plants, evaporates, or infiltrates back into the ground. As areas are built up with hard surfaces, rainwater runoff greatly increases, while evaporation and infiltration decrease substantially.





## Types of permeable materials

**Loose stones and gravel.** A stone driveway is exactly as it sounds; loose stones, usually placed over a gravel base. Water is allowed to infiltrate through the stones and into the soil, reducing excess runoff and trapping contaminants. Other types of pavers you can use include bricks or cobblestones.

**Permeable pavers.** These are interlocking pavers that fit together like puzzle pieces and have gaps between them to allow water to seep down into the ground. You can find different patterns, shapes, and colours to customize your surface.

**Pervious asphalt.** The difference between regular asphalt and pervious asphalt is the size of particles in the material. By adding a variety of particle sizes to the asphalt, the porosity is increased, allowing for more water to absorb into the ground.

**Pervious concrete.** Similar to pervious asphalt, pervious concrete reduces the amount of fine particles in the mix. The installation of this type of material requires professional and experienced installers, as the method is different from traditional concrete.



Circular paver blocks



Interlocking stone

## Washing the car and other vehicles

When cars are washed on hard, impermeable driveways, the water, soap, and grit from the car travels down the driveway to the storm drain or ditch, and, ultimately, untreated into your local river or lake. This contaminated runoff, even runoff containing biodegradable soap, can cause significant harm to aquatic plant life, fish and other animals. In short, something as seemingly harmless as a car wash can contribute to the decline of water quality.

### Avoiding paved surfaces



Although most of us wash our cars at a commercial car wash (automated or coin-operated car washes are generally more lake-friendly than washing your car at home!) recreational vehicles (motor homes, boats, all-terrain vehicles) are commonly cleaned at home.

If you are washing these vehicles on your property, use a minimal amount of phosphate-free soap and wash from a bucket, rinsing with a hose that has a sprayer attachment to conserve water. Direct the excess water toward a vegetated surface to encourage infiltration of the wash water and trap sediments. Whether you're washing something in the garage or washing an item on your lawn, or washing your dog outside in the backyard, that soap and water will find its way into local lakes and rivers. Use only the amount of water and soap necessary to get the job done, and ensure the water is absorbed by your lawn before it has an opportunity to run into the street.

Looking down the street at the gutters can be a good indicator of which land-use practices are occurring on individual lots in your community. Pooling, soapy water and piles of organic matter such as leaves and grass on the street or piled on the storm drain can suggest that an adjustment of practices is required to protect our lakes and rivers.

***Leftover soap and water should be poured into the sink or on the grass. Pouring the remnants of the bucket down the driveway sends that dirty, soapy water into the storm drain and into the local lake or river.***



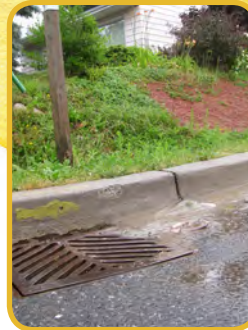
## Blue-green algae

Blue-green algae or cyanobacteria are a natural phenomena occurring in fresh water bodies. The amount of available nutrients (especially phosphorus and nitrogen) can determine the growth rate and amount of algae present in a water body. Phosphorus and nitrogen can enter the water in many ways:

- Soil erosion and poor run-off prevention
- Use of fertilizers on lawns and farm fields
- Poor maintenance of septic systems
- Detergents and phosphate soaps
- Grass clippings and leaves, either through the storm drain or blown directly into the water
- Pet waste.



Urban runoff and the resulting transport of soils, sediments, and nutrients into waterways can increase the potential for an algal bloom.



## Recognizing the signs of blue-green algae

Early identification is key to protecting the health of you, your family and your pets. Blue-green algae blooms have a specific appearance. Dense blooms appear bluish to green in colour, and the consistency can resemble pea soup. If the blooms are very large, they may form clumps in the water. A new bloom may also smell like fresh-mown grass, while the odour of an older bloom may resemble rotting garbage.

When blue-green algae are present, avoid all uses of the water, including swimming, fishing, bathing, or drinking. Blue-green algae present potential health risks for humans, pets, and wildlife. These include skin and eye irritations; and, if the water is consumed, nausea, vomiting, headaches, stomach pain, and diarrhea.

Boiling water with high levels of blue-green algae does not help. It causes the destruction of the cell wall, which may cause the algae to release more toxins.

***If you suspect a blue-green algae bloom, assume toxins are present and call the Ministry of the Environment Spills Action Centre at 1.800.268.6060.***

You can also contact your local Health Unit for further information on blue-green algae and the risks it poses to human health. The Ministry of Health INFOline can connect you to your local unit by calling 1.800.387.5559, or visit [http://www.health.gov.on.ca/english/public/contact/phu/phuloc\\_mn.html](http://www.health.gov.on.ca/english/public/contact/phu/phuloc_mn.html)





# Fall

*Fall is the time to prepare  
for winter and spring.*

*Late summer to early fall is considered the best time to establish a new lawn from seed. Fall germinations have reduced weed competition and, more importantly, have two cool growing seasons (fall and spring) before the heat-stress of the summer. Although fall is when the grass roots are storing nutrients for next spring, fertilizer applications are not recommended. Additional nutrients can force grass to expend unnecessary nutrients on new and untimely growth. Fall is an optimal time to plant or divide perennials and to amend the soil by aerating or adding organics if there is need for improvement.*

## Preparing your lawn and garden

**Over-seeding.** The best time to over-seed a lawn with perennial grasses is in the late fall (late-August to late-September, during a rainy period) to get a head start on creating a thick lawn for next spring. The thicker the grass, the more difficult it will be for weeds to thrive. Use grass species that are suitable to your growing area. Species such as perennial rye and fescue grasses are native and drought-tolerant, and do not require extra fertilizer. Native grass species are also more pest-resistant, hardy, and develop strong root structures which reduce erosion. To ensure success, apply a top-dressing or compost (1/2 inch in depth) before or after over-seeding.

**Thatch removal.** Before over-seeding, be sure to remove any over-abundant thatch. Thatch is a tightly intermingled layer of living and dead stems, leaves and roots which accumulates between the layer of actively-growing grass and the soil underneath. It is a normal component of an actively growing turf grass. Thatching requires that you either remove the dead grass with a lawn rake, or cut into the soil to provide air and proper circulation. If you de-thatch prior to the winter months, the grass will recover quickly and grow to its full potential in the spring.

**Consider compost.** Fall leaves can be turned into valuable compost to be used on your lawn next spring. Try mulching your leaves with a lawn mower and leaving these finer particles on your lawn and garden to offer nutrients and act as an insulator blanket for grass and perennials. They decompose very quickly, thereby contributing to the long term development of richer soil, and will give your garden a head start!

**Rake leaves instead of using a blower.** Once raked up, use leaves as mulch to protect plants throughout the winter or mix them into a compost pile. Multiple options exist for disposing leaves and other organic debris. Do not blow them onto the street or allow these materials to travel to the storm drain. Leaves, twigs, and grass add high levels of nutrients to our lakes and rivers, and contribute to a decline in water quality.



Leaf litter left on your lawn can add nutrients into the soil and acts as an insulator for your grass.



# Composting 101

Composting keeps materials out of landfills and literally adds something beneficial to the environment. Compost is decomposed organic waste transformed by bacteria and heat into a rich, soil-like material called 'humus.' Organic materials such as vegetables, fruits, leaf and yard trimmings, paper, and woody materials are used to create compost.

Compost can be added to your garden or applied as a top-dressing for your lawn to improve quality, texture, and water absorption of soils.

## What do you need to get started?

- Composter** Available at most hardware stores (or make your own from cedar stakes and chicken wire).
- Air** Turning and mixing the pile regularly is important. Try a tumbling composter to make it easier. Keep it moist but not too wet.
  - Carbon Leaves and tree trimmings (brown materials).
- Nitrogen** Kitchen waste and grass clippings (green materials).



Organic materials such as leaves, grass, and vegetable trimmings become a high quality soil amendment through composting.

The smaller the pieces you put into the composter, the faster the material will break down. Adding big mats of wet grass or leaves will mould rather than decay. Contact your local municipality to inquire about composters and related programs.

**If your compost isn't breaking down, add nitrogen rich material such as kitchen waste. Turning and aeration is necessary. If your compost smells like ammonia, add more carbon-rich material such as leaves or twigs. Do not add meats, fats, diseased, or insect-ridden plants, or weeds that have gone to seed.**

## Pool water



Pool water may contain high levels of chemicals which harm aquatic ecosystems.

Discharging swimming pool and hot tub water containing chlorine, bromine, or copper algaecides into lakes, streams, or into the storm drain damages water quality and is harmful to fish and other aquatic life. Before emptying, the water should sit untreated for at least 4 days to reduce the level of chemicals in the water. Testing the chlorine level and PH of the water can ensure it is safe to remove from the pool or hot tub. If needed, wait a few more days. As copper algaecides will gradually dissipate, do not add any algaecide two weeks prior to closing the pool.

The discharged water should be directed onto a vegetated surface (grass, rain garden, or swale) to encourage infiltration. The discharge should not flow onto any other person's property or create nuisance conditions. If the discharge flow is to occur over bare soils, care should be taken to prevent soil erosion. This can be done by reducing the rate of flow (use a small diameter hose) or using additional piping or hose lengths to transfer the water to a vegetated area. If chlorine or bromine levels in the pool are over 10 mg/L or 10 parts per million (ppm), let the pool water stand for at least one week before adding dechlorination tablets. This avoids the use of additional chemicals.



# Winter

*Pavement and concrete in urban areas prevent snow melt from seeping into the ground.*

*Instead, it runs off into storm drains, carrying the sand and salt applied to slippery surfaces into local waterways. Many people are under the false impression that it goes to a water treatment plant. In most cases, storm water and spring runoff flow directly into your local lake or river.*



Salt has been used to make roads safer for winter weather, but salt corrodes and pollutes, and may seep into water supplies.

## Salt alternatives

Sodium chloride (NaCl) and other salts are often used in excessive amounts to de-ice driveways and sidewalks. Numerous studies indicate that salt is contributing to problems in waterways and contaminating ground water resources. The key to eco-friendly de-icing is to use only as much as you need, or use a less harmful alternative. Adding extra salt doesn't melt the ice any faster.

### *De-icing Tips*

- Avoid salting surfaces which are never used or where sunlight melts the ice.
- Try an alternative, such as sawdust, wood chips, or a natural product containing baking soda or corn fibre.
- Be aware that even de-icers labelled as 'eco-friendly' may contain chemicals that can harm lakes, aquatic life, and plants.
- When you shovel, you can also make a difference. Shovel as soon as possible after a snow storm to avoid compaction and ice formation; and if it's a long-lasting storm, brave the weather and shovel while it snows.

**In the spring, be sure to sweep up any sand or other materials on the driveway and gathered near the storm drain before they are washed away with rain water.**



## Preventing erosion

Erosion can occur from rushing snow melt and seasonally high water levels along water courses. By preventing erosion, you will be keeping sediments and nutrients out of nearby lakes and rivers.

Over the winter and spring, make note of any erosion occurring on your property. Create a plan for putting in plants with deep, strong roots in these areas when the ground is workable and the weather appropriate. The plants will help slow down water and hold sediments and soils in place with their roots. Buffalo grass can be used in locations where a 'lawn-like' look is preferred. Native shrubs such as Sandbar willow, Silky dogwood, and Speckled alder can also be planted to minimize and prevent erosion.

## Other types of pollutants

Non-point pollution sources also affect our water, and add to the contaminants entering the system. Here are a few examples of materials that travel into local lakes and rivers via urban runoff:

- Hazardous household waste (HHW) improperly stored or discarded
- Motor oil and grease drippings from vehicles
- *E-coli* from pet and livestock wastes
- Litter and garbage
- Fertilizers and pesticides in gardens and in the home.



Leftover prescription medication, over the counter medications and vitamins require proper disposal. Ask your pharmacist about return programs to ensure these medications don't end up in local waterways.

## Disposing of hazardous wastes

Almost 40 percent of all household hazardous waste is improperly disposed of each year. Some of these materials can end up in lakes and rivers. While you are packing up your summer gear and getting ready for the first snow fall, consider checking your home and garage for items needing disposal at your local hazardous waste facility. Cold weather can cause containers to fail, allowing toxins to leach into the environment. For advice and information, please contact your local municipal service centre.

### *Household Hazardous Waste Materials (HHW)*

Here are some of the materials that require drop-off at your local hazardous waste facility:

- Bathroom Cleaners
- Medication
- Nail polish
- Perfume
- Drain openers
- Furniture polish
- Oven cleaner
- Car cleaners and wax
- Fire extinguishers
- Fluorescent light bulbs – mercury
- Batteries
- Detergents
- Lighter fluid
- Flea collars
- Fertilizer
- Pesticides
- Pool chemicals
- Slug or ant bait
- Old gasoline and other surplus petroleum products



Winter temperatures can damage HHW containers. Return unused or leftover materials to the proper facility before the first snowfall.



## *Making a real difference*

Can one household really make a difference? Yes! Our environmental challenges are a result of the many small things we do every day. What may seem like small changes are cumulative, and will catch on with the next generation and within your neighbourhood. When we each do a little, it adds up to a lot.

## *Suggested Reading and Online Publications*

### **A Homeowner's Guide to Stormwater Management**

[www.delawareestuary.org/pdf/HomeownersGuideSWMgmt.pdf](http://www.delawareestuary.org/pdf/HomeownersGuideSWMgmt.pdf)

### **Aquatic Plants in Lake Scugog: What's causing them and what you can do**

[www.kawarthaconservation.com/pdf/LakeScugogNutrientFactSheet.pdf](http://www.kawarthaconservation.com/pdf/LakeScugogNutrientFactSheet.pdf)

### **A Shoreline Owner's Guide to Lakeland Living**

[www.kawarthaconservation.com/pdf/Lakeland\\_Living\\_Guide.pdf](http://www.kawarthaconservation.com/pdf/Lakeland_Living_Guide.pdf)

### **Green Lawns, the Green Way**

[www.kawarthaconservation.com/pdf/GreenLawns.pdf](http://www.kawarthaconservation.com/pdf/GreenLawns.pdf)

### **Living in Town: What you can do to protect Lake Scugog**

<http://www.kawarthaconservation.com/livingintown/index.html>

### **Ontario Invasive Plant Council**

[www.ontarioinvasiveplants.ca](http://www.ontarioinvasiveplants.ca)

### **Plant wind breaks, save money**

[www.kawarthaconservation.com/pdf/MTO291\\_Windbreaks\\_Bro\\_EN.pdf](http://www.kawarthaconservation.com/pdf/MTO291_Windbreaks_Bro_EN.pdf)

### **The Shoreline Primer**

[www.kawarthaconservation.com/pdf/TheShorePrimer.pdf](http://www.kawarthaconservation.com/pdf/TheShorePrimer.pdf)

### **Toronto Homeowners' Guide to Rainfall**

[www.riversides.org/rainguide](http://www.riversides.org/rainguide)



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CONSERVATION**

Discover • Protect • Restore

**Kawartha Conservation**

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# Shoreline Protection

## Ice Ridges Fact Sheet

Winter can result in substantial changes to the shoreline of the lakes in our watershed. Ice can push mud, clay, soil, and rock from the bottom of the lake and from along the shoreline up onto the land, often resulting in large ridges or mounds. This process is often referred to as “ice heaving” or “ice jacking”. The mounds or ridges are referred to as “ice ridges”, “ice pushes”, or “ramparts”.



### Examples of ice ridges along Lake Scugog



## How does it happen?

- Ice on the lake expands naturally when temperatures increase, pushing outwards.
- Cracks form in the ice when there are different temperatures at the top and bottom of the ice and different expansion rates. This occurs more often when there is not a lot of snow cover to provide insulation and the top of the ice warms up more quickly. When water rises into these cracks and freezes, it causes the ice to expand and push out.
- Warming and cooling of the ice sheets with changing temperatures pushes the ice towards the shore and can scrape and push material from the lake bed and shoreline into mounds (Minnesota Department of Natural Resources, 2012).
- If ice ridges have occurred on your property, this means your shoreline is prone to ice heaving and you will probably continue to get more ice ridges over time.

# What You Can Do

All shoreline works require a permit from Kawartha Conservation per Ontario Regulation 182/06: Kawartha Region Conservation Authority Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses and may also require a permit from Parks Canada (Trent-Severn Waterway). It is your responsibility to obtain all necessary permits before you start any shoreline work. (Contact information on back.)

## ACTIONS THAT DO NOT REQUIRE A PERMIT

1. Do nothing - Let nature take its course. Ice ridges protect shorelines from ice and wave damage. They often create a barrier that prevents sediment and other nutrients from entering into the lake and at the same time they create fertile soil where plants can grow. The roots of the plants help to further stabilize the shoreline and take up nutrients as well as provide shade and habitat for birds, fish, and other wildlife.

2. Return your property to its original grade by following these steps:

- PROPERLY install a silt fence between the water and the disturbed area before any grading to ensure no sediment/soil enters into the water.

Note: Sediment particles contain nutrients and other water pollutants and can also adversely impact fish and smother fish eggs. Visit the Permits and Planning section of the Library on our Kawartha Conservation website ([kawarthaconservation.com](http://kawarthaconservation.com)) to obtain a fact sheet or contact us to obtain more information on the proper installation of a silt fence.

- Grade your lawn by leveling out the material pushed up on the property to return it to the original grade.

Note: Land lost to erosion cannot be reclaimed. You cannot use the material to create new land or extend your existing shoreline after it has been eroded.

- Keep the silt fence in place until the disturbed area is stabilized (i.e. vegetation has become established and there are no more bare soils).

Note: As ice heaving is a natural process, you may have to re-grade again in the future.



An example of an older ice ridge that has become vegetated and now provides some protection against future ice heaving.

3. Create a ramp through the ice ridge for water access. Consider keeping a portion of the ice ridge for shoreline protection and creating a ramp through the ice ridge to allow access the water. Any material you remove from the ice ridge should be placed elsewhere on your property. Please follow the steps identified in the points above.

## ACTIONS THAT REQUIRE A PERMIT

Do not proceed with any of the actions listed below (1-6) without first obtaining a permit from Kawartha Conservation and/or Parks Canada (Trent-Severn Waterway).

1. Pushing material that is on land back into the water and disturbing any material in the water or below the summer high-water mark.

Note: Material that is in or below the summer high-water mark of the lake (which would be in the water during the summer months) will naturally erode away and be re-deposited on the lake bottom as water levels increase. There are fish timing windows in place to protect spawning fish along the shoreline of the lakes. The timing window is March 31st to July 1st for most lakes. Do not complete any in-water work during this time to avoid impacts to spawning beds.

2. Changing the original drainage of your property or creating a new swale or ditch to drain water that is trapped on your property due to an ice ridge.
3. Completing any excavation work (i.e. digging into the bank or bed of the lake).
4. Placing any material (soil, gravel, etc.) from an off-site location on your property to change the grade or improve drainage.
5. Installing any shoreline treatment such as rip-rap, river rock, retaining walls (including armour stone), or other erosion protection measures.
6. Disturbing emergent aquatic vegetation (i.e., vegetation that is partially in the water and partially above it such as cattails) or shoreline vegetation. This vegetation provides important erosion protection and habitat for wildlife species.

Permit applications may be obtained by contacting Kawartha Conservation and Parks Canada (Trent-Severn Waterway). Contact information can be found on the back of this fact sheet.

## What you can do to protect your property from future ice damage:

**Mature Vegetation:** Mature woody vegetation (trees and shrubs) provides the best protection from ice damage and shoreline erosion. When this vegetation is removed from the shoreline, ice and wave erosion occurs more rapidly.

**Sloped Rock:** If you do not have mature woody vegetation, another successful shoreline treatment for protection against ice damage involves installing river rock in varying sizes at a 3:1 (horizontal:vertical) slope ratio (i.e., 33% slope) along the natural contour of the shoreline. The slope allows the ice to roll up onto the rocks and recede without pushing up ridges of earth or pulling earth back into the water. This maintains the natural functions of the lake, provides fish habitat, and offers erosion protection from ice.

Planting larger mature trees and shrubs within the spaces of the rocks adds additional protection from ice, stabilizes the underlying bank and the rocks, and provides habitat for wildlife. This may require annual maintenance to replace damaged vegetation or adjust any rocks that are moved by the ice.

**We do not recommend “hardened shorelines”.** Hardened shorelines such as retaining walls, sheet piles, armour stone, etc. create a vertical barrier. The force of the expanding ice can easily damage or destroy these vertical walls and cause more property damage. In addition, these walls eliminate fish habitat and can adversely affect the natural functions of the lake.

You must obtain a permit from Kawartha Conservation and Parks Canada (Trent-Severn Waterway) before installing any type of shoreline treatment, including sloped rock.



Remember: It is your responsibility to obtain all necessary permits before you start any shoreline work.

If you would like to learn more about shoreline treatments, or if you have any questions about obtaining a Kawartha Conservation, or Parks Canada permit, please contact our offices.

For Kawartha Conservation Permit information or for information about Natural Shoreline Treatments:

Kawartha Conservation

Call: 705.328.2271

Email: [geninfo@kawarthaconservation.com](mailto:geninfo@kawarthaconservation.com)

Web: [kawarthaconservation.com/stewardship/on-the-shore](http://kawarthaconservation.com/stewardship/on-the-shore)

For Parks Canada/Trent-Severn Waterway In-Water and Shoreline Work Permit information:

Parks Canada Agency

Call: 705.750.4923

Email: [information@pc.gc.ca](mailto:information@pc.gc.ca)

Web: [pc.gc.ca](http://pc.gc.ca)

Shoreline Policies: [pc.gc.ca/eng/docs/r/poli/page01.aspx](http://pc.gc.ca/eng/docs/r/poli/page01.aspx)



Above and below are examples of naturalized shoreline treatments that minimize ice damage. These include river rock of various sizes placed at a 3:1 (horizontal:vertical) slope ratio (i.e., 33% slope) along the contour of the shoreline. Above, the ice is free to roll up onto the rocks and recede without pushing up ridges of earth or pulling earth back into the water. This is highly recommended because it maintains the natural functions of the lake, is fish-friendly, and offers protection from ice. You must obtain a permit from Kawartha Conservation and Parks Canada (Trent-Severn Waterway) before installing any type of shoreline treatment, including sloped rock (as shown below).



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Trent Severn Waterway  
National Historic Site  
[parkscanada.gc.ca](http://parkscanada.gc.ca)

Lieu Historique National  
de la Voie-Navigable-  
Trent-Severn



# Solutions for Shoreline Erosion

## A Basic Guide to Bioengineering



CATARAQUI REGION  
CONSERVATION AUTHORITY



Mississippi Valley  
Conservation



Raisin Region  
Conservation Authority  
Office de protection de la  
nature de la région Raisin



SOUTH NATION  
CONSERVATION  
DE LA NATION SUD

Partners:

Ontario Ministry of Natural Resources  
Cataraqui Region Conservation Authority  
Mississippi Valley Conservation  
Quinte Conservation  
Raisin Region Conservation Authority  
Rideau Valley Conservation Authority  
South Nation Conservation

The materials found in this booklet are intended for information purposes only. Although it is our goal to provide accurate and relevant information, the success of bioengineering methods cannot be guaranteed. Any and all bioengineering activities are done at your own risk and require consent/approval from the proper authorities prior to any undertaking. Doing so without proper approval could result in fines and/or serious legal recourse.

Cette publication est également disponible en français.



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## What is Shoreline Erosion?

Soils along the shorelines of lakes, rivers and streams are gradually weathered, displaced and deposited by various forces including wind, water, ice, and gravity.

Although erosion is a natural process, it can be dramatically accelerated by changes in land use, such as removal of shoreline vegetation. Without the presence of a healthy vegetated buffer, shorelines have reduced resistance against erosion, potentially resulting in a loss of habitat, soil stability and land.

## What is Bioengineering?

Bioengineering is the combination of engineering techniques using natural materials and structures to stabilize soils. It is often used as a means of repairing/remediating shorelines from the effects of erosion with the intent of minimizing the overall impact to the environment. The end goal is a self-repairing shoreline that stabilizes soils, minimizes erosion and contributes to healthy habitat. Various bioengineering solutions are available depending on site specific conditions (slope, wave/water energy and soil composition).



Planting material



Coir fabric installation



## Why Consider Bioengineering?

Conventional methods, while potentially effective, may offer only a temporary fix to a dynamic problem.

Bioengineering:

- is low maintenance and self-repairing
- is cost-effective compared to conventional methods that need regular maintenance
- addresses a variety of contributing causes of erosion
- promotes good habitat value for fish and wildlife, while still addressing the issue of shoreline erosion
- can be less invasive compared to conventional erosion control methods

While the use of bioengineering methods to remediate shoreline erosion is beneficial, it may not always be an appropriate course of action if site-specific conditions limit the potential for this approach.



***Eroded shoreline with exposed roots and soil***



# Bioengineering & Your Shoreline: Planning Considerations

A shoreline is a dynamic system, with complex ties to both the terrestrial and aquatic environment.

Each property's shoreline is unique. Site conditions such as waterfront access, erosion type/source, soil type, existing vegetation, prevailing winds, wave action, fluctuating water levels and growing conditions need to be considered in your bioengineering project planning.

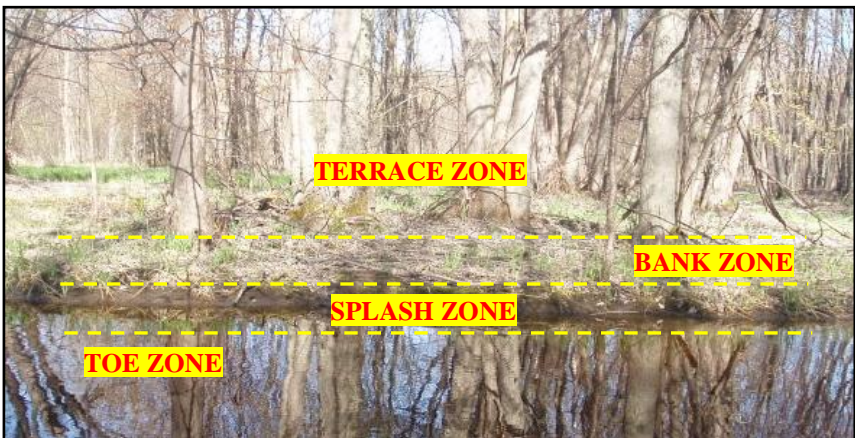
## 1. Shoreline Dynamics

Shorelines are made up of four zones that are subject to a number of natural and human-made erosive forces.

Table 1. Bioengineering by shoreline zones

Zone Type	Description	Erosion Source Example
Toe Zone	The bank portion between the lake/stream and the average water height	Boat wakes
Splash Zone	The bank portion which falls between the average range in high and low water levels	Ice movement/scour
Bank Zone	The section above the normal high water level	Mowing to water's edge/removal of vegetated buffer
Terrace Zone	Inland portion from the bank zone	Lack of upland vegetation






Allen, H & Leech, J.R. – Bioengineering for Stream Bank Erosion Control *U.S. Army Corps of Eng.*





## 2. Causes and Types of Erosion:

Table 2. Common sources and causes of shoreline erosion

Erosion Type	Description
 <p data-bbox="139 427 213 451"><b>Sheet</b></p>	<ul data-bbox="322 277 916 334" style="list-style-type: none"><li>• The impact of rain or runoff from upland areas moves and displaces soil</li></ul>
 <p data-bbox="93 703 256 727"><b>Wave Action</b></p>	<ul data-bbox="322 537 926 659" style="list-style-type: none"><li>• The wearing away of bank materials due to the impact of wave action along the shoreline</li><li>• May be natural or human-influenced (i.e., boat wakes)</li></ul>
 <p data-bbox="93 979 256 1003"><b>Undercutting</b></p>	<ul data-bbox="322 797 963 919" style="list-style-type: none"><li>• The displacement of shoreline material within the toe/splash zones in which the bank is cut out from underneath, leaving an open gap.</li><li>• Can be scoured out by ice movement</li></ul>
 <p data-bbox="93 1255 256 1279"><b>Slope Failure</b></p>	<ul data-bbox="322 1073 974 1195" style="list-style-type: none"><li>• Once bank stability has been compromised through loading and/or undercutting, the bank may collapse/slump, washing sediment and debris into the waterway</li></ul>
 <p data-bbox="118 1531 235 1555"><b>Rill/Gully</b></p>	<ul data-bbox="322 1365 958 1455" style="list-style-type: none"><li>• Periodic drainage paths which extend from inland to the shoreline, cutting into banks and washing sediment into the waterway</li></ul>

### 3. High Water Mark (HWM):

- The usual or average level to which a body of water rises at its highest point and remains for sufficient time so as to change the characteristics of the land.
- Shoreline alterations below the HWM have the potential to damage aquatic habitat.
- Identifying the HWM allows for a reasonable determination of where special precaution must be taken when modifying the shoreline (e.g., sediment control measures and extent of work needed).

### 4. Accessing the Site for your Project:

- Steep slopes and/or weak soil stability may not allow for the use of heavy machinery, regardless of the initial design plan.
- Precautions must be taken to prepare the site against possible environmental damage, and ultimately minimize the impacts to adjacent lands and the waterway (i.e., siltation).
- Site preparation will often require the selective removal of vegetation, but should be done in a manner which permits for rapid restoration.
- When removing vegetation, it is best to leave the root systems intact, removing only the portions which may impede the work environment.
- By preventing disturbances to larger vegetation (i.e., trees, large shrubs) and utilizing a single point access route, damage to the site can be minimized.





### 5. Soil Types:

Soil characteristics (i.e., drainage) determine the types of trees and shrubs that are suitable for your shoreline.

- Silts and sands are generally considered easily erodible, while finer clay soils are more resistant to erosive forces.
- Soils such as leda clays are well known for their rapid transition between seemingly solid to liquid states, potentially resulting in slope failure.
- In general, soils with high organic matter content are less erodible.



Table 3. Common soil classifications and their related properties

Soil Type/Class	Description	Bioengineering Considerations
 <b>SAND</b>	Granular soil structure that drains quickly	Sand is easily erodible and displaced and its sole use in projects should be avoided
 <b>SILT</b>	Moderate sized soil particle	Is highly erodible and well known for its impact on waterways (siltation)
 <b>CLAY</b>	Smallest soil particles	Erosion rate varies based on the soil structure. Some clays have high resistance against erosion and others have low resistance (i.e., leda clay)
 <b>LOAM</b>	Mixture of silt, clay, sand and organics	Most ideal soil composition for use in bioengineering as it offers a suitable growth medium and relatively strong soil cohesion

## 6. Slope:

- The stability of a slope is related to its steepness and soil type, which will ultimately determine the bioengineering options/methods used on your site.
- If the bank profile has been highly eroded, grading must take place to ensure that vegetation remains rooted.
- Sand will remain stable up to an angle of approximately 30°, whereas clay and silt can resist movement at much steeper angles.
- Based on the compositions of the soils present, the overall slope characteristics will need to be adjusted to complement the soil properties.

In order to depict bank steepness, the banks can be classified into two steepness profiles:

- High bank (1:1 slope ratio / ~ 45 °)
- Low bank (3:1 slope ratio / ~ 18 °)

## Low Bank Example



## High Bank Example



## 7. Aquatic/Terrestrial Transition – Ribbon of Life:

The goal of shoreline erosion protection is to ensure that an appropriate undisturbed buffer is maintained or incorporated into your design.

- The naturalized portion of the shoreline, which closely borders the waterway, is referred to as the buffer zone.
- This zone represents the transition between aquatic and terrestrial habitat.
- The buffer provides habitat to local plant and animal communities, protects sensitive organisms from sunlight and heat and protects water quality by filtering out contaminants.
- This portion of the shoreline provides habitat for fish and wildlife for feeding, reproducing and resting.



- Shoreline vegetation provides natural resistance against erosion, reinforcing soils stability through complex root structures.
- Larger buffer zones have a greater ability to protect the shoreline from degradation.
- With periodic maintenance and monitoring, bioengineering techniques have been shown to successfully promote the reintroduction/maintenance of these self-sustaining environments.

## 8. Landowner Goals

- **Aesthetics**
  - Waterfronts are sometimes altered for aesthetic purposes, despite the resulting negative implications to the natural environment.
- **Access/Use**
  - Removal of natural vegetation degrades the shoreline and waterway making it more susceptible to erosion.
- **Reducing Erosion**
  - Loss of the upland buffer typically leads to the loss of soils and sediment in the water and can negatively impact fish and wildlife.
- **Maintaining a Healthy Shoreline**
  - The use of fertilizers has the potential to reach the waterway and harm aquatic species and habitat

### Habitat friendly approaches:

- Allow for a healthy vegetated buffer between upland mowed lawn and waterbody.
- Allow for a moderate access area (15 meters or 25 percent of the waterfront, whichever is less)
- Utilize floating/seasonal docks or walkways that use a single point of water access to minimize shoreline disturbance.

## 9. Vegetation/Plant Selection

- Choose native plant varieties which promote biodiversity and are suitable to the shoreline environment.
- Herbaceous plants (grasses and wildflowers) increase the overall fertility of the soil.
- Woody shrubs (dogwoods/willows) possess complex root structures that work to stabilize soils.
- In general, projects with the greatest diversity of plants tend to be the most successful (i.e. using both herbaceous and woody shrubs).
- Plants are typically cut fresh and installed during their dormancy. When dormant, plants are more resistant to the stresses associated with transplanting.



***Differences in root structure between natural shrubs with long roots (left) and ornamental grasses with short roots (right).***

## Bioengineering Approaches/Techniques

### Method: Live Crib Wall



Log walls with live vegetation placed between the seams of each layer and often utilized when bank grading is not possible.

Slope Type: low or high bank profiles

Erosion Type: undercut, sheet, rill/gully, slope failure

**Pro**: protection for both toe and bank zones

**Con**: higher development and labour cost over other bioengineering approaches

### Method: Brush Mattress



Layers of live cuttings staked into upper banks as a means of stabilizing soils and establishing riparian vegetation.

Slope Type: low or high bank profiles

Erosion Type: undercut, sheet, rill/gully, slope failure

**Pro**: provides immediate protection

**Con**: effective on upper slopes but not as effective on lower banks





### Method: Coir Logs

Coconut/synthetic fibers bound together into a cylindrical structure and placed along the shoreline to absorb wave energy and allow vegetation to establish.

Slope Type: low bank profile

Erosion Type: undercut

**Pro:** bundles are flexible and capable of molding to the shoreline

**Con:** not suitable for high flow or shear stress areas



### Method: Planting

Planting of riparian vegetation along the shoreline to promote soil structure.

Slope Type: low or high bank profiles

Erosion Type: undercut, sheet, rill/gully

**Pro:** relatively low cost with little environmental disturbance

**Con:** can not be used in all situations (i.e., soil type, extreme shade)



### Method: Planting/Riprap Combination

Planting of riparian vegetation along shoreline with stone/rock placed on lower banks for stabilization.

Slope Type: low bank profile

Erosion Type: undercut, sheet, rill/gully, toe

**Pro:** protection for both the toe and upper bank zones

**Con:** typically requires heavy machinery for re-grading purposes with moderate disturbance to the environment



### Method: Live Staking

Live cuttings are staked into the bank to stabilize the shoreline, allowing for the re-establishment of riparian vegetation.

Slope Type: low or high bank profiles

Erosion Type: undercut, slope failure

**Pro:** versatile technique, little environmental disturbance, low cost, good early stage solution

**Con:** does not provide immediate protection (ie., Requires about two years to establish)



### **Method: Soil Wraps**

Live cuttings divided between layers of staked soil wraps, graded to create a stable bank and re-establish vegetation growth.

Slope Type: low or high bank profiles

Erosion Type: undercut, slope failure

**Pro:** capable of stabilizing steep slopes

**Con:** complex and relatively expensive technique compared to other bioengineering approaches



### **Method: Fascine / Brush Mattress**

Bundles of live cuttings staked and secured into the bank to create a stable platform for vegetation growth and stable soils.

Slope Type: low or high bank profiles

Erosion Type: undercut, sheet, rill/gully

**Pro:** offers both sediment and erosion control with minimal disturbance to the environment

**Con:** may be restrictions on in-water work

## **Costs of Bioengineering**

In general, shoreline work carried out using naturalized approaches and concepts can have an overall economic benefit over more traditional erosion control methods (i.e., rip-rap, armour stone).

Some of the costs associated with bioengineering include:

- Specific site attributes (i.e., slope, access)
- Scope of project
- Availability/source of materials
- Equipment needs/available access
- Labour costs

While there is an initial cost for establishing this naturalized approach, the costs of bioengineering can be minimized by:

- Using native plants/vegetation
- Recruiting volunteers for labour
- Carrying out work at times when other construction activities are not as prevalent
- Applying for financial assistance through stewardship programs
- Long term sustainability and therefore reduced maintenance costs



## Contacts & Approvals

Before starting your project, ensure that you contact the following agencies to gain the necessary permits and approvals. It is the responsibility of the proponent to secure any other permits/permissions from other Federal, Provincial, and Municipal agencies.

### Conservation Authority – Provincial Legislation

If you are planning to do any work near a lake, river, stream or wetland, you may require approval from a Conservation Authority (CA). Through the direction of your local conservation authority, the project may undergo review and refinement, with specific consideration made for minimizing damage to the natural environment, promoting habitat and protecting the public from flooding. Pre-consultation can identify potential conflicts related to the project design at a site specific level. Consult CA staff early in the design process, as they may offer valuable advice, while helping to expedite the approval process. CA staff will help to implement a design and work strategy which eliminates major physical disturbance, maintains a healthy vegetated buffer, sustains stream flow and minimizes sedimentation to the waterway. CAs have agreements with Fisheries and Oceans Canada whereby they review the impacts to fish and fish habitat on their behalf.

### Ontario Ministry of Natural Resources Provincial Legislation

In Ontario, the beds of most lakes and rivers are public lands. A work permit is a document issued by the Ministry of Natural Resources under authority of Section 14 of the *Public Lands Act*, to authorize specific activities and works on public lands and shore lands. A Work Permit is required to provide for effective stewardship of public lands and to ensure that specific activities undertaken on shore lands have regard for the environment, other users and neighbouring landowners. Requirements and considerations under the provincial *Endangered Species Act (2007)* must also be addressed. If in doubt as to whether a permit is required or not, applicants are encouraged to contact their local Ministry of Natural Resources office well in advance and make an appointment to speak with a Ministry staff person.

## Parks Canada – Federal Legislation

Parks Canada Agency, Rideau Canal Office administers the Federal Crown's jurisdiction over the beds of the rivers and lakes which comprise the Rideau Canal system and is responsible for granting approval to dredge, fill, or perform other works in the waters or bed of the Canal. All in-water and shoreline works or structures on, in, over, under, or adjoining bodies of water under the jurisdiction of Parks Canada must receive written authorization prior to the commencement of any work. Applicants may also be required to obtain written permission of the adjoining landowner should your proposal have the potential to interfere with that owner's riparian rights.

### **Parks Canada – Rideau Canal Office**

34A Beckwith St. S – Smith Falls, ON

K7A 2A8 Tel: 613-860-1251

<http://www.pc.gc.ca>

## Fisheries and Oceans Canada – Federal Legislation

Any development along a shoreline has the potential to damage the environment, and may be harmful to fish and fish habitat. The federal *Fisheries Act* protects the welfare of fish and habitat against harmful alterations, disruption and destruction (HADD). The Act also states that no one is permitted to deposit a deleterious (harmful) substance into water containing fish. Violations to the *Fisheries Act* may result in substantial fines, and/or the risk of imprisonment. If found guilty, the violator may also be required to cover the costs of restoring the habitat at the site and/or be required to fulfill other court ordered remedies.

Bioengineering projects must first meet the criteria of an Operational Statement, incorporating conditions intended to protect the habitat. If the project design meets these criteria, a formal review from Fisheries and Oceans will not be required. Projects and designs which do not fall into the contexts of these conditions may require review under alternate legislation.



## References & Resources

### Publications:

- Allen, H.H. Leech, J.R. (1997) ***Bioengineering for Streambank Erosion Control***. U.S. Army Corps of Engineers
- ***Bioengineering Techniques for Erosion Prevention***. Capital Region District – British Columbia  
<http://www.crd.bc.ca/watersheds/protection/howtohelp/bioengineering.htm>
- ***Bioengineering Techniques***. Drainage Management Guide (2004). Ministry of Agriculture, Food and Fisheries. BC
- Extension Notes:
  - ***Buffers Protect the Environment (2000)***
  - ***Protecting Fish Habitat From Sediment (2000)***
- ***Fish Habitat and Determining the High Water Mark on Lakes (T-6)*** Fisheries and Oceans Canada Factsheet
- ***Fish Habitat and Shoreline Stabilization (C-4)*** Fisheries and Oceans Canada Factsheet
- ***Native Plant Resource Guide***. 2000. Society for Ecological Restoration, Ontario Chapter, Second Edition.
- ***The Shore Primer – A Cottager’s Guide to a Healthy Waterfront***. Fisheries and Oceans Canada (2008)

## Potential Financial Assistance Programs

- **Community Fisheries and Wildlife Involvement Program**  
Ministry of Natural Resources (MNR) funding for projects that benefit biodiversity, involve the public and benefit the community.  
<http://www.mnr.gov.on.ca>
- **Ontario Drinking Water Stewardship Program (ODWSP)**  
Potential funds available for projects that protect surface and ground water on lands located near municipal wells and surface water intakes. Approved projects may include runoff and erosion control protection. Contact your local Conservation Authority.

- **Rural Clean Water Programs**

Incentive grants to assist farmers and rural property owners with projects that protect surface and ground water. Projects may include erosion control and shoreline planting.

- **Shoreline Naturalization Programs**

Provide information about the value and benefits of naturally vegetated, healthy shorelines. The program also offers simple, cost-effective advice and hands on guidance to waterfront property owners interested in enhancing or naturalizing their shorelines. The program provides technical and financial assistance for approved shoreline naturalization projects.

## Ontario Stewardship Councils

- **Ontario Stewardship**

Ontario Stewardship's purpose is to link landowners with funding, information and expertise to ensure that good management practices flourish. (Shoreline protection, trees/shrubs planting, wildlife habitat protection projects, project funding support)

[www.ontariostewardship.org](http://www.ontariostewardship.org)

## Native Plant Sources

- **Ferguson Forest Centre**

Quality tree seedlings for today and tomorrow  
275 County Road 44, Kemptville, ON K0G 1J0  
(613) 258-0110  
ffc@storm.ca, [www.seedlingnursery.com](http://www.seedlingnursery.com)

- **Trees Ontario**

[www.treesontario.on.ca](http://www.treesontario.on.ca)





## ONTARIO MINISTRY OF NATURAL RESOURCES

10 Campus Dr. Postal Bag 2002 Kemptville, ON K0G 1J0  
Tel: 1-800-667-1940 Fax: 613-258-3920  
Email: [mnr.nric@ontario.ca](mailto:mnr.nric@ontario.ca) Web: [www.mnr.gov.on.ca](http://www.mnr.gov.on.ca)



## CATARAQUI REGION CONSERVATION AUTHORITY

PO Box 160, Glenburnie, ON K0H 1S0 Tel: 1-877-956-CRCA  
Fax: 613-544-6474 Email: [crca@cataraquieregion.on.ca](mailto:crca@cataraquieregion.on.ca)  
Web: [www.cataraquieregion.on.ca](http://www.cataraquieregion.on.ca)



## MISSISSIPPI VALLEY CONSERVATION

4175 Hwy 511, RR#2 Lanark, ON K0G 1K0  
Tel: 613-259-2421 Fax: 613-259-3468  
Email: [info@mvc.on.ca](mailto:info@mvc.on.ca) Web: [www.mvc.on.ca](http://www.mvc.on.ca)



**Mississippi Valley  
Conservation**

## QUINTE CONSERVATION

2061 Old Highway 2, R.R. #2 Belleville, ON K8N 4Z2  
Tel: 613-968-3434 Fax: 613-968-8240  
Email: [quinteca@quinteconservation.ca](mailto:quinteca@quinteconservation.ca)  
Web: <http://quinteconservation.ca>



## RAISIN REGION CONSERVATION AUTHORITY

18045 County Rd. 2, Cornwall, ON  
Tel: 613-938-3611 Fax: 613-938-3221  
Email: [info@rrca.on.ca](mailto:info@rrca.on.ca) Web: [www.rrca.on.ca](http://www.rrca.on.ca)



**Raisin Region  
Conservation Authority**  
Office de protection de la  
nature de la région Raisin

## RIDEAU VALLEY CONSERVATION AUTHORITY

3889 Rideau Valley Dr, PO BOX 599 Manotick, ON K4M 1A5  
Tel: 1-800-267-3504 Fax: 613-692-0831  
Email: [postmaster@rvca.ca](mailto:postmaster@rvca.ca) Web: [www.rvca.ca](http://www.rvca.ca)



## SOUTH NATION CONSERVATION

38 Victoria St. PO Box 29, Finch ON K0C 1K0  
Tel: 1-877-984-2948 Fax: 613-984-2872  
Email: [info@nation.on.ca](mailto:info@nation.on.ca) Web: [www.nation.on.ca](http://www.nation.on.ca)



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# THE DOCK PRIMER



## A COTTAGER'S GUIDE TO WATERFRONT-FRIENDLY DOCKS



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada

Cottage Life



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# THE DOCK PRIMER

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*By Max Burns*



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Fisheries and Oceans Canada

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#### FISHERIES AND OCEANS CANADA

Fish Habitat Management Program  
– Ontario, Referrals Coordinator,  
867 Lakeshore Rd., Burlington ON L7R 4A6  
905-336-4595 fax: 905-336-6285  
E-mail: [referralsontario@dfo-mpo.gc.ca](mailto:referralsontario@dfo-mpo.gc.ca)



## GETTING STARTED

In the beginning...there was a shoreline. Perhaps it already had a dock, one that no longer suited anybody's requirements. Perhaps the dock was falling apart, or maybe the shoreline was devoid of a dock, an empty beach with no place to moor a boat. For whatever reason, the decision was made, and that shoreline is getting a new dock.

Building a residential dock is not a difficult process. In fact, constructing a dock can be as easy as falling off a log, often with the same results. Fortunately, building a safe and stable dock is only a little more difficult than building a bad one, with the majority of not-as-good-as-they-could-be docks existing simply because the builder was unaware how little separates good from bad. This primer points both the confirmed do-it-yourselfer and the equally confirmed purchase-it-yourselfer in the direction of good docks and good dock-building practices. It also explains how to avoid some potentially damaging and costly errors. For the full scoop on docks – including plans and full construction techniques – you will need to buy *The Dock Manual* (Storey Books), the only resource that can explain all facets of residential dock construction. (See “Further Reading,” p. 22.) Coincidentally, *The Dock Manual* was also written by the author

of this primer, which explains how I got away with borrowing some research from it.

The most important thing to know about dock construction is that no dock is a stand-alone structure. A dock has to work in harmony with that sometimes uneasy marriage of land and water known as your shoreline, and with the various uses you and your family envision for that shoreline. No two sites are alike. And no two families are alike. Celebrate this uniqueness by making note of your shoreline's prominent features and hidden secrets. Then make a detailed map of it all. Graph paper is the preferred media for cartographic novices, as a scale can easily be assigned to the squares, such as one  $\frac{1}{4}$ " square equals 4' or whatever is needed to fit your cottage shoreline onto paper.

A detailed map of your shoreline is your most valuable tool in building a dock. For one thing, while I'm sure you are a very nice person, you probably don't want to build your neighbours a dock, which can happen when your carefully constructed masterpiece ends up on the wrong side of a property line (it happens).

Also, no matter where your waterfront is located, chances are you will need to get approval from at least one government agency, probably several. Having a map of your site, with the

proposed project all neatly drawn out, cuts down on the red tape (see “The Approval Process,” p. 20). Yet the best reason to map your shoreline is that it greatly eases the task of choosing the location, type, and size of dock best suited to your needs and budget, whether you're building it yourself or hiring a professional.

Begin the mapping process by locating lot lines and measuring any structures, such as the cottage or pumphouse. Mark your findings on the map. Same goes for the shape of the shoreline, the direction of prevailing winds and currents, the best views of the lake and shoreline, the topography and vegetation on the land rising from the water and the land under the water, noting its makeup (rock, sand, mud) at 12', 24', and 36' intervals. Also mark the location of submerged navigational hazards such as rocks and sand bars. Note

frequently used areas such as horseshoe pits or swimming areas, along with water-intake lines, power lines, and telephone lines – basically everything.

If you are aware of shoreline nesting sites for waterfowl (remember the ducklings that swam by in the spring?), fish spawning areas or wetlands, mark these on the map too. But don't include any as-yet-to-be-constructed docks – yet. Do, however, take pictures. In the summer, definitely, but also in winter and during spring break-up if possible. While your cottage may be only a summertime retreat, the shoreline is there all year, and spring ice can tear apart anything that you might decide to add – even reinforced concrete bunkers. If you are new to the area, ask the neighbours about the ice; longtime residents delight in frightening newcomers.



**Before you pick up a hammer, pick up a pencil and make a detailed site plan of your waterfront.**

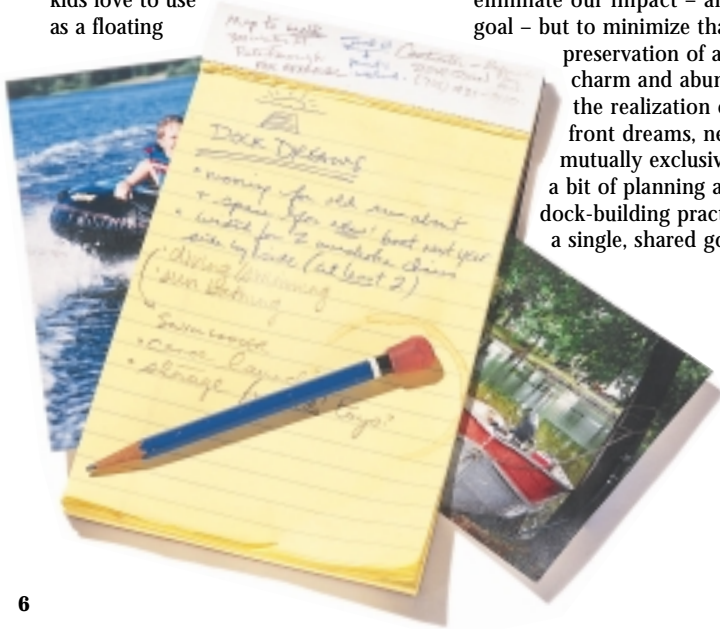
## A SHORELINE NAMED DESIRE

At this stage, what you have is the “before” plan, the shoreline as it exists prior to any dock additions. Now, look into the future – not at structures, but at uses. Remember that the dock only facilitates your needs. Make a wish list of shoreline desires. Perhaps you need a place to moor the boat. (How big is it?) Or perhaps a place to swim, fish, launch a canoe, and sunbathe. Or maybe just a spot to sit and watch the world drift by. Or any combination of the above and more. Your needs and what you have in the way of waterfront property should dictate the shape, size, and type of dock, not what the local lumberyard happens to have in stock. Obviously, finances also play a role, but as we will see, docks are usually modular devices, allowing you to add and rearrange dock sections over time. So rather than compromise your dreams with some substandard fright the kids love to use as a floating

roller coaster and older members of the family refuse to board, complete your dream in stages as your finances permit.

Any successful shoreline structure also pays homage to its surroundings. The body of water fronting your property exists because of a delicate balance in nature that has evolved over many millennia. That narrow band of earth known as the shoreline – an interdependent conglomerate that includes the water and both exposed and submerged lands – is the most ecologically sensitive piece of the planet most of us are likely to encounter. It’s also the reason we have chosen to inhabit this small piece of planet earth. Unfortunately, anything we do at or near the shoreline will inevitably disrupt the balance, sometimes destroying not only the shoreline, but also water quality and many of the countless plants and animals that depend on that shore area for existence. The goal in successful dock building is not to eliminate our impact – an impossible goal – but to minimize that impact. The

preservation of a shoreline’s charm and abundant life, and the realization of our waterfront dreams, need not be mutually exclusive goals. With a bit of planning and use of good dock-building practices, it can be a single, shared goal.



## THE SHAPE OF THINGS TO COME

The most common dock shape is the rectangle. It is, after all, the simplest and most economical shape to build. But often there are better choices, both from the shoreline’s perspective and that of our cottage wish list. The neat thing is that most variations are based on the rectangle, often with one or more rectangular sections joined together to make a more stable, useful, and attractive dock.

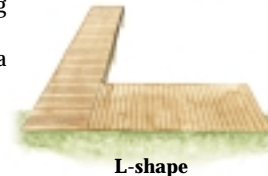
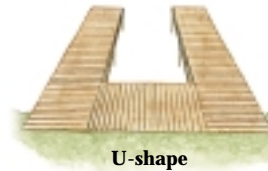
In most cases, dock stability increases with size. It’s simply a matter of percentages – the bigger the dock, the smaller the impact your visit, or nature’s tantrums for that matter, will have on it. But it’s also true that as dock size increases, so too does the risk of harming nature. All docks possess the potential to disrupt currents enough to erode submerged lands and shorelines (including those belonging to your neighbours), increase the shading of submerged lands, and disturb submerged lands via a dock’s seemingly benign footprint, all of which can destroy aquatic flora and destroy fish habitat and

spanning areas. Then there’s the connection of dock to shoreline and dock to cottage, both of which are no slouches when it comes to disrupting that delicate ecological balance. The bigger the dock, the greater the potential for mayhem. “Bigger” also costs more to construct and maintain. So big docks are bad, right? Maybe. The problem is, build a dock too small and not only is stability compro-

mised, it might also fail to serve your needs. That’s why that map of your shoreline is so important – it makes it easier for both you and the various approval authorities to choose the dock best suited to both your shoreline and your needs.

The needs part of the equation is your wish list. The list tells you what activities are envisioned for the dock, and these often dictate minimum size requirements. For instance, while considered small craft, both sailboards and canoes can become serious dock hogs when out of water, demanding plenty of deck-acreage to swing around and launch. And things only get worse should Aunt Mabel demand

### DOCK SHAPES



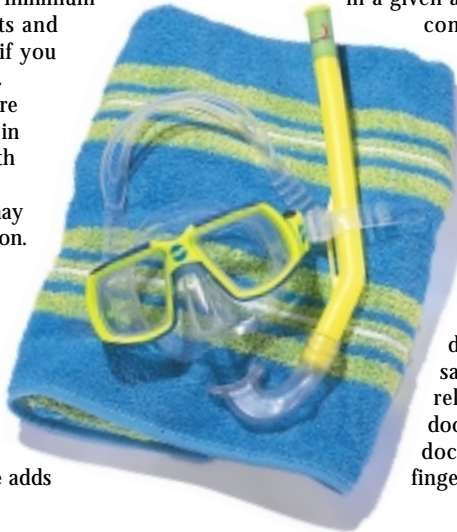


unobstructed sitting room for her and her favourite deck chair while all this is taking place. That said, if your shoreline includes a usable beach (check your map if you forgot), some things – such as swimming zones and sailboard storage, may be best assigned to the beach, reducing demands on dock size. However (dock planning has no shortage of “howevers”), if big boats are in the picture, there’s little point in opting for a small dock. Should nature make waves, and the dock isn’t up to snuff, it’s goodbye to both dock and boat. If the shoreline has no usable beach – where water and land meet at a steep cliff, for example – the dock then takes on the role of a beach.

### THE LIMITS TO THIN

With the exception of finger docks (we’ll get to them later), 3’ is the practical minimum width for any dock. You need that much room for two people to pass without risking one, or both, being bumped into the drink. Also, as you will see in our discussion of the various dock types, most docks have minimum size requirements and stability suffers if you try to go smaller.

If your needs are modest (perhaps in rare harmony with your budget), the basic rectangle may be your best option. However, by adding a second rectangular section perpendicular to the first dock (at the deep end), the resulting T-shape or L-shape adds



to dock stability – like training wheels on a bicycle – and the shapes created help to define designated activity areas. For example, one end of a T-shape could be set aside for sunbathing, while splashing and diving are moved to the other end. The shapes can also “capture” protected areas of water for the mooring boats or to create a children’s wading area.

Breaking away from the basic rectangle allows us to direct foot and boat traffic, and activity patterns, reducing dock congestion. Therefore, less deck-acreage is required to accomplish the same goals. This means less cost, less impact on the environment, and usually makes for a more attractive shoreline. And, as a bonus, those additional rectangles can be added or subtracted over time as needs – and finances – change.

What shouldn’t be considered for budgetary reasons are finger docks. Finger docks are long and skinny rectangles that run out from a much larger main dock or breakwall. They are designed to provide the maximum number of slips (stalls to moor a boat) in a given area, not to save on construction costs.

Because of the reduced width (sometimes down to a foot), finger docks wiggle around just like fingers and provide wobbly access to boats, but not much else.

If your activity list demands greater versatility, or you don’t relish that impending doom feeling of a tippy dock, stay away from finger docks.

### BETWEEN A DOCK AND A HARD PLACE

The main problem docks experience is one shared with everything else in the universe: entropy. Or the idea that nothing lasts forever. Wood, metal, plastic, concrete – all the basic ingredients of dock building – and even nature’s own bedrock, are all under continual assault from two very destructive forces – stress and decay. The deleterious effects of stress (the result, say, of visiting boaters bashing into the dock, or nature hurling up huge waves, or spring ice pounding at your shoreline) can be reduced by distributing the loads. For a dock to survive to its maximum life expectancy, all loads must be shared by as much of the structure as possible. That’s construction rule number one.

Decay is often a keen partner to stress when it comes to destruction. Wood rots, plastic degrades, concrete spalls and cracks, metal corrodes, rock erodes – it’s all part of nature’s regenerative process.

Generally, decay thrives in an environment of warmth, a little moisture, and a little oxygen, all readily available at your local shoreline. Too much or not enough of any of these ingredients and decay moderates its attack. The secret to longevity, therefore, is to take advantage of this weakness, using good design and appropriate materials to discourage the onset and growth of decay. That’s construction rule number two.

### DOCK MATERIALISM

**WOOD** Wood is the most common element in residential dock construction. It’s relatively easy to work with, reasonably priced, and has some “give,” allowing it to bend slightly under duress. It’s also at its strongest under short-term loads (such as when your neighbour Phil clob-



CEDAR

PLASTIC

PRESSURE-TREATED

**While real wood should be used for your dock’s framing, plastic lumber can be an excellent choice for decking. When installed properly, it can offer a long working life.**

bers the dock with his new ski boat), a decided advantage to waterfront structures. And things made of wood are usually easy to rebuild should nature prove the better of humanity once again.

On the other hand, wood is at its worst down at the waterfront – wet and fat one moment, dry and skinny the next. Therefore, joining pieces of wood in dock building requires different techniques than the accepted practices of house carpentry.

The preferred deck woods for dock building are western red cedar, redwood, cypress, and eastern white cedar (in that order), all of which offer reasonable longevity and beauty. For most docks, that’s also the preferred structural list, but for dock cribs and permanent piles, stronger woods, such as Douglas fir, hemlock, and tamarack (in that order) are a better choice. Unfortunately, this group is not as resistant to rot as the first. For permanent piles, western larch, pine, and even spruce can be used if fir is not available.

The downside of opting for the preferred species, such as western red cedar,

is cost. It may last longer than other species, but it's also becoming increasingly expensive. Granted, that could be said for all types of wood. Certainly, the better decking species, being naturally resistant to rot, will outlast species such as spruce, but what if the bank account won't accept that logic and demands a cheaper solution? That's when we compromise. One way to do this – already mentioned – is to reduce the deck acreage. Or we can try to extend the life of lesser grades of wood.

Unfortunately, the standard route to wood preservation – paint and stain – is not the answer for docks. Any coating you put on a dock will fade, blister, and peel. Not only will this look terrible, but damaged coatings also trap water, creating an ideal spot for a wood-destroying fungi family to take up housekeeping. So you can either scrape and re-coat the dock every few years or use preferred wood species and do as many dock builders advise – let the wood go naturally grey, an option that suits my minimal-work ethic just fine.

**PRESSURE TREATING** But we're not out of the protected woods yet. There's still pressure-treated spruce or pine, that Kermit-green alternative seen on countless decks, jungle gyms, and suburban retaining walls. Pressure-treated pine or spruce is about 20–30% less expensive than the preferred decking species, such as cedar, but because the grades of lumber set



aside for treatment are usually low, pressure-treated wood is typically more susceptible to warping and cracking when exposed to weather than the untreated decking species, and even some of the structural species, such as fir. Most of the problem wood is labelled S-GRN (the chemicals applied when the wood is wet with sap, and therefore not as absorbent); pressure-treated wood labelled S-DRY is typically of much better quality and longer lasting, but also more expensive.

Because it can leach chemicals into the environment, pressure-treated wood is banned for waterfront use in some areas and, in all cases, construction should take place well back from the shoreline, with the finished dock being left to thoroughly dry and “age” before being launched into the water. Working with pressure-treated wood is more difficult, the sawdust considered toxic, and each cut end must be sealed with an approved preservative, all of which exposes the builder (not to mention the flora and fauna living in the water) to some nasty chemicals. A reasonable compromise is to use pressure-treated wood for the structure of the dock, keeping the preferred species for the decking, thereby lessening the odds of exposing skin to potentially harmful chemicals.



**PLASTIC** Plastic has become a common building material for docks. Compared to most woods, metals, or concrete, the types of plastic used in dock construction are relatively low in strength and lack hardness, which rules them out for structural duties. Plastic is, however, the primary material for dock floats and when supported by an appropriate structure – typically made from wood, metal, or concrete – plastic materials can be used for decking. Plastic is also waterproof and decay-resistant, a decided advantage when it comes to dock construction.

The cost of plastic decking usually fits somewhere between cedar and pressure-treated wood, although some variations are more expensive than even the preferred species of wood decking. Typically, plastic decking comes in traditional “planks” of solid polyethylene (PE), extrusions made from polyvinylchloride (PVC), and composites of recycled PE and wood byproducts. Unfortunately, all plastic decking has a propensity to sag, which means that decking cannot extend across the spans of traditional dock designs (check with the decking's manufacturer).

Plastic decking is more fragile than wood and more prone to splitting during installation (so follow the instructions), but when installed properly, it can certainly offer long life.



**High-quality hardware, like galvanized corner brackets, heavy-duty hinges, and corrosion resistant nuts, bolts, and screws is crucial if you want a long-lasting dock.**

## HARDWARE

I cannot stress enough the importance of good hardware in building docks. Dock hardware is that bewildering array of metal brackets (usually steel) used to brace corners and joints, connect dock and ramp sections, hold the legs of pipe docks in place, and basically add strength to any dock connection under load. Technically, it doesn't fasten stuff together; it leaves that task to the nails, screws, nuts, and bolts. Instead, once secured in place with nuts and bolts and the like, dock hardware shares and transfers loads, diminishing stress at crucial junctures. Joints that are nailed or screwed together without the benefit of dock hardware will inevitably pull apart. It doesn't make sense to waste your time and money on second-rate hardware – whether it's your own creation (sorry), a piece of metal conscripted for a duty it wasn't designed for (such as barn-door hinges used to join sections of dock), or even most hardware sold from mass-merchandising outlets. Whether

you're buying individual pieces or acquiring the hardware as part of a completed dock or in a kit, buy your hardware from an established dock builder. It's an expense you'll never regret.

As for fasteners, screws and bolts hold a dock together much better than nails. The extra cost is minimal, but the increase in strength is not.



## DOCK TYPES

**A**lthough nature considers all docks to be removable, floating docks and pipe docks are the only ones cottagers usually consider removing, either for repairs or to protect the dock from the ravages of winter ice and spring breakup. Given Canada's climate, that means removable docks are extremely popular.

### REMOVABLE DOCKS

**Floating docks** The people's choice award goes to floating docks. Floating docks are relatively easy and economical to build, adaptable to most shorelines and, because they are held up by the water, the distance between the top of the dock's deck and the surface of the water – known as freeboard – remains darn near constant, varying only with dock load and high seas (both variances being minimal on a well-designed and well-built floater). And because a floating dock is not dependent on submerged lands to hold it up, there is no maximum water depth that prevents its use.

From an environmental perspective, floating docks cause minimal direct disruption to submerged lands; typically from the small areas dis-

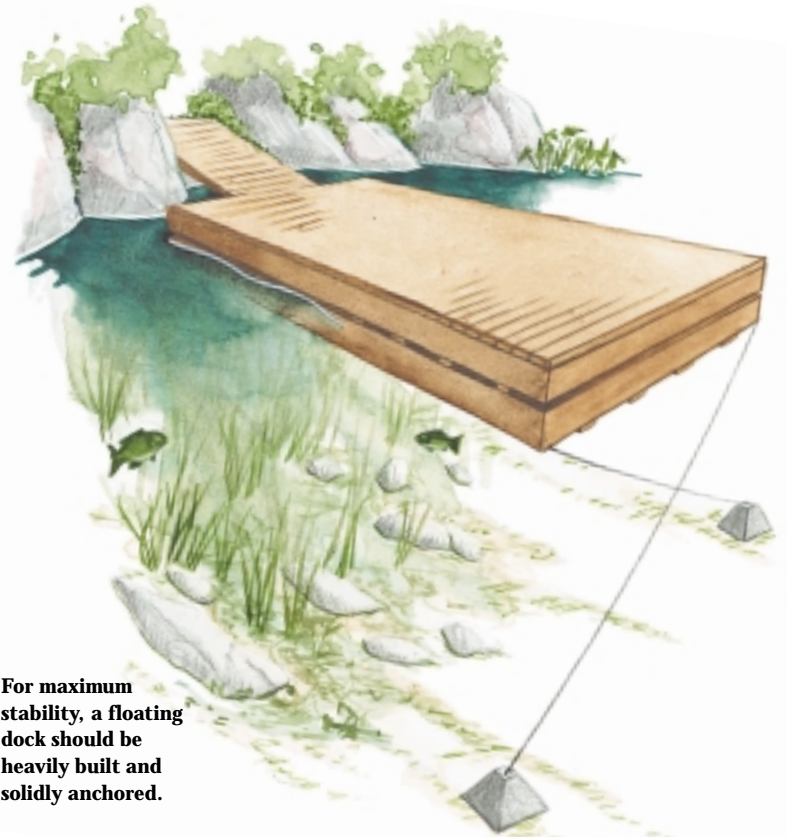
turbed by anchors, spuds, or pilings (the most popular ways to moor a floating dock in place). In fact, if secured to the shore only, there may be no contact with submerged lands at all. However, floating docks can block sunlight to aquatic plants – destroying fish habitat – and they may also cause the erosion of shorelines.

So, floating docks won't work everywhere. For instance, a floater must have sufficient draft to keep its floats resting on water, rather than bumping into submerged lands (which can harm both the dock and aquatic habitat). A depth of 3' (measured at the low-water mark) is the normal accepted minimum, however, less may be possible if the water level never varies and the area is not subjected to harsh wave action.

Floating docks often lack stability.

Not that it isn't possible to make a stable floater – hundreds of good designs exist, some so stable a user could mistake the dock underfoot for a waterfront boardwalk. Unfortunately, the stable of stability disasters is even greater. But it ain't the dock's fault, folks, it's bad construction practices.

When it comes to stability, a floating dock works best when it's made long,



**For maximum stability, a floating dock should be heavily built and solidly anchored.**

wide, low, and heavy. The consensus among dock builders is that 6' x 20' is the minimum size for a stable floater, this single section weighing in at about 1,000 lbs, minimum. And bigger is even better.

As usual, the drawbacks to bigger are increased initial cost, increased labour to install (and remove) and, of course, greater impact on the shoreline's ecosystem. A pipe dock – which can be made smaller and still remain stable – may be a preferable choice in shallow water.

In areas where ice conditions prohibit a four-season solution, the floating dock

offers the advantage that it can be removed from the water in the fall and replaced in the spring (albeit with no small effort in some cases). That said, many floaters are left in all year where wave action and ice conditions permit.

In addition to size and shape, float type and float location also contribute to stability. A discussion of float types is beyond the scope of this booklet (see "Further Reading," p. 22) but as a general rule, installing floats towards the perimeter of the dock, rather than set back towards the dock's centre line, greatly enhances stability.





**Because they have little contact with submerged lands, pipe docks are easy on the aquatic environment.**

**Pipe docks** If you can imagine a 4' wide wooden ramp, sitting about a foot above the water, supported by long skinny legs running from the ramp down to submerged land, you've just mentally built a pipe dock. Building one in reality is only a little more difficult, and not a lot more expensive (pipe docks are typically the least costly dock option). And because most of the dock sits out of water, with contact with land and shading of aquatic plants held to a minimum, a simple pipe dock is typically the least disruptive to the environment of all the dock types.

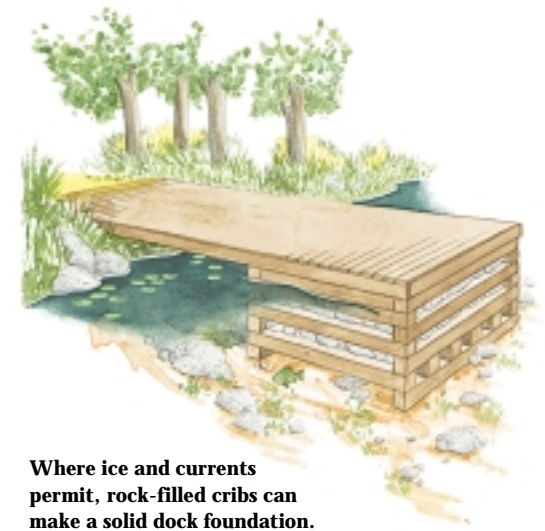
Unlike the floating dock, the pipe dock's freeboard varies as the water rises and falls. Should the lake or river at your shoreline do a gentle retreat through the season, the pipe dock's deck can usually be lowered on its legs to accommodate moderate fluctuations in water levels, and even more extreme fluctuations can sometimes be handled by relocating the dock further out on the shoreline. (The dock's light weight is a real advantage here.) Some pipe dock legs can also be fitted with wheels to make moving the dock an even easier task. Be aware that the slightest amount of ice movement can fold up a pipe dock like an accordion, so plan on moving the dock at least twice a year. Or buying a new one each spring.

Because a pipe dock's deck and framing remain elevated above the water, there's very little surface area exposed at the water-line for nature to take a whack at. This makes the pipe dock a good candidate for situations where plenty of surface activity is experi-

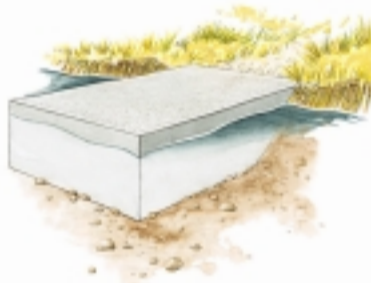
enced, such as on busy river channels where the wakes from passing boats may be a problem. However, with waves passing under the dock unobstructed, any boat moored to the opposite side will be exposed to the full brunt of wave action. This makes a pipe dock a poor choice for creating protected areas.

Severe wave action can put some of the lighter aluminum pipe docks at risk. However, lighter construction also means less labour to install and remove the dock, and less initial cost to purchase. And in the right situation – a protected bay for instance – a lightweight pipe dock is certainly up to the task of mooring smaller boats. For larger vessels and harsher wave action, boat lifts or marine railways are a better choice. (For more information about these options, see *The Dock Manual*.)

Because a pipe dock is propped up on legs, it can be built smaller than a floating dock yet still remain stable. The basic rule for pipe docks is that the



**Where ice and currents permit, rock-filled cribs can make a solid dock foundation.**



**Concrete piers are expensive and environmentally destructive.**

width of the dock should be at least 3' and never less than the depth of the water. Because stability suffers as legs get longer, about 6'-7' is considered the maximum water depth for pipe dock installations. Choose one of the other dock types – such as a floating dock – for deeper water.

### PERMANENT DOCKS

Residential permanent docks (as opposed to commercial wharves) can be divided up into three categories: crib docks, concrete piers, and permanent pile docks. The term “permanent dock” is more a reflection of objective than reality, because permanence is not a concept recognized by nature. Shifting ice can topple cribs, lift piles right out of submerged land, and push concrete piers up onto shore. However, blessed with sound construction techniques and the appropriate conditions, a permanent dock can be made nature resistant, perhaps serving faithfully for several generations.

Because freeboard will vary with fluctuations in water level, permanent docks are often used in conjunction with floating docks, the floaters attached to the more permanent structure in a manner that permits the floater to move up and down in concert with changing water levels.

**Crib docks** A “crib” is a container. It could hold farm produce, or a child that hopefully will soon go to sleep or, in the context of waterfront construction, a few tons of rock and stone. Cribs should not be confused with gabions. Gabions are inexpensive wire or plastic mesh baskets designed to hold stones, rock, or concrete, the baskets wired together to serve as unattractive retaining walls. At first glance, they may seem like a good idea for dock building, but time has proven gabions to be better at tearing skin than retaining rock under siege by strong currents, waves, and ice, all of which will distort the basket's shape, causing the gabion to sag and flatten (along with your bank account when you replace them).

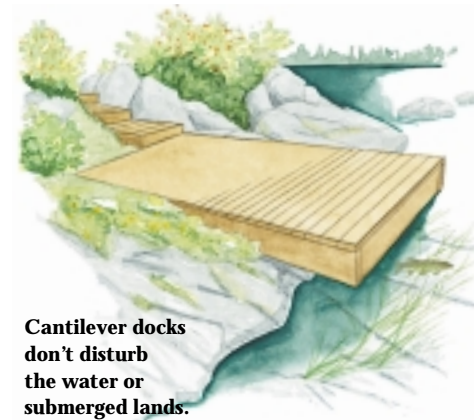
A proper crib is made from new, square-cut timber, not wire or driftwood or round logs tacked together with small nails and hope. (Occasionally, steel or concrete castings are used in lieu of wood.) The timbers are assembled in opposing pairs, one pair laid out on top of the next, creating a slatted, box-like affair boasting an integral floor. Threaded rods run the full height in each corner to secure the timbers in place. The box is then filled with rock, providing the bulk necessary to face off against nature. (Of course nobody – not even Gretzky – wins every faceoff.)

Maximum water depth for a crib is about 8'. For optimum stability (required to fend off attacks from nature more than humanity), a crib's total height should at least equal its total width. Obviously, this can make for a very large container, which in turn needs a ton or more of rock to fill. And all of this rock must be taken from onshore sources, not from close-at-hand submerged lands (which would disrupt fish habitat). For this reason, and from an environmental standpoint, cribs work best when placed

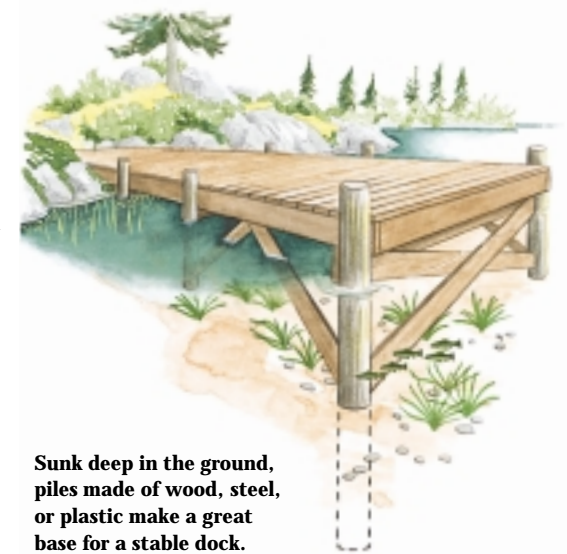
above the high-water mark, using the strength of the crib as an anchor or attachment point for other structures such as floating docks, cantilever docks or pipe docks.

From an environmental perspective, cribs aren't the most destructive kind of dock (see “Concrete pier,” below). But because a crib covers a large area of submerged ground, essentially smothering anything beneath it, crib-based docks often claim a close second on the list of bad-guy installations.

**Concrete piers** The concrete pier is basically a big, monolithic block of cement and aggregate, bound together in apparent perpetuity, often with an integral boat ramp. Most often, they are found in commercial or municipal settings. As with crib-based docks, practical water depths are limited to about 8', and the piers can be merged into shorelines to provide a shoreline interface for other types of docks.



**Cantilever docks don't disturb the water or submerged lands.**



**Sunk deep in the ground, piles made of wood, steel, or plastic make a great base for a stable dock.**

However, concrete piers are expensive to construct, and no dock does a better job of disrupting the environment. Erosion of submerged lands at the base of the pier can often be a problem too. And unlike the slatted sides of the crib, the concrete pier provides no substitute home for refuge aquatic life. In most cases, there are better solutions for residential docks.

### Permanent pile docks

The permanent pile dock is a heavyweight, long-term version of the pipe dock – still a ramp on long legs, but definitely not portable. Instead of resting on the surface of submerged lands (as the legs of pipe docks do), long poles of wood or tubes of steel or plastic – all referred to as piles – are sunk into planet earth, either by force or by being set in pre-drilled holes.

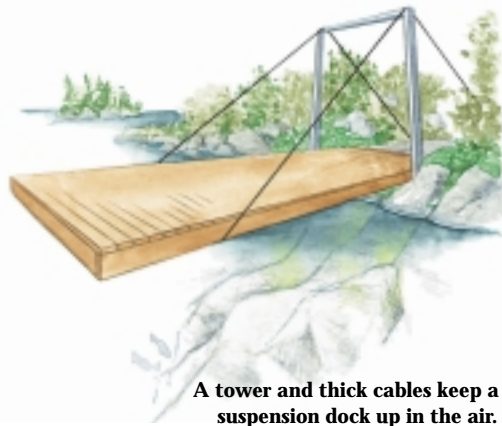


Either way, because of the heavy-duty equipment required, a pile dock is not the stuff of home workshop projects.

Piles should always be braced to prevent sway, and although there are no theoretical limits to depth, if the exposed portion of the pile extends 25' or more above supportive soil, construction costs will skyrocket.

The permanent pile dock shares many of the environmental advantages of the pipe dock – minimal contact with submerged lands, free flow of water underneath, and the ability to build a relatively narrow dock that is still quite stable.

**Specialty docks** Specialty docks include cantilever docks, suspension docks, and lift docks. These docks can be dramatic to behold, and expensive to purchase. Some design and construction similarities exist between specialty docks and the docks discussed above, but specialty docks are more complex, typically making their construction and installation beyond the skills of even many professional dock builders. So these are not docks that lend themselves well to the average tinkerer.

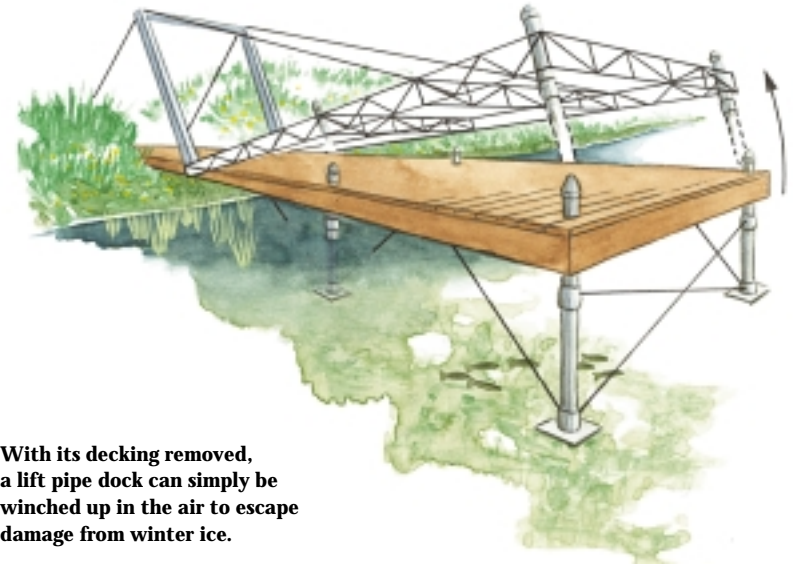


A tower and thick cables keep a suspension dock up in the air.

**Cantilever and suspension docks** The cantilever dock works in the same manner as an overhanging apartment building balcony: the dock's frame stretches from shore over the fulcrum point and then out over the water. The maximum length of the dock, and what proportion of that length is land-based, is determined by how well the land-based end – the end that supports the load – is tagged to the shore. Customarily, a cantilevered dock requires 2' of onshore dock for every 1' hanging beyond the fulcrum, although I have seen cantilever docks incorporated into wood bulkheads (walls built parallel to, and usually at, the shoreline) using a leverage ratio as little as 1' on shore for every 1' of overhang, and even less when the land-based end is embedded into a concrete bulkhead or solid bedrock.

The suspension dock, on the other hand, has more in common with a massive suspension bridge than an apartment balcony. Picture half a Golden Gate Bridge. But instead of connecting two bits of land together, it connects one bit of land to water and your boat. What you get is the Golden Gate Dock.

Unlike the cantilever dock, a suspension dock's deck does not rely on large chunks of shoreline for support. Instead, a rectangular tower holds up a pair of cables anchored well back on shore to keep the deck suspended over the water (just like the entrance to the aforementioned bridge). Both cantilever and suspension docks sit completely out of the water, so neither dock demands a minimum depth of water for installation. And because freeboard will vary with water level fluctuations,



With its decking removed, a lift pipe dock can simply be winched up in the air to escape damage from winter ice.

cantilever and suspension docks are not the answer for locations that experience extreme water level fluctuations.

Both dock types have practical limits to the length of overhang: About 8' for cantilever docks (which normally equates to a minimum of 16' of onshore decking), and about 50' for the suspension dock. Greater distances are not considered cost effective.

A short cantilevered overhang of about 1'-2' can work very well along bulkheads, cribs, and the like. And when a large, shore-based deck is desirable (such as over a boulder-strewn shoreline), the cantilever dock again becomes a reasonable option.

Cantilever and suspension docks cause the least disruption to the water or submerged lands – it's difficult to disrupt what you don't touch. However, as with floating docks, the resulting shading of the aquatic environment could be deleterious to aquatic life. Also, both dock

types will disturb the shoreline, particularly the cantilever dock, which in turn has the potential to disrupt both aquatic and land-based life.

**Lift docks** These come in three flavours – lift pipe docks, lift floating docks, and lift suspension docks – each based on its non-lifting parent. The freeboard of each is the same as for non-lifting versions.

In concept, the lift dock appears to function much like the classic drawbridge. Yet while the drawbridge was historically raised to protect the castle from unwanted weekend guests, the lift dock gets raised for its own protection, hoisting it up out of reach of winter ice. (Although I suppose a lift dock could still be used in the traditional sense if unwanted guests arrive by boat.)

Size restrictions and environmental impact for the three versions of lift docks are the same as for their non-lifting counterparts.





## THE APPROVAL PROCESS

**T**he approval process begins with you. Makes sense; it is, after all, your dock. With the map of your shoreline and your wish list of shoreline desires spread out on the kitchen table, use what you've learned about dock shapes and types from Sections 2 and 3 to look for solutions. How will a dock work here? Perhaps it would be better at the opposite end of the shoreline? Based on the terrain – both submerged and above-water – what type of dock is best for both you and the environment?

What shape of dock will best accommodate your wish list of activities? Make copies of your original site map and let members of the family explore different solutions. When a consensus has been arrived at (through democratic process or dictatorial rule), the next step is to get approval from whatever government agencies might take an interest in your proposed dock.

Fisheries and Oceans Canada (DFO) has the responsibility to protect fish habitat anywhere in Canada. And since shoreline alterations can affect the life and times of a fish, your dock falls under the jurisdiction of the DFO. Naturally, this being Canada, the provinces have also got into the act (the *Fisheries Act*, to be specific), as have regional

Conservation Authorities. Perhaps it doesn't need saying, but when it comes to getting approval for any kind of shoreline work it's always best to start at the bottom and work up. So in Ontario, your first stop for approval should be the local Conservation Authority, then the Ministry of Natural Resources (MNR), and finally the DFO.

You may not have to talk to each of these agencies separately. For instance, some Conservation Authorities may handle the entire process on behalf of the others, or the MNR may

do it all, but the only surefire way to find out is to ask (see the contact information on p. 23). It's also important to remember that some municipalities now require building permits for dock construction, so you'll need to check there too.

The size, shape, and location of your dock – or perhaps even whether you can have one at all – will all come under review by the powers that be, so don't be surprised if you're asked to make some changes. But making adjustments at this stage – when your dock is still in erasable pencil on paper – is much easier and more economical than altering the finished work. And, of course, fines have yet to be imposed for nonconforming plans (at least at the time of this writing).

### TIPS FOR EASING THE PROCESS

Begin the mapping and designing process in the summer when you can accurately assess current and proposed waterfront activities. Present your plan to government agencies in the winter or late fall when those in charge of approvals have the time to look at your proposal and suggest alternatives should there be a problem. Waiting until spring to talk to the government gang could result in long delays before your plan is even considered, and don't expect much personal attention. By getting all the paperwork taken care of when the lake is frozen, you could be building your dock in the spring and sipping lemonade on its



deck by summer. Having a shoreline map, photos, and a well thought out plan eases a bureaucrat's job (and they're all overworked, remember), which in turn will definitely improve the odds of getting a timely "okay" to proceed.

And no lemonade tastes sweeter than that sipped from a deck chair on your own dock, while your mind drifts with the breeze. Now, let's see...maybe an L-section attached to the end would just be enough to get the chair out into the sun. That's the other thing about docks – when construction stops, invariably the wish list begins anew.



## FURTHER READING

MOST WELL-STOCKED BOOKSTORES WILL either carry, or can order, any of the publications listed below.

•*Cottage Life* magazine, 54 St. Patrick St., Toronto, ON M5T 1V1

Published six times a year, *Cottage Life* is an excellent source of information for anyone owning, or even renting, residential waterfront property.

Phone: 416-599-2000

Fax: 416-599-0500

E-mail: [clmag@cottagelife.com](mailto:clmag@cottagelife.com)

•*Cottage Water Systems*, Max Burns, Cottage Life Books, Toronto, ON ISBN 0-9696922-0-X

Not about docks, but if preserving your bit of God's country is important to you, this is the best book available for people living or vacationing on property not serviced by municipal sewers and water (the situation for many waterfront residences). The book discusses where to find water, what could be in it, how to get the water into the cottage or house, pumps, water treatment, sewage treatment, outhouses, alternative toilets, and even how to cope with your plumbing when the world around you is white and frozen. (Contact info same as for *Cottage Life* magazine.)



•*Docks & Projects*, Cottage Life Books, Toronto, ON ISBN 0-9696922-1-8

A compendium of fun and useful things to make at the cottage, from deck chairs and loon nesting platforms to games, snow huts, and much more. It features docks, too, with complete plans for two floaters. The portion on dock building was written by me and subsequently expanded and updated in *The Dock Manual*. (Contact info the same as for *Cottage Life* magazine.)

•*The Dock Manual*, Max Burns, Storey Books, Pownal, VT ISBN 1-58017-098-6

The only book dedicated to residential docks. All topics are covered in detail, from site planning to every dock type and the many variations available. Includes extensive how-to sections with lists of required tools and materials. Also features sections on mooring a dock, shore access (ramps), winterizing, boat lifts, and marine railways. There are also ten sets of plans and a list of suppliers and dock builders – everything you need to know in order to build the best dock for you and your shoreline.

Storey Books

Phone: 800-793-9396

Fax: 802-823-5819

E-mail: [storey@storey.com](mailto:storey@storey.com)

Web site: [www.storey.com](http://www.storey.com)



## CONTACTS

### COTTAGE LIFE

54 St. Patrick Street, Toronto, ON M5T 1V1

416-599-2000 fax: 416-599-0800

E-mail: [clmag@cottagelife.com](mailto:clmag@cottagelife.com)

### FISHERIES AND OCEANS CANADA

Fish Habitat Management Program – Ontario,  
Referrals Coordinator,

867 Lakeshore Rd., Burlington ON L7R 4A6

905-336-4595 fax: 905-336-6285

E-mail: [referralsontario@dfo-mpo.gc.ca](mailto:referralsontario@dfo-mpo.gc.ca)

### ONTARIO MINISTRY OF NATURAL RESOURCES

Lands and Water Section,

300 Water St., Box 700,

Peterborough, ON K9J 8M5

705-755-1694 fax: 705-755-1267

E-mail: [mnr.nric@mnr.gov.on.ca](mailto:mnr.nric@mnr.gov.on.ca)

Web site: [www.mnr.gov.on.ca](http://www.mnr.gov.on.ca)

### CONSERVATION ONTARIO

120 Bayview Parkway,

Box 11, Newmarket, ON L3Y 4W3

905-895-0716 fax: 905-895-0751

E-mail: [conserve@idirect.com](mailto:conserve@idirect.com)

Web-site: [www.trca.on.ca](http://www.trca.on.ca)

(This Web-site for the Toronto region lists contact info for Ontario's 38 Conservation Authorities. Click the link for "Things you should know about us.")



FEDERATION OF  
ONTARIO COTTAGERS' ASSOCIATIONS



Fisheries and Oceans  
Canada

Pêches et Océans  
Canada





# THE SHORE PRIMER



A COTTAGER'S GUIDE TO  
A HEALTHY WATERFRONT

CottageLife

Produced by  
Fisheries and Oceans Canada  
in association with  
Cottage Life

**FISHERIES AND OCEANS CANADA**

Fish Habitat Management Program - Ontario-Great Lakes Area  
867 Lakeshore Road, Burlington, ON L7R 4A6  
Web Site: [www.dfo-mpo.gc.ca/oceans-habitat/](http://www.dfo-mpo.gc.ca/oceans-habitat/)

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# THE SHORE PRIMER

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## YOUR SHORELINE: A NATURAL WONDER

**F**or many cottagers and other waterfront residents, the quiet spot by the lake is a little bit of paradise where we can relax, play, and enjoy being closer to nature. But it is a special place for another reason too. The zone where the water meets the land is the richest natural environment that most of us

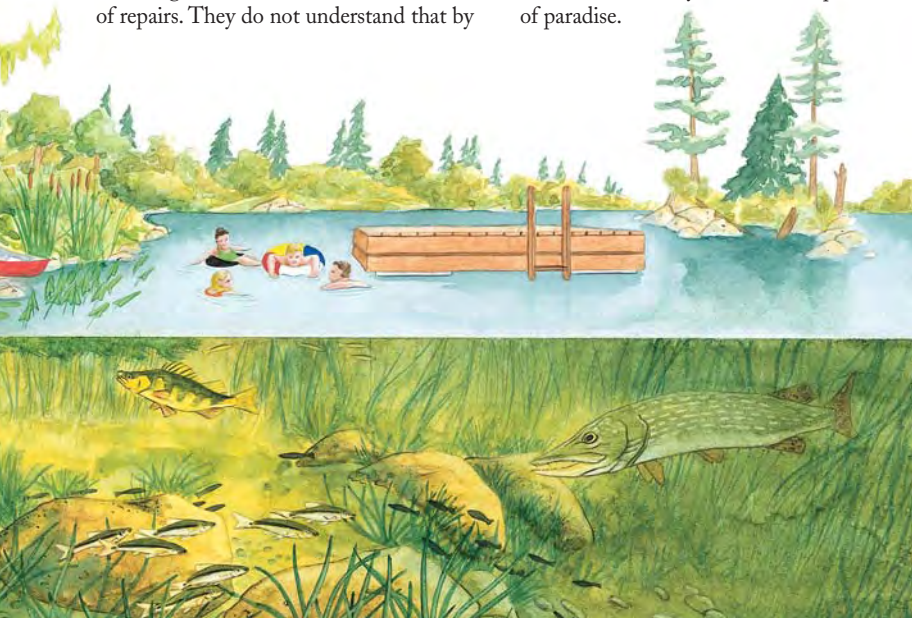
will ever come into contact with, and almost certainly the most complex piece of the earth that we will ever have the opportunity to live near and share. Equally important, the waterfront is crucial to your lake's health, providing oxygen, food, cover and a barrier to contaminants, as well as a living retaining wall for the shoreline.



When a natural shoreline is altered, often by well-intentioned projects meant to improve waterfront living, the intricate balance between vegetation, aquatic organisms, and the shoreline is toppled. A typical scenario goes like this: After purchasing their new cottage lot, the new owners want to enjoy an unobstructed view of the water so they organize a weekend logging bee and clear out the thicket of plants, shrubs, and trees lining the shoreline. However, once the trees and shrubs are gone, the soil that their roots held in place begins to erode. Now the cottager family spends uneasy weekends watching their frontage erode into the lake. Worried about the erosion of their property and investment, they spend a great deal of money to build a breakwall. In a few years, the wall, undermined by the constant pounding of the waves, begins to list or crack. Again, the owners fund a new series of repairs. They do not understand that by

retaining the shoreline vegetation, their shoreline would enjoy the benefits of natural erosion control. What began as a bid to have a view of the lake turns into a grudge match between the cottagers and the waterfront - and both sides are taking a beating.

Why not declare a truce and weave your cottage needs into the natural shoreline? This primer will show you how to protect and nurture the qualities that make it such a special location. It also offers cottagers and other landowners constructive solutions for restoring an altered shoreline to its former health and beauty. *The Shore Primer* is the second in a series of primers on waterfront stewardship published by Fisheries and Oceans Canada (DFO) in association with Cottage Life. In combination with *The Shore Primer*, this series of primers can help you become a better caretaker of your own little piece of paradise.





## HOW TO PRESERVE YOUR SHORELINE'S TRUE NATURE

**T**ake a good look around your property and familiarize yourself with the features of your waterfront. The natural shoreline has four components, beginning underwater and extending upland (farther than you would think). Shoreline experts call these four components the *littoral zone*, the *shoreline*, the *riparian zone*, and the *upland zone*, and each plays a critical role in keeping your lake healthy. As important as these separate zones are however, it is vital to remember that the shoreline is a natural progression - each area transforms into the next in a gradual, almost seamless transition.

Altering any portion of this region affects the whole, diminishing its ability to support life on the lake.

### THE LITTORAL ZONE: PERFECTLY PRODUCTIVE HABITAT

Sitting on your dock, you are perched in the *littoral zone*, the area from the water's edge to roughly where sunlight no longer penetrates to the lake bottom. As much as 90 percent of the species in the lake either pass through or live in this zone. Algae floats freely in the water or attaches to twigs, stones, and plants. Microscopic water bears (freshwater

invertebrates that look like tiny lumbering bears - if you ignore the two extra legs) graze on aquatic plants. Yellow perch spawn in the shallows, while

northern pike lurk among the sedges. Ducks forage in the pond weeds, and turtles loaf on the trunks of fallen trees.

The water in front of the shoreline provides spawning areas, cover, nursery habitat and food for

**Building a sand beach is tempting, but it can easily erode, smothering aquatic life.**





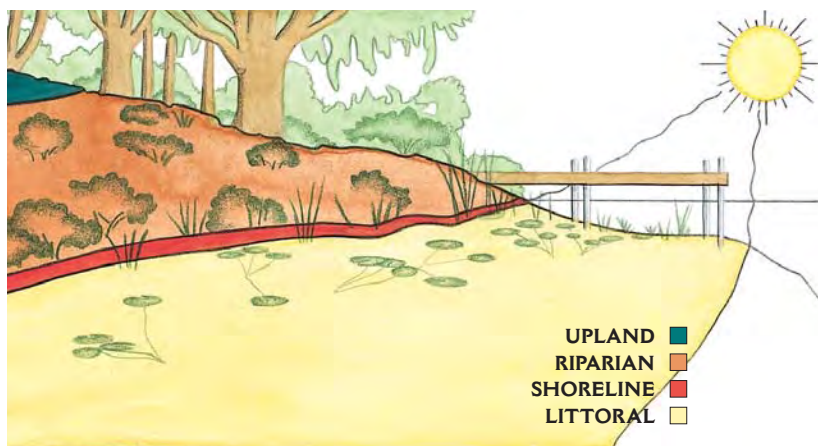
a range of species, offering foraging areas and hiding spots and a shallow, relatively protected area for young fish and amphibians to grow. Aquatic plants and downed trees are a crucial part of the system, with the plants acting as the lungs of the lake, converting sunlight into food and releasing oxygen in the process, and providing food and shelter for other creatures. Once submerged, wood becomes a major source of food for aquatic insects, crayfish, and small fish, its surface covered with tiny plants and invertebrates. Downed trees and woody debris also act as hiding spots for small fish and their predators, and are good spawning zones for yellow perch.

### **How we can help the littoral zone stay healthy:**

The water's edge is also a focal point for human activity. While we do not intend to, it is easy for humans to interfere with the delicate operations of the littoral zone. If you accidentally spill two-stroke fuel for example, the juvenile perch will be looking for a new home.

The simplest way to keep the littoral zone vibrant and healthy is to tinker with it as little as possible:

- Use your dock as a bridge over the weedier shallows, and moor a swimming raft out in deeper water, rather than removing fish and amphibian habitat by ripping out aquatic plants to make a swimming area.
- Leave trees where they fall, unless they are a hazard to boats or swimmers. Typically, only a few trees along a kilometre of waterfront will tumble into the water during a year. When a cottager removes all of the trees lining the waterfront, habitat formed by the fallen trunks and branches that took decades to accumulate is destroyed in a single summer.
- Before the impact of creating sandy beaches on lake habitats was well understood, many cottagers liked to “improve” their swimming areas by bringing in a few truckloads of sand and dumping them on the shoreline.



So what is the harm in that? When the sand erodes, as it almost certainly will, it smothers spawning areas for smallmouth bass and other fish, buries mayflies in their burrows, and covers the vegetation where frogs and toads lay their eggs. The impact ripples through the food chain. Without frogs and tadpoles and other aquatic species to eat decaying aquatic plants and insects, more oxygen-depleting algae fills the lake and more insects swarm the shoreline. The blue heron moves on when amphibians grow scarce. While a beach may be fun for sunbathers, it is no picnic for littoral residents.

Despite these problems, sometimes a compromise is possible. You may be able to have a sandy area if, for example, it is well above the ordinary high water mark and there is little or no disruption to natural shoreline vegetation. (On a lakeshore, the ordinary high water mark is the highest point to which water customarily rises, and where the vegetation changes from mostly aquatic species to terrestrial). (For guidance, check DFO's "Operational Statements"; see p. 14).

**THE SHORELINE:  
GLUE FOR THE WATERFRONT**

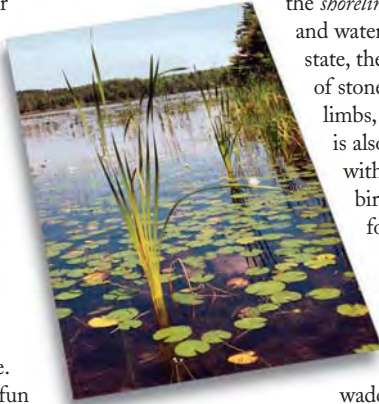
Thanks to thousands of years of practice, the existence of natural shoreline vegetation provides one of the world's most effective, least expensive erosion controls. The mix of

plants, shrubs, and trees forms a complex web of roots and foliage that knits the waterfront together, holding the bank in place and fending off the impacts of wind, rain, waves, ice, and boat wake.

The barricade against erosion is the *shoreline*, the place where land and water meet. In its natural state, the shoreline is a profusion of stones, plants, shrubs, fallen limbs, and tree trunks. But it is also a busy intersection, with animals, insects, and birds traveling back and forth. Moose and deer pick their way down

to the water to forage or drink. Mink skulk about on hunting trips. Water birds waddle from their nests to the water. Overhanging vegetation shades and cools the water, and acts as a fast-food outlet for fish by producing a rain of aphids, ants, and other insects that slip from their perches above.

**How we can help keep the shoreline together:** Things start to come apart when people remove the vegetation whose roots act as the glue that holds the shoreline together. The resulting erosion sends silt and sediment into the water



where it damages spawning areas. For example, the eggs of northern pike cling to vegetation in the shallows. Water circulating around the spawning bed carries oxygen to the eggs, but when silt covers them, the unhatched fish are suffocated.

A method often used to protect against shoreline erosion is to replace the natural shoreline with a breakwall made of wood, rock, concrete, or steel. In environmental terms, this converts a lively waterfront into a sterile environment. By imposing a sharp vertical drop-off on the shoreline, a breakwall limits the ability of plants to re-root up or down the bank as water levels rise and fall, typically reducing waterfront vegetation by one-half to three-quarters. The decline in the number and diversity of aquatic plants has a ripple effect, reducing habitat for fish, birds, and amphibians. As well, this kind of erosion control is almost always an expensive temporary fix. Because artificial materials lack the resilience of the natural shoreline, a homemade vertical breakwall often lasts only a decade or so before cracking and falling apart.

To maintain a healthy shoreline:

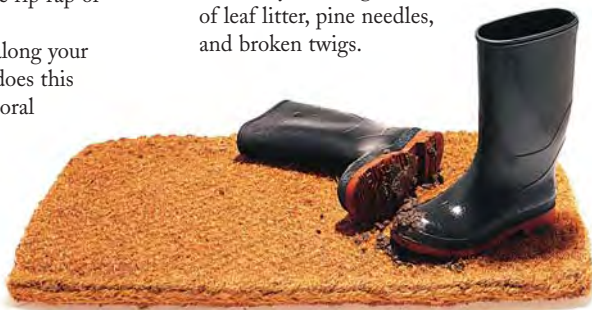
- DO leave the natural vegetation on the land and in the water.
- DO NOT replace the shoreline with a hardened surface like rip rap or breakwall.
- DO NOT dump fill along your waterfront. Not only does this destroy part of the littoral zone where fish live, but it may alter water currents and increase erosion on adjacent properties.

## THE RIPARIAN AND UPLAND ZONES: THE LAKE'S BUFFER

Just like the mat laid at the cottage door that welcomes muddy feet and shoes, lakes have a similar "contaminant" barrier: the *riparian* and *upland zones*.

There are a lot of nasty things waiting to catch a lift down to the lake with rain runoff, including seepage from septic tanks, fertilizers and pesticides, deposits from family pets, and oil or gas spilled on the driveway. One of the main contaminants from cottage runoff is phosphorus, a "nutrient" that occurs both in nature, as well as in human-made products, such as fertilizer and detergent. On its own, phosphorus helps to nourish life in the lake, but when we add to that natural load, phosphorus over-feeds the lake, causing algal blooms that consume the water's oxygen, and that results in poor water quality.

Fortunately, the jumble of trees, shrubs, and grasses along a natural shoreline forms a "buffer" that helps filter out undesirables. In the *riparian zone* - the section of land closest to the shoreline - the thick layer of low foliage controls erosion and sifts impurities out of surface runoff. Leaves and branches break the force of falling rain, which is further slowed by the rough surface of leaf litter, pine needles, and broken twigs.





The water is then absorbed by plant roots or the soil. As well as being a filter for the lake, the riparian zone is a refuge for wildlife: water birds nest in the tall grasses near the water; and red-winged blackbirds flit among the cattails. When the area is flooded during the high water period, even if there is only 18 cm of water, pike will thrash their way over the spring-flooded banks, scattering their eggs in the lake-edge nursery.

The higher, drier ground called the *upland zone* is typically forested with the kinds of trees that take advantage of better drainage, including Manitoba maple, poplar, spruce and white birch. The deep roots of the trees stabilize the slopes, while their foliage buffers the *shoreline* from winds. The forest canopy also cools the area by maintaining shade and boosting humidity in the summer. In winter, it shelters deer, chickadees, porcupines, grouse, and rabbits.

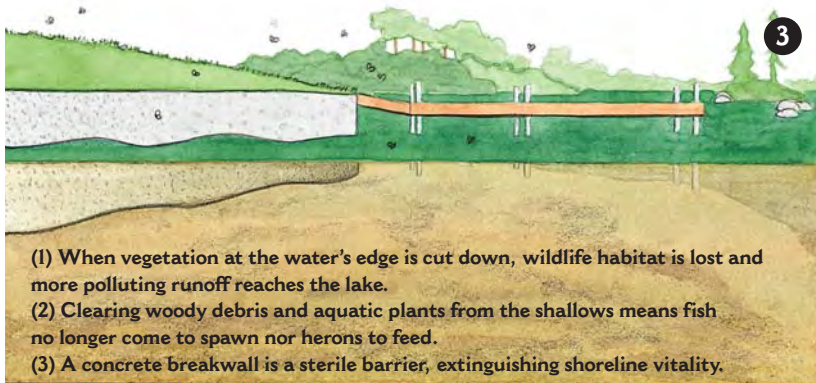
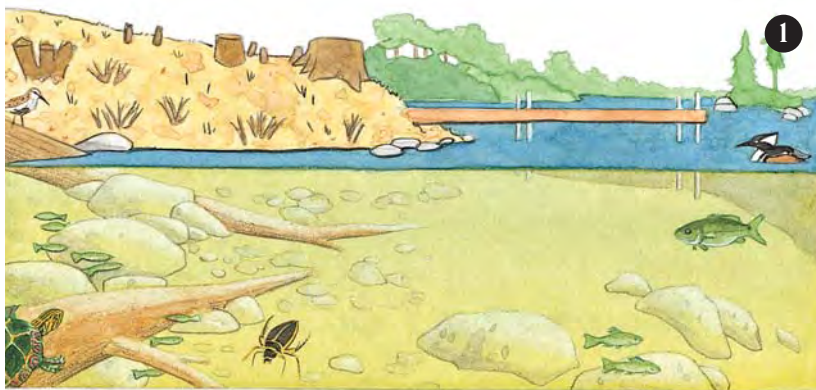
Together, these two zones form a buffer so effective that many experts estimate *only 10 percent* of the runoff actually makes it into the lake, and much of the sediment and other pollutants are filtered out before reaching the water. If the lake bottom does not drop off too quickly, then the

remaining run-off will tangle with another barrier of aquatic plants in the *littoral zone*, where the jumble of bulrushes, arrowhead, and cattails slows the influx of runoff and consumes many of its nutrients.

**How to keep the riparian and upland zones in place:** Almost any kind of development can weaken the lake's buffer, and some projects can ruin it altogether. Even in the *upland zone*, the hard surfaces of paved driveways, shingled roofs, and patios shed water, increasing runoff and heightening the danger of erosion. Sediment carried into the water is also a concern during construction when land is being cleared for a cottage, a garage, or even just a lawn. Here are a few ways you can assist the lake's natural filtering system:

- Eliminate potential pollutants by being careful with gas and oil around the cottage, avoiding the use of fertilizers and pesticides, and maintaining your septic system with regular pump-outs. Be careful not to overload the septic system with too much water; something to consider when running the dishwasher or washing machine, or hosting a big crowd for the weekend. Working the septic system too hard shortens its life, and can send some unpleasant things seeping toward the lake.
- Maintain as much riparian and upland vegetation as possible.
- Opt for softer or more permeable surfaces (gravel or wood chips) rather than concrete and asphalt.
- Replant disturbed areas as quickly as possible, and landscape grassed swales or depressions around the cottage to catch and encourage infiltration of rainwater flowing off of the roof.





(1) When vegetation at the water's edge is cut down, wildlife habitat is lost and more polluting runoff reaches the lake.

(2) Clearing woody debris and aquatic plants from the shallows means fish no longer come to spawn nor herons to feed.

(3) A concrete breakwall is a sterile barrier, extinguishing shoreline vitality.

Be especially careful in the *riparian zone*, where any soil dug up is apt to be washed straight into the lake during the next rainfall. Leave the riparian plants, shrubs and trees in place.

- Keep flower and vegetable gardens well away from the lake.

## YOU CAN SAVE YOUR LAKE FROM PREMATURE AGING

Like any cottager, a lake ages in a natural process called *eutrophication*: the increase in nutrients due to run-off from the surrounding area and the growth and decomposition of aquatic plants over time. Eventually (thousands of years later), so much decomposing plant and animal matter builds up that the lake bottom fills in, converting it to a bog and eventually, dry land.

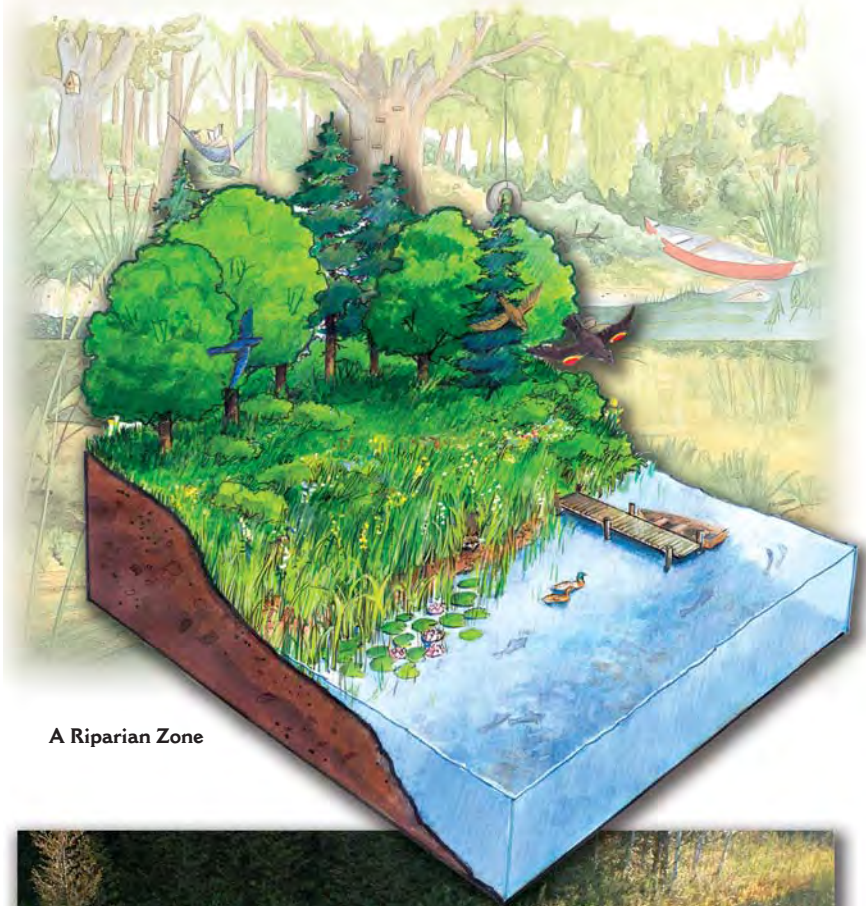
On the geologic time scale, this is a good and normal thing - a healthy eutrophic lake supports all sorts of warmwater fish such as largemouth bass, catfish, and pike. But when humans fast-forward the process by tearing out the shoreline buffer zone and dumping too many nutrients such as

phosphorus into the lake, the water begins to change too rapidly for the life that depends upon it. The water becomes murkier as plant and algae growth explodes, the added vegetation decomposing and consuming the oxygen normally shared with other aquatic creatures. Sensitive species like trout can suffocate in the oxygen depleted environment, interrupting the food chain and causing fish with a higher tolerance of lower oxygen conditions (like carp) to flourish. The lake ages before its time.

Because eutrophication is often the result of a lot of small actions - poor septic systems, using high-phosphate soaps, removing shoreline plants - it can also be arrested by the efforts of landowners. By understanding how a natural shoreline functions and then acting collectively to preserve, not destroy, that critical balance, individuals *can* make a difference.







**A Riparian Zone**





## MAKING AMENDS: WAYS TO RESTORE AN ALTERED SHORELINE

**T**he trouble with the natural shoreline is that there is not as much as there used to be. The extravagant native greenery that once sprawled along the waterfront has been cut down, boxed in, built over, and otherwise shoved aside on many lakes. It has been replaced by the ordered and angular world of docks, grass, beaches, and breakwalls. However, a “developed” shoreline is not a lost cause. Restoring the beauty and integrity of your waterfront need not cost a lot of money or require a lot of labour - after all, working with nature is cheaper and easier than working against it.

Because each stretch of shoreline is distinct, there is no one generic prescription for bringing an altered waterfront back to

health. But the following scenarios and suggestions will help you begin to make amends with your shoreline.

### BEFORE YOU RESTORE: THE APPROVALS PROCESS

A number of federal, provincial, and municipal laws and regulations influence shoreline work across Canada. Whether you want to restore your shoreline, or build from scratch, check well in advance of your project to see what approvals you may require. Under the federal *Fisheries Act*, the onus is on property owners to ensure that shoreline work does not harmfully alter, disrupt, or destroy fish habitat without the required authorization from DFO.

The first step is to check whether your project meets the criteria of an

Operational Statement - DFO's guidelines for works around water that pose a low risk to fish habitat. If your shoreline plan meets the conditions laid out in an Operational

Statement and you incorporate the measures it advises to protect fish habitat, then your project does not require formal review by



DFO. To see if your plans are lake-friendly (or to find out how to make them better), visit the DFO web site at [www.dfo-mpo.gc.ca/oceans-habitat/](http://www.dfo-mpo.gc.ca/oceans-habitat/). Once there, click on “Operational Statements” (for dock and boathouse construction, beach creation, etc.).

If the Operational Statements do not relate to your project, or they do not apply in Ontario, talk to your local Conservation Authority (CA) or, if you do not have one, the nearest Ontario Ministry of Natural Resources (MNR) office. For landowners who have property fronting the Rideau Canal, Trent-Severn Waterway, or other federal lands, contact Parks Canada. On regulated waterways, you should also consult with the authority responsible for water levels.

Here is another stop you should make on the approvals journey: If your project is in an area where there are aquatic species at risk, as defined by the federal *Species at Risk Act* (SARA), get in touch with your local CA, DFO or Parks Canada office to make sure that what you have in mind is in compliance with SARA. A visit to [www.sararegistry.gc.ca](http://www.sararegistry.gc.ca) will help.

If you are in doubt about what process to follow, contact your nearest DFO office. DFO staff can guide you through the approvals process, provide some options, and help you select the best approach for your shoreline, possibly saving you time and money. Projects that involve hard materials such as stone, steel, or concrete are more apt to become tangled in shoreline regulations, but it is a good idea to call the government experts even if you are just mulling over a restoration.



Keep in mind that obtaining approval from one agency does not guarantee that you will get the okay from another. Make sure that you have *all* necessary approvals before starting work.

#### **How to prepare for your project:**

Make a plan for your shoreline-friendly property, including an inventory of existing plants and features, the different waterfront zones your project will involve, and a notion of your final objectives. Find some graph paper (to make it easier to draw to scale) and draw up a map of your property, including buildings and structures, the shoreline, high and low water points, water intakes, vegetation on the land and in the water, wildlife habitat (fish spawning places, areas where ducklings swim), and prevailing winds and currents. This map will come in handy if you discover that you



require formal approvals or permits for your project, so make several copies.

Next, note problem areas on your shoreline: places that have been clear-cut, eroding banks, failing breakwalls, ailing docks, and so on. Include high-activity areas, such as the patch of lawn that acts as the badminton or volleyball court, and the pathways to the shoreline. Brainstorm with your family, neighbouring cottagers, and shoreline-care experts to find natural, environmentally friendly solutions.

When you have come up with the best approach, discuss your project with the CA, MNR, Parks Canada or DFO. If you need to make a formal application, be sure to include:

- Your name, address, telephone number, fax number, and e-mail address;
- Your water body's name and location, including lot and concession number, municipality, county or district, and even the latitude and longitude coordinates if

you have them (the coordinates are available off a good topographic map or a Global Positioning System receiver);

- A copy of your hand-drawn lot map, signed and dated;
- An outline of your plans, including construction details, schedule, techniques, materials and goals; and
- Photos of the work site and the surrounding shoreline. Photos throughout the seasons (summer, winter, and during spring breakup) may be helpful.

Do your planning the summer before you want to begin the work, and file your applications (where required) in the fall. That way, you will have all of the paperwork taken care of in time for the spring thaw.

What happens if you ignore all of this good advice? Not taking the proper precautions to ensure that your project meets provincial and federal requirements may result in a violation under the *Fisheries Act* and related legislation. First time offenders under the *Fisheries Act* can receive a maximum fine of \$300,000, and possible jail time for subsequent conviction. As well, the courts often order restoration of the property to its original state.

## RESTORATION #1: LESSENING YOUR LAWN'S IMPACT

How many lawns can you count around your lake? Probably more than you used to, as increasing numbers of people are retiring to live full time at their cottages. While turf has its place, lakes and lawns have a relationship that is uneasy at best, and poisonous at worst. Lawns displace the hard-working native plants that protect the lake, and when a heavy rain comes, they do little to protect



the lake from sediment or chemical-laden run-off. According to one study, 90 percent of the rain falling on a natural shoreline is absorbed before reaching the water, while *up to 55 percent* of the rain falling on hard surfaces, including lawns, flows right into the lake.

All that runoff hastens erosion, sending silt and sediment into the water where it damages spawning and feeding areas. Pesticides and fertilizers lavished on the lawn also play havoc with the aquatic ecosystem. Weed and bug killers may harm fish or destroy the plants and insects that fish feed on, and fertilizers promote algae growth, leading to a greener, murkier lake. A kilogram of phosphorus fertilizer washed off of the lawn and into the lake fuels the growth of 500 kg of aquatic plants, snaring boat propellers and choking shorelines.

If you must have a lawn (over the septic bed, for example), use natural methods to maintain it and avoid chemical fertilizers and weed controls. Try leaving the grass clippings where they fall to mulch and fertilize the sod, but only if the lawn is far enough away from the water that the clippings will not be washed into the lake. Let the grass grow at least seven centimetres long between trimmings to conserve soil moisture. Another option is to let the grass grow all season; knocking it down once a year with a trimmer or scythe will keep trees and shrubs out, while permitting wildflowers to put down roots.

### **Buffering your lawn from the lake:**

Because lawns are the last thing a lake wants beside it, you will be doing the shoreline and yourself a big favour by getting rid of the tidy plot once and for all. But if that is too radical a notion for first-time restorationists, take the next best step: Keep them apart with a buffer zone of natural vegetation to filter contaminants in runoff, provide homes for wildlife, and enhance your cottage privacy. (For more detail on buffer function, see p. 9).

The deeper a buffer is, the better it works. As a rough rule of thumb, a buffer extending back 30 metres from the top of the bank is sufficient for most coldwater lakes (whose fish suffer more from nutrient runoff), while 15 metres will protect a warmwater lake. The natural area should be even deeper on properties with steep, erosion-prone slopes. The key thing to remember is that any amount of buffer is better than none at all. If 30 metres sounds

**Replace a hardened walkway with a more absorbent one made of wood chips, gravel, or wooden slats spaced apart so that rainfall can soak into the soil.**

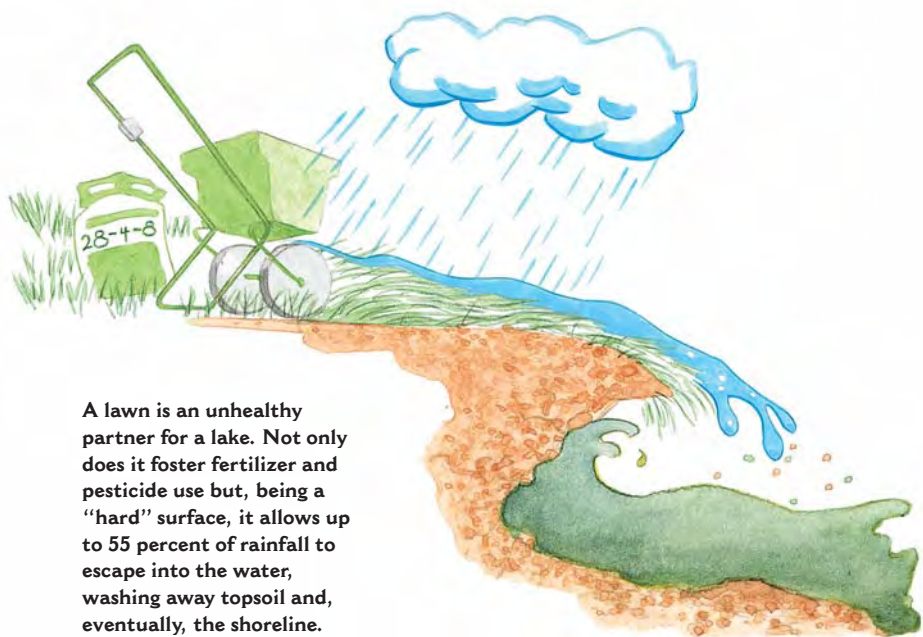


like too much, consider going *au naturel* in stages, adding a bit more each year by working back from the shoreline in two-to-three metre strips.

**How to Build a Buffer:** The easiest approach to building a buffer, especially for lots with patches of healthy native vegetation or erosion-prone soils, is to stop mowing the lawn. Native grasses, shrubs, and trees will colonize the area, with the wildflowers and grasses moving in during the first year, and shrubs and trees following a year or two later. Troublesome invaders, such as garlic mustard or burdock, can be selectively cut or hand pulled.

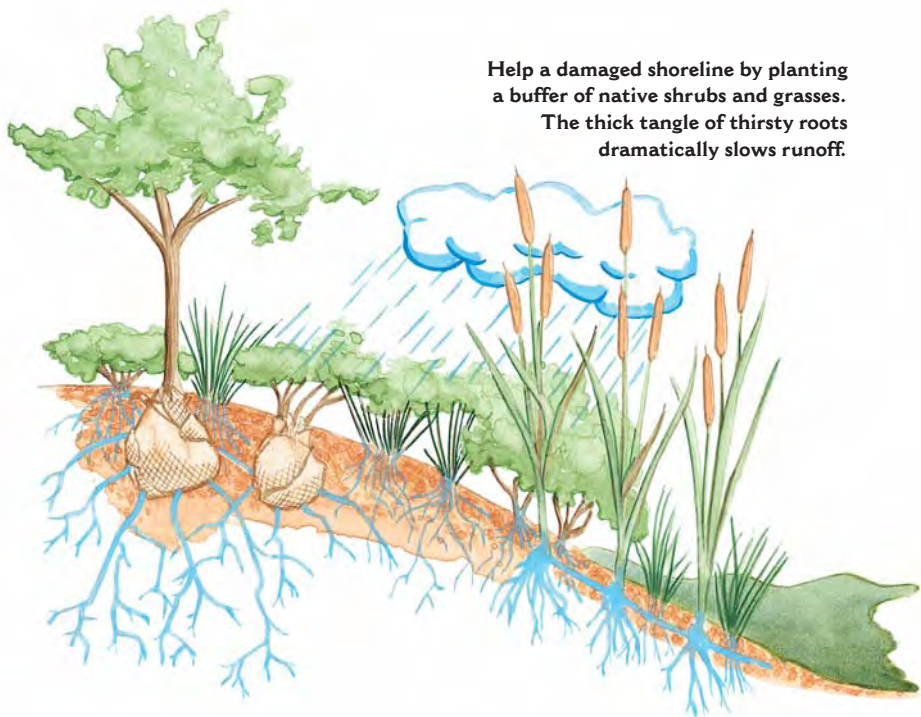
Restoring a heavily clear-cut area is a little tougher, but not beyond the skills of anyone who can handle a shovel and a

watering can. Start by looking at the foliage covering natural areas of the lake and try to duplicate it on your lot. By planting a mix of native plants and shrubs - willows, dogwoods, joe-pye weed, blue vervain, and elderberry - in the riparian zone, you can protect the soil, buffer the waterfront, and entice birds and other wildlife. In the upland area, you can add species that thrive on well-drained slopes, such as sugar maple, white birch, white pine, and white ash. Avoid pilfering wild plants (unless they are going to be built on or paved over) because you are simply denuding one area to clothe another. Do make sure that the species you purchase are native to your area - consult with the various shoreline experts, local gardening centres, horticultural societies, and naturalists' clubs.



**A lawn is an unhealthy partner for a lake. Not only does it foster fertilizer and pesticide use but, being a “hard” surface, it allows up to 55 percent of rainfall to escape into the water, washing away topsoil and, eventually, the shoreline.**





**Help a damaged shoreline by planting a buffer of native shrubs and grasses. The thick tangle of thirsty roots dramatically slows runoff.**

A natural area often looks more appealing to the eye if you plan a transition zone between it and the more manicured areas of your property. If you like, consider softening the shift from lawn and gardens to a wilder-looking buffer with a mix of showy native plants, such as black-eyed Susan and bee balm. Adopt flowing, curving borders rather than straight lines to promote this natural aesthetic. Preserve a view of the water through judicious pruning, grouping taller trees to allow sightlines, or building an elevated viewing deck behind the cottage.

Use a meandering trail - angled along the slope, not running straight down to the shoreline - to lead visitors from the cottage

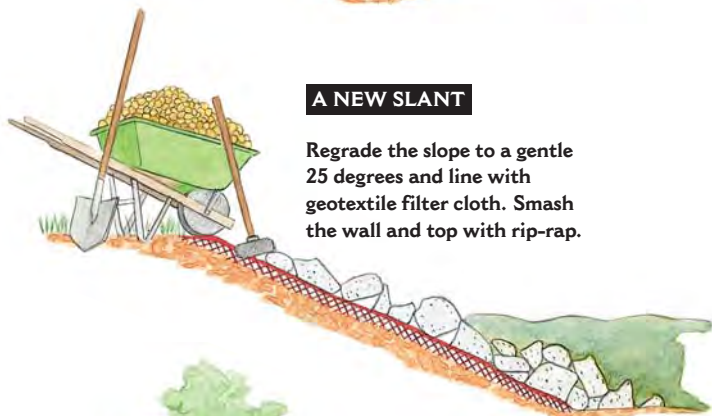
to the dock. The path will look more natural and will allow rainwater to infiltrate the soil if it is covered with pea gravel or bark chips.

Another option is a wood walkway, with slats wide enough to let rain and sunlight through. Creative types might also consider adding an elevated walkway or bridge over sensitive areas, built on posts rising 15 - 30 cm above the ground. The bridge protects vegetation and provides cover for ground-hugging woodland creatures such as frogs, toads, snakes, and salamanders. On slopes, it is best to opt for raised wooden stairs built on posts. Cutting into the slope to install steps only encourages erosion.



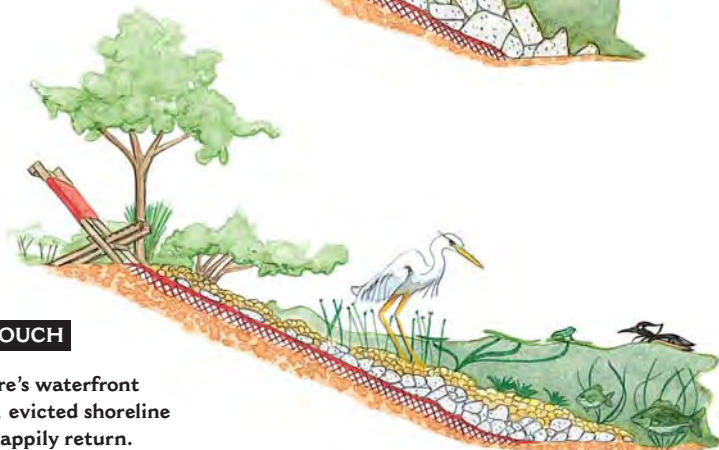
**A HARD EDGE**

Over time, wave action turns a breakwall into a crumbling eyesore.



**A NEW SLANT**

Regrade the slope to a gentle 25 degrees and line with geotextile filter cloth. Smash the wall and top with rip-rap.



**A SOFT TOUCH**

With nature's waterfront re-created, evicted shoreline residents happily return.

Concrete steps and sidewalks will circumvent your buffer by channelling runoff towards the lake.

## RESTORATION #2: SWITCHING TO A SHORELINE- FRIENDLY DOCK

Docks are so much a part of lakeside living, you probably see them as extensions of the shoreline. The truth is, ill-designed shoreline structures fragment the habitat that is so critical to lakeside creatures. When the time comes to replace the rickety, old dock you have inherited, select one that suits your purposes but that also does the least harm to the lake. Cottagers can find all that they need to know about shoreline-friendly structures in *The Dock Primer* (to get a copy, see p. 24), but here are a few key factors to keep in mind:

- **Type of dock:** A floating dock is among the top fish-friendly choices because it causes the least disturbance to the lake bottom, provides fish cover, rides out fluctuating lake levels, and does not alter water currents. But it is not perfect. Floating docks shade some of the littoral zone, reducing the aquatic life that many fish, insects, and animals depend on. They also pose problems for ducklings. The waterfowl cling to the shoreline as they learn to paddle, and may shun an area where they have to circumnavigate a lot of docks jammed up against the land. You can easily fix this problem by pushing the dock a bit further out and using a gangplank to bridge the short stretch of water between it and the shoreline. This gives mama duck and her brood a marine underpass, while allowing you to access your dock.

Pipe or pile docks may be an equally good option for lakes with more stable water levels. Resting mostly out of water

on pipes or posts, both types of dock have a small footprint on the *littoral zone*. They also provide some structural habitat, and allow more sunlight to penetrate through to the lake bottom. Cantilever, suspension, and lift docks are anchored by their base to the shoreline and overhang the water. They are gentle on the environment, but they are expensive and fairly complex to build. Less preferred are crib docks, usually built on a base of square-cut timbers filled with stones, covering parts of the *littoral zone*. Last and definitely least, a concrete pier is a disaster in environmental terms, crushing the life in the *littoral zone*.

- **Building materials:** The safest option for waterfront construction is untreated wood, such as cedar, fir, hemlock, and tamarack. Plastic wood, if installed properly, offers long life, but may sag between spans or split during installation if you are not careful.

Treated wood is definitely a second choice. Wood preservatives kill the organisms that cause rot, but what destroys fungi can also harm other organisms (including you if you breathe in too much sawdust or get too much preservative on your skin). If you must go this route, buy lumber that is pressure treated at the factory rather than doing it yourself with a paintbrush. Approved wood preservatives most commonly used are alkaline copper quaternary (ACQ) and copper azole (CA). Creosote-treated wood should not be used in or near water. Before you buy, ask your local building supply outlet for more information about environmentally friendly wood products.

- **Choose your site carefully:** You can reduce the impact of waterfront development by selecting dock or boathouse sites with little or no vegetation, and developing 25 percent or less of your



total frontage. If, for example, you own 30 metres of lakefront, pick the three to eight metres where development will do the least harm, and set that section aside for a dock or swimming area. Keep the fish, ducks, and other wildlife happy by leaving the rest in its natural state. DFO's Operational Statements provide good advice about protecting fish and fish habitat when building a dock or undertaking other shoreline projects; (see p. 14).

### RESTORATION #3: SOFTENING A HARDENED SHORELINE

Take a look along your waterfront - wherever you see a breakwall, that stretch of shoreline looks almost lifeless. "Hardened" shorelines are like hardened arteries: Left without treatment, they can have serious health consequences.

When a shoreline is bounded by concrete, steel, or stone, the flow of life along the waterfront is constricted. In serious cases, the biological components of the waterfront are removed altogether, as plant habitat is destroyed and fish, birds, and amphibians move on.

Worse still, hardened shorelines are only a temporary fix for an erosion problem usually caused by removing shoreline vegetation. When wave

action slams against a vertical wall, the energy is deflected upwards where the wave breaks against the top of the wall, and downwards, where currents scour out the earth at its base. As the ground beneath it washes away, the wall begins to list and break up. Eventually, it topples over.

If you own a breakwall, there are a few things you can do to reduce the pounding it takes and improve habitat along the shoreline. First, plant a buffer zone (see p. 17), including a lot of deep-rooted native shrubs, to hold the soil together and prevent gullies from opening up behind the wall. The next step, which requires the approval of government authorities, is to improve the habitat in the littoral zone. Stones piled at a 45-degree angle in front of the wall will add more places for fish to hide and feed, and may trap enough sediment to encourage the growth of aquatic plants. As a bonus, the stones will

also absorb much of the force of the waves, extending the life of the wall. "Shore ladders," made by piling up enough stones to reach from the lake bed to the top of the wall, allow frogs, snakes, and mink to travel back and forth from land to water.

If the breakwall is already falling apart, view it as an opportunity to replace the crumbling eyesore with a new, more natural shoreline. After receiving the appropriate approvals and advice, dig out the bank behind the failing wall to restore a slope of 25 degrees or less, and line it with



geotextile filter cloth to keep the soil in place. Ideally, you should remove the breakwall, but if that is not practical, you can pull it back onto the new slope and break the concrete into cobble-sized pieces of rubble. Be sure to add a veneer of appropriately sized stones commonly known as “rip-rap” (usually 15-20 cm in diameter) to cover the filter cloth. Just behind the riprap, plant woody vegetation and shrubs, such as willow, dogwood, sweet gale, Virginia creeper, riverbank grape, and poplar. Eventually, the plants will grow into the spaces between the stones. You will have a shoreline-friendly waterfront that controls erosion and provides wildlife habitat.

Most shorelines can be held together by their natural vegetation. In erosion-prone areas, the existing plants can be augmented by shrub willows. CAs can also explain how to “bio-engineer” a shoreline to resist erosion with a tough and resilient combination of stones, wood, willow, and poplar cuttings.

Finally, if you have a serious erosion problem - particularly if you are on one of the Great Lakes - you will need good advice on protecting your shoreline. Check with your local CA or MNR office and consider weighing your options with a coastal engineer. Well-engineered erosion controls that balance shoreline protection and habitat maintenance will cost more than a do-it-yourself job, but the investment pays off in longevity, peace of mind, and preservation of the waterfront environment.

## THE NEW-LOOK WATERFRONT

Depending how developed your lake is with lawns, breakwalls, and the like, a cottager opting for the “natural” look may be viewed by the neighbours with varying degrees of interest, curiosity, and bemusement. As you begin your restoration project, get other lake residents onside by explaining why you are forsaking the lawn in favour of dogwood and black-eyed Susan, and perhaps offering them a copy of this booklet. Explain that you are concerned about the health of the waterfront and that you want to preserve the lake and its inhabitants for your kids - or their kids - to enjoy. On a wider scale, try contacting like-minded lake lovers through the local lake association. Forming an unofficial shoreline support group is a good way to share shoreline restoration information.

Then, having ensured your reputation as a thoughtful, concerned lakeside resident - maybe even a visionary! - you can spend more time relaxing and enjoying your waterfront.

## FURTHER READING



### **The Dock Primer**

Co-published by Fisheries and Oceans Canada and Cottage Life

*The Dock Primer* is an invaluable guide to waterfront-friendly docks, covering all the essentials from best building designs to the approvals process.

### **The Drain Primer**

Cliff Evanitski

Fisheries and Oceans Canada, Ontario Federation of Agriculture and Drain Superintendents Association of Ontario

*The Drain Primer* is a helpful guide to maintaining and conserving agricultural drains and fish habitat.

### **The Baitfish Primer**

Becky Cudmore and Nicholas E. Mandrak  
Fisheries and Oceans Canada and  
Bait Association of Ontario

*The Baitfish Primer* is an informative guide for identifying and protecting Ontario's baitfishes.

### **The Fish Habitat Primer**

Fisheries and Oceans Canada

*The Fish Habitat Primer* is an essential guide to recognizing and respecting the environment on which fish depend to keep their - and our - waterways vibrant with life.

**Working Around Water? – a series of fact sheets.**

**Operational Statements - a series of documents developed to streamline DFO's regulatory review of low risk activities.**

These publications, and more, are available electronically on the Fisheries and Oceans Canada (DFO) web site at [www.dfo-mpo.gc.ca/oceans-habitat/](http://www.dfo-mpo.gc.ca/oceans-habitat/). For a copy of any of these DFO publications, please contact your local DFO office (see "Contacts," p. 27).

Aussi disponible en français.





## ACKNOWLEDGEMENTS

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Illustrations by David Wysotski. Photography by Kevin Hewitt.



## CONTACTS

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E-mail: [referralsburlington@dfo-mpo.gc.ca](mailto:referralsburlington@dfo-mpo.gc.ca)

#### **London**

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Fax: 519-668-1772  
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### EASTERN ONTARIO DISTRICT

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#### **Peterborough**

501 Towerhill Road, Unit 102  
Peterborough, ON K9H 7S3  
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Fax: 705-750-4016  
E-mail: [referralspeterborough@dfo-mpo.gc.ca](mailto:referralspeterborough@dfo-mpo.gc.ca)

#### **Prescott**

401 King Street West  
Prescott, ON K0E 1T0  
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Fax: 613-925-2245  
E-mail: [referralsprescott@dfo-mpo.gc.ca](mailto:referralsprescott@dfo-mpo.gc.ca)

### NORTHERN ONTARIO DISTRICT

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#### **Parry Sound**

28 Waubeek Street  
Parry Sound, ON P2A 1B9  
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Fax: 705-746-4820  
E-mail: [referralsparrysound@dfo-mpo.gc.ca](mailto:referralsparrysound@dfo-mpo.gc.ca)

#### **Thunder Bay and Kenora**

425-100 Main Street  
Thunder Bay, ON P7B 6R9  
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Fax: 807-346-8545  
E-mail: [referralsthunderbay@dfo-mpo.gc.ca](mailto:referralsthunderbay@dfo-mpo.gc.ca)

#### **Sudbury and Sault Ste. Marie**

1500 Paris Street, Unit 11  
Sudbury, ON P3E 3B8  
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Fax: 705-522-6421  
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## Cottage Life

### COTTAGE LIFE

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Web Site: [www.cottagelife.com](http://www.cottagelife.com)



### MINISTRY OF NATURAL RESOURCES Natural Resources Information Centre

P.O. Box 7000  
300 Water Street  
Peterborough, ON K9J 8M5  
Tel: 1-800-667-1940  
Fax: 705-755-1677  
E-mail: [mnr.nric@ontario.ca](mailto:mnr.nric@ontario.ca)  
Web Site: [www.mnr.gov.on.ca](http://www.mnr.gov.on.ca)



### CONSERVATION ONTARIO

120 Bayview Parkway, Box 11  
Newmarket, ON L3Y 4W3  
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E-mail: [info@conservationontario.ca](mailto:info@conservationontario.ca)  
Web Site: [www.conservationontario.ca](http://www.conservationontario.ca)



Parcs  
Canada

Parks  
Canada

### PARKS CANADA

25 Eddy Street  
Gatineau, QC K1A 0M5  
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### FEDERATION OF ONTARIO COTTAGERS' ASSOCIATIONS (FOCA)

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### THE LIVING BY WATER PROJECT

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Web Site: [www.watersheds.ca](http://www.watersheds.ca)

See page 27 for complete listing of DFO Offices.



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