



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/

COTTAGE LIFE

54 St. Patrick Street, Toronto, ON M5T 1V1
Web Site: www.cottagelife.com

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YOUR SHORELINE: A NATURAL WONDER

For 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

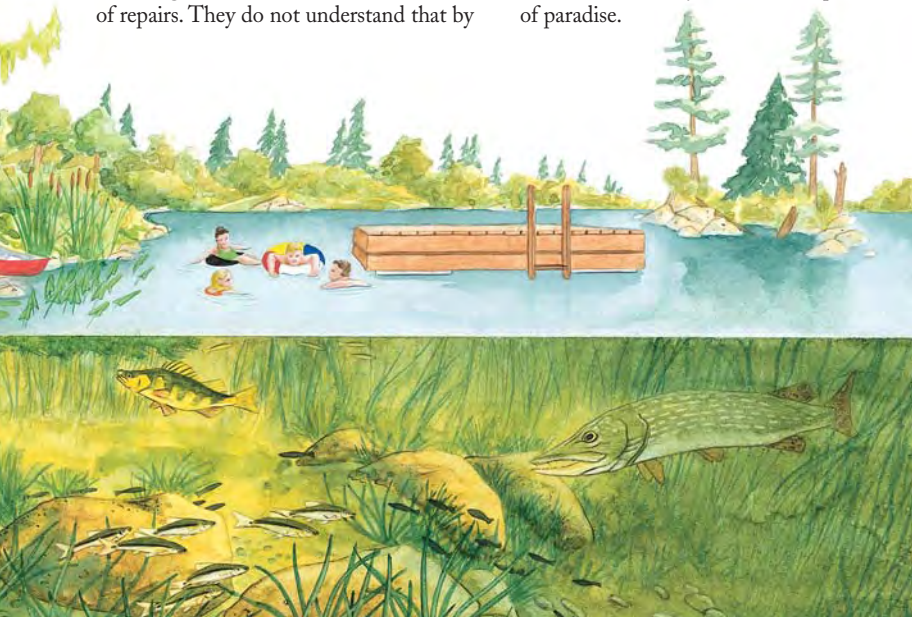
will ever come into contact with, and almost certainly the most complex piece of the earth that we will ever have the opportunity to live near and share. Equally important, the waterfront is crucial to your lake's health, providing oxygen, food, cover and a barrier to contaminants, as well as a living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

Take 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.



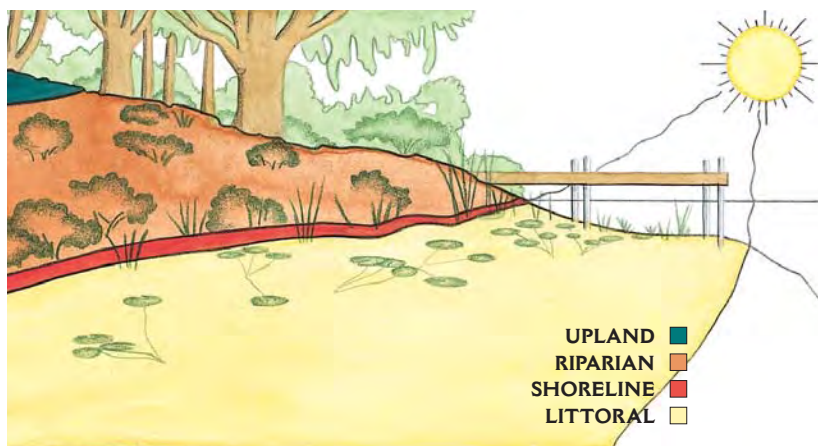
a range of species, offering foraging areas and hiding spots and a shallow, relatively protected area for young fish and amphibians to grow. Aquatic plants and downed trees are a crucial part of the system, with the plants acting as the lungs of the lake, converting sunlight into food and releasing oxygen 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**

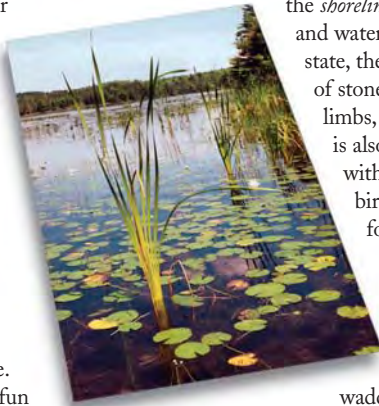
Thanks to thousands of years of practice, the existence of natural shoreline vegetation provides one of the world's most effective, least expensive erosion controls. The mix of

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:

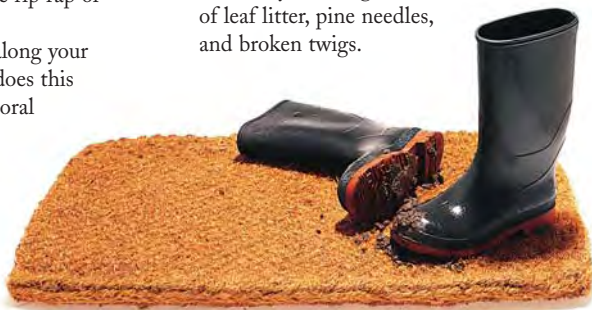
- DO leave the natural vegetation on the land and in the water.
- DO NOT replace the shoreline with a hardened surface like rip rap or breakwall.
- DO NOT dump fill along your waterfront. Not only does this destroy part of the littoral zone where fish live, but it may alter water currents and increase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

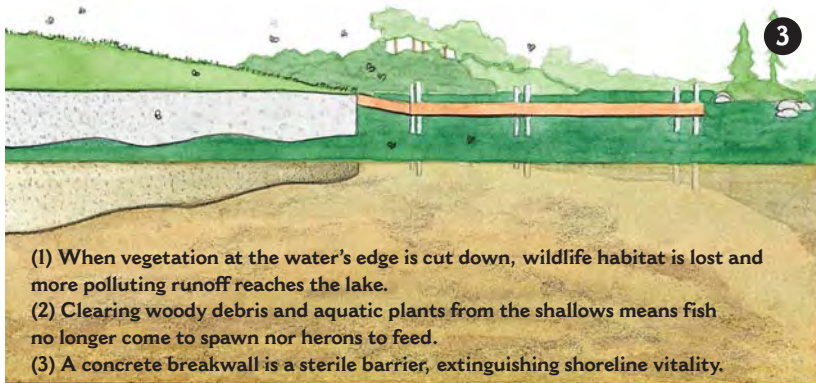
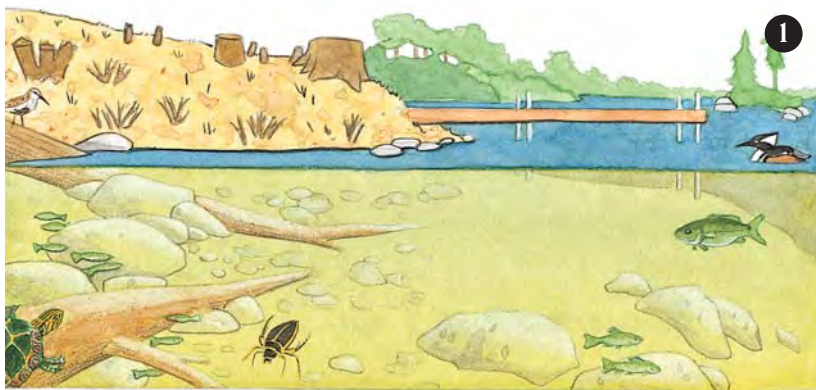
Together, these two zones form a buffer so effective that many experts estimate *only 10 percent* of the runoff actually makes it into the lake, and much of the sediment and other pollutants are filtered out before reaching the water. If the lake bottom does not drop off too quickly, then the

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

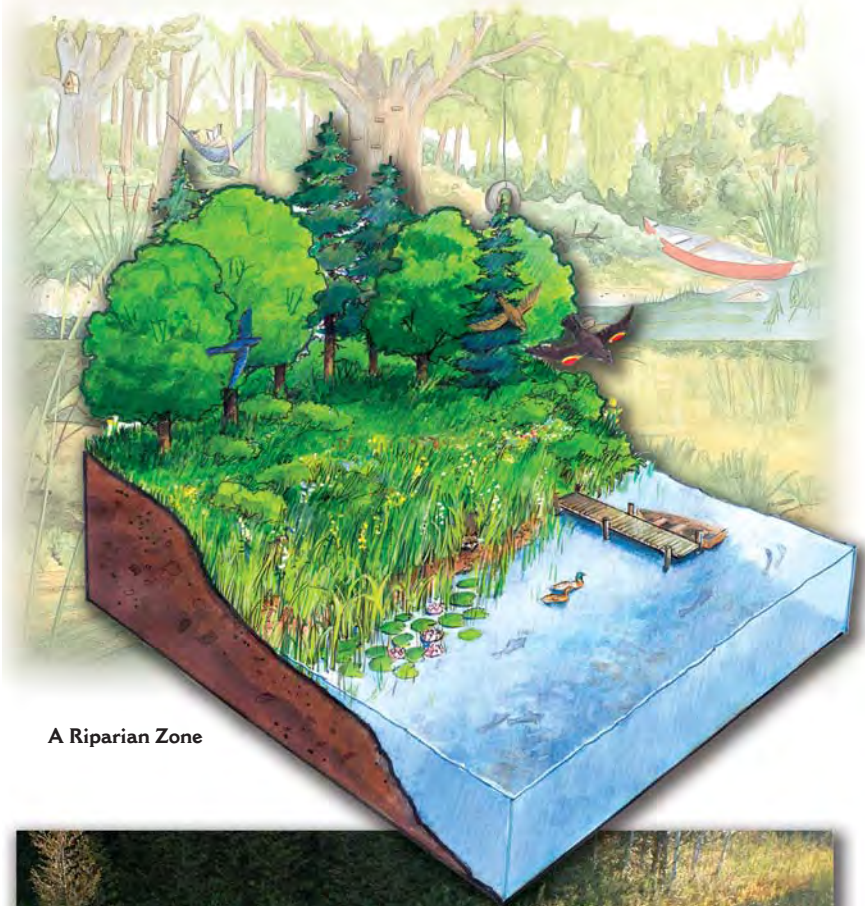
Like any cottager, a lake ages in a natural process called *eutrophication*: the increase in nutrients due to run-off from the surrounding area and the growth and decomposition of aquatic plants over time. Eventually (thousands of years later), so much decomposing plant and animal matter builds up that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

The 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/. 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 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.

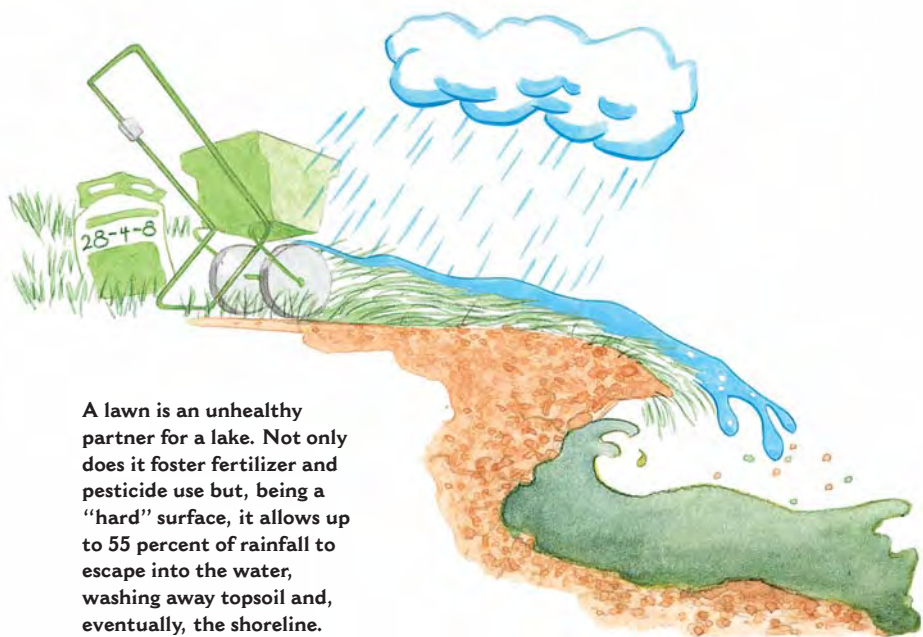


like too much, consider going *au naturel* in stages, adding a bit more each year by working back from the shoreline in two-to-three metre strips.

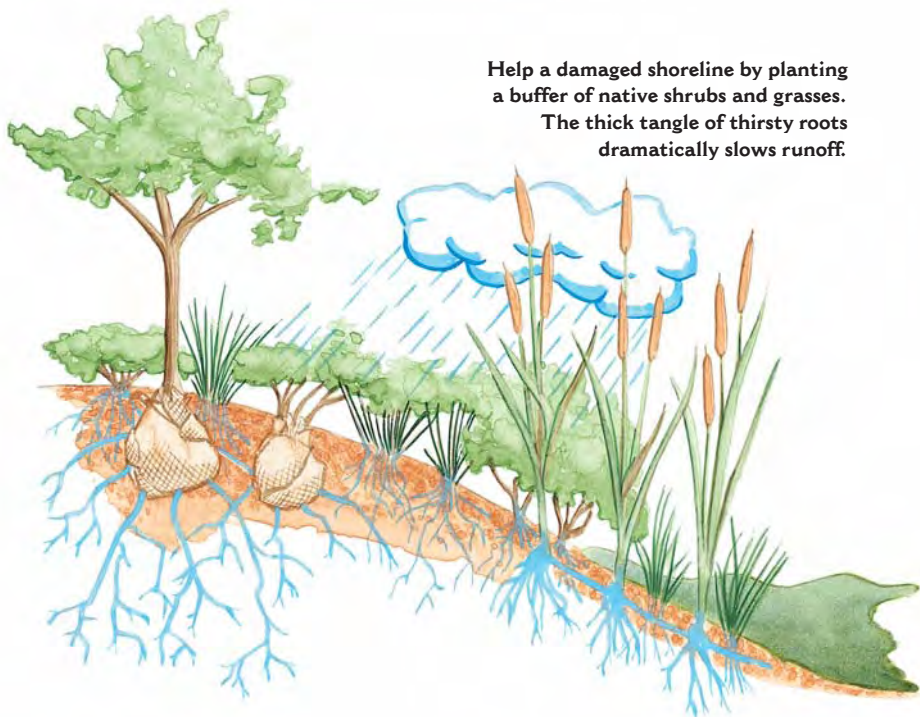
How to Build a Buffer: The easiest approach to building a buffer, especially for lots with patches of healthy native vegetation or erosion-prone soils, is to stop mowing the lawn. Native grasses, shrubs, and trees will colonize the area, with the wildflowers and grasses moving in during the first year, 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

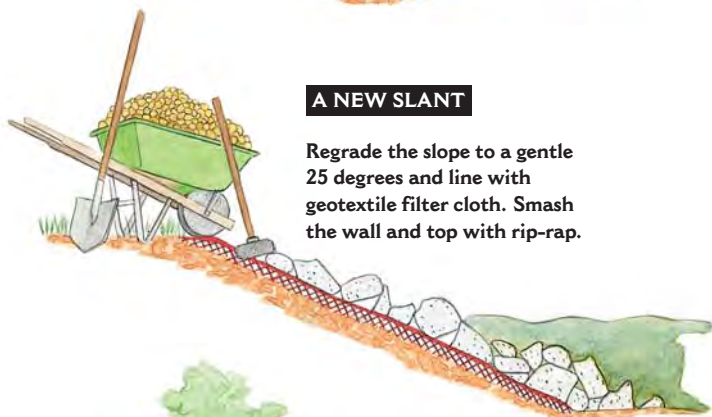
to the dock. The path will look more natural and will allow rainwater to infiltrate the soil if it is covered with pea gravel or bark chips.

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.



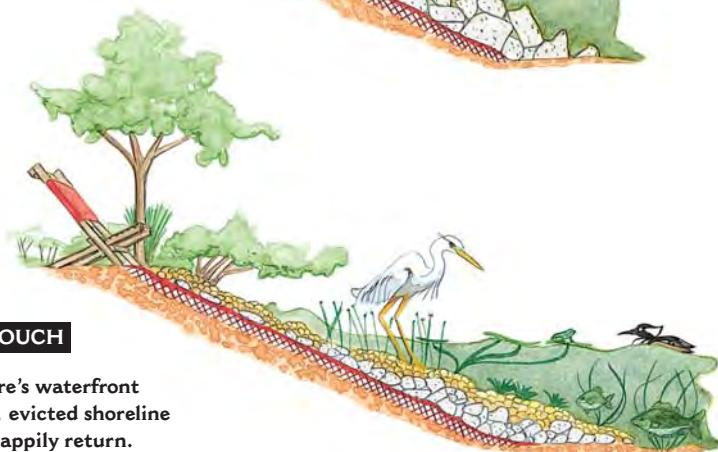
A HARD EDGE

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/. For a copy of any of these DFO publications, please contact your local DFO office (see "Contacts," p. 27).

Aussi disponible en français.



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Illustrations by David Wysotski. Photography by Kevin Hewitt.

CONTACTS

Fisheries and Oceans Canada - Ontario-Great Lakes Area Offices

SOUTHERN ONTARIO DISTRICT

Burlington

304-3027 Harvester Road
P.O. Box 85060
Burlington, ON L7R 4K3
Tel: 905-639-0188
Fax: 905-639-3549
E-mail: referralsburlington@dfo-mpo.gc.ca

London

73 Meg Drive
London, ON N6E 2V2
Tel: 519-668-2722
Fax: 519-668-1772
E-mail: referralslondon@dfo-mpo.gc.ca

EASTERN ONTARIO DISTRICT

Peterborough

501 Towerhill Road, Unit 102
Peterborough, ON K9H 7S3
Tel: 705-750-0269
Fax: 705-750-4016
E-mail: referralspeterborough@dfo-mpo.gc.ca

Prescott

401 King Street West
Prescott, ON K0E 1T0
Tel: 613-925-2865
Fax: 613-925-2245
E-mail: referralsprescott@dfo-mpo.gc.ca

NORTHERN ONTARIO DISTRICT

Parry Sound

28 Waubeek Street
Parry Sound, ON P2A 1B9
Tel: 705-746-2196
Fax: 705-746-4820
E-mail: referralsparrysound@dfo-mpo.gc.ca

Thunder Bay and Kenora

425-100 Main Street
Thunder Bay, ON P7B 6R9
Tel: 807-346-8118
Fax: 807-346-8545
E-mail: referralsthunderbay@dfo-mpo.gc.ca

Sudbury and Sault Ste. Marie

1500 Paris Street, Unit 11
Sudbury, ON P3E 3B8
Tel: 705-522-2816
Fax: 705-522-6421
E-mail: referralssudbury@dfo-mpo.gc.ca

Cottage Life

COTTAGE LIFE

54 St. Patrick Street
Toronto, ON M5T 1V1
Tel: 416-599-2000
Fax: 416-599-0500
E-mail: clmag@cottagelife.com
Web Site: 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
Web Site: www.mnr.gov.on.ca



CONSERVATION ONTARIO

120 Bayview Parkway, Box 11
Newmarket, ON L3Y 4W3
Tel: 905-895-0716
Fax: 905-895-0751
E-mail: info@conservationontario.ca
Web Site: www.conservationontario.ca



Parcs
Canada Parks
Canada

PARKS CANADA

25 Eddy Street
Gatineau, QC K1A 0M5
Tel: 1-888-773-8888
E-mail: information@pc.gc.ca
Web Site: www.parksCanada.gc.ca



FEDERATION OF ONTARIO COTTAGERS' ASSOCIATIONS (FOCA)

201 - 159 King Street
Peterborough, ON K9J 2R8
Phone: 705-749-FOCA (3622)
Fax: 705-749-6522
E-mail: info@foca.on.ca
Web Site: www.foca.on.ca



THE LIVING BY WATER PROJECT

Centre for Sustainable Watersheds
14 Water Street, Box 280
Portland, ON K0G 1V0
Tel: 613-272-5136
E-mail: lbw@watersheds.ca
Web Site: www.watersheds.ca

See page 27 for complete listing of DFO Offices.



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