

Take the Plunge

A Guide to Stewardship of Ontario's Waters



Federation of Ontario Cottagers' Associations

Take the Plunge

A Guide to Stewardship of Ontario's Waters



ISBN
978-0-9684236-1-5

Ontario Federation of Cottagers' Associations
201 - 159 King St., Peterborough, ON K9J 2R8
Phone: 705-749-3622
Email: info@foca.on.ca
Fax: 705-749-6522



The Federation of Ontario Cottagers' Associations would like to thank the volunteers (FOCA members and environmental professionals) who dedicated their time to this project.

Coordinator/Editor: Samantha Brown
Production Editor: Judith Earnshaw
Design and Layout: Louis Taylor
Printing: Transcontinental

This book was manufactured using Enviro 100 stock which contains FSC certified 100% post-consumer fibre and is Certified EcoLogo, Processed Chlorine Free and FSC Recycled. It was Manufactured using biogas energy.



This publication was made possible with the support of the Ontario Trillium Foundation.

Copyright © 2009, Federation of Ontario Cottagers' Associations

Contents

A Word from the Coordinator.....	4
Introduction.....	5
Part 1: The Lake Environment	
Surficial Geology of Ontario As It Relates to Cottage-Country Lakes.....	7
Water Quality.....	10
Wetlands.....	20
Crown-Land Forestry.....	28
Part 2: Biodiversity and the Waterfront	
Shorelands.....	34
Freshwater Fisheries.....	42
Wildlife.....	48
Living With Wildlife.....	52
Attracting Birds and Butterflies to Your Property.....	58
Native Vegetation.....	61
A Guide to Invading Species.....	68
Part 3: Sustainability At the Lake	
Designing a Sustainable Waterfront Property.....	75
Septic Systems.....	79
Light Pollution in Rural Areas	85
Noise Around the Lake.....	88
Air Pollution.....	90
Part 4: Planning and Protecting for the Future	
Land-Use Planning in Ontario.....	94
Watershed Planning.....	100
Land Trusts: A Powerful Conservation Tool.....	105
Protecting the Environment.....	109
Part 5: Waterfront Groups in Action	
Volunteerism: How To Reel Them In and Get Them Started.....	120
Case Study: Recruiting Volunteers.....	124
Communications.....	125
Case Study: Kahshe Lake.....	129
Fundraising.....	130

With thanks

The production of *Take the Plunge: Stewardship of Ontario's Waters* was made possible by the generous support and participation of:

Kathy Allan
Ken Allen
Aspen Valley Wildlife Sanctuary
Samantha Brown
Clean Air Foundation
Robert Dick
Judith Earnshaw
Karl Fiander
Sally Gillis
Andrew Hellebust
Lorraine Johnson
Sara Kelly
Frank Knaapen
Joseph Kozelka
Anastasia Lintner
Gerald L. Mackie
Beth MacKay
Eleanor Maclean
Andy Metelka
Nancy Matthews
Aileen Merriam
Gray Merriam
Drew Monkman
Roslyn Moore
Denis Orendt
C. Brad Peterson
Kathy Prescott
Terry Rees
Robert Smith
Charles Stewart
Sylvia Stock
Kristie Virgoe
Kelly Warner-Rosen
Heather Watson
Mark Wideman
Frances Wilbur
Amanda Wilkins
William Woitowich
Brent Wooton

A Word from the Coordinator

Putting together *Take the Plunge* has been an interesting experience. It has been one of relationship building, patience, inspiration, determination and finally success.

I would like to thank all the volunteers that contributed to the content of this publication, Amanda Wilkins for putting me on the right path, Louis Taylor for teaching me about the wonderful world of editing, printing, and formatting, and Terry Rees for helping me to interpret and relay the best management practices from the many great resources and organizations available to the FOCA membership and to rural communities everywhere.

I encourage you to read this book and share the knowledge with your family and neighbours. Take some of the ideas and make them a reality; use the examples that have been set by other lake stewards and use communication and education to create awareness around the lake or down the river.

Samantha Brown
FOCA Lake Planning Coordinator

Introduction

The Federation of Ontario Cottagers' Associations (FOCA) is a non-profit, voluntary organization serving as an information centre, providing assistance and leadership to Ontario's cottage associations and to our individual members. For over 45 years, FOCA has been dedicated to supporting the interests of Ontario's cottagers. This is accomplished by assisting local member associations and by representing the interests of waterfront property owners. FOCA promotes sustainable waterfront communities by encouraging positive environmental stewardship, by supporting strong community leadership, and by promoting fair and equitable public policy.

The original version of *Take the Plunge* was produced and distributed to FOCA member associations in 1998. This new version has been updated with new topics such as green cottage design, air, light, and noise pollution, and new information about the issues that are facing waterfront people today.

Take the Plunge is divided into five sections: The Lake Environment, Biodiversity of the Waterfront, Sustainability at the Lake, Planning and Protecting for the Future, and Waterfront Groups in Action. A list of organizations, websites, and resources

related to the topic appears at the end of each article. FOCA's website (www.foca.on.ca) is also a great place to find more information and links about the topics that are important to FOCA's membership, from boating and docks to shorelines and invasive species.

Development continues along Ontario's waterfront and it is up to community members to voice their concerns and to take action to help keep Ontario's rural areas pristine. *Take the Plunge* is full of information that will help waterfront people understand their environment – how it functions, the wildlife that depends on it, the threats it faces, the rules that protect it, and how people benefit from it.

The Lake Planning Handbook for Community Groups, which was released before this publication, is a complementary document to *Take the Plunge*. It provides a more hands-on approach to lake stewardship and lake-planning activities. Created with input from lake associations across Ontario, planners, and municipal representatives, the handbook provides a base to help neighbours work with each other, associations, government, and other organizations.



TAKE THE PLUNGE

THE LAKE ENVIRONMENT

Surficial Geology of Ontario As It Relates to Cottage-Country Lakes

William Woitowich

Twenty thousand years ago Ontario was completely covered by the Laurentide Ice Sheet. This large continental glacier complex covered much of Canada and extended into the northern states of the United States. The Labrador Sector of this ice sheet covered Ontario. Over a period of approximately 100,000 years the Laurentide Ice Sheet developed and advanced over 80 percent of Canada. These glaciations played a major role in forming the landscape of Ontario. They removed pre-existing soils and eroded and smoothed bedrock surfaces. They also formed landforms such as moraines and eskers that are indicative of glaciers and left unconsolidated deposits of till, gravel, sand, silt, and clay.

The deposits and landforms play an important role in the history and development of the province of Ontario. The lake and rivers that developed following the last glaciation are those which native peoples and early settlers used for transportation and settlement.

Bedrock Geology

Bedrock geology is a general term that refers to the solid rock that lies beneath the soil and other surficial materials such as sand and gravel. Bedrock geology is a major influence on the surface features and drainage patterns of the earth. The bedrock geology of Ontario can be divided into Precambrian and sedimentary rocks based on age and these two types are found in three regions.

The Precambrian Canadian Shield is a central area of uplands consisting of very old, resistant rocks that range in age from 570 million to more than 3

billion years old. The rocks of the Canadian Shield consist of crystalline igneous, sedimentary, and metamorphic rocks that have had a complex history of volcanic eruptions, mountain building, faulting, deformation, burial, uplift, weathering and erosion. These rocks contain the majority of Ontario's metallic mineral deposits in areas known as "greenstone belts" because they are dominantly composed of green or grey volcanic and sedimentary rocks. This upland area separates two lowland areas. To the north, the Hudson Bay Lowland is composed of flat-lying sedimentary rock of Paleozoic and Mesozoic age. To the south, the Great Lakes-St. Lawrence Lowland is composed of gently dipping Paleozoic sedimentary rock. These are sedimentary rocks that range in age from 63 to 570 million years old and contain valuable deposits of salt, gypsum, oil, natural gas, groundwater, shale, lime, building stone, and aggregate. These rocks were deposited in large sedimentary basins during long periods of sedimentation that also saw the development of life forms from simple algae and primitive marine invertebrates to dinosaurs and mammals.

The present morphology of the bedrock surface has not changed substantially from that which existed before glaciation. Much of the Canadian Shield has survived glaciation with only minor alterations. It is believed that only a few metres to tens of metres of material have been removed from the bedrock surface by glacial erosion. Glacial erosion may have also deepened and broadened pre-glacial valleys of the sedimentary bedrock formations.

Surficial Geology

Surficial geology, also referred to as Quaternary geology, refers to those unconsolidated materials lying on top of the bedrock. Although the Quaternary era covers the last 1.81 million years of earth history, in Ontario almost all surficial sediments are much younger (<45,000 years old). The sediments were deposited either during or after the last glacial period. Common surficial materials include

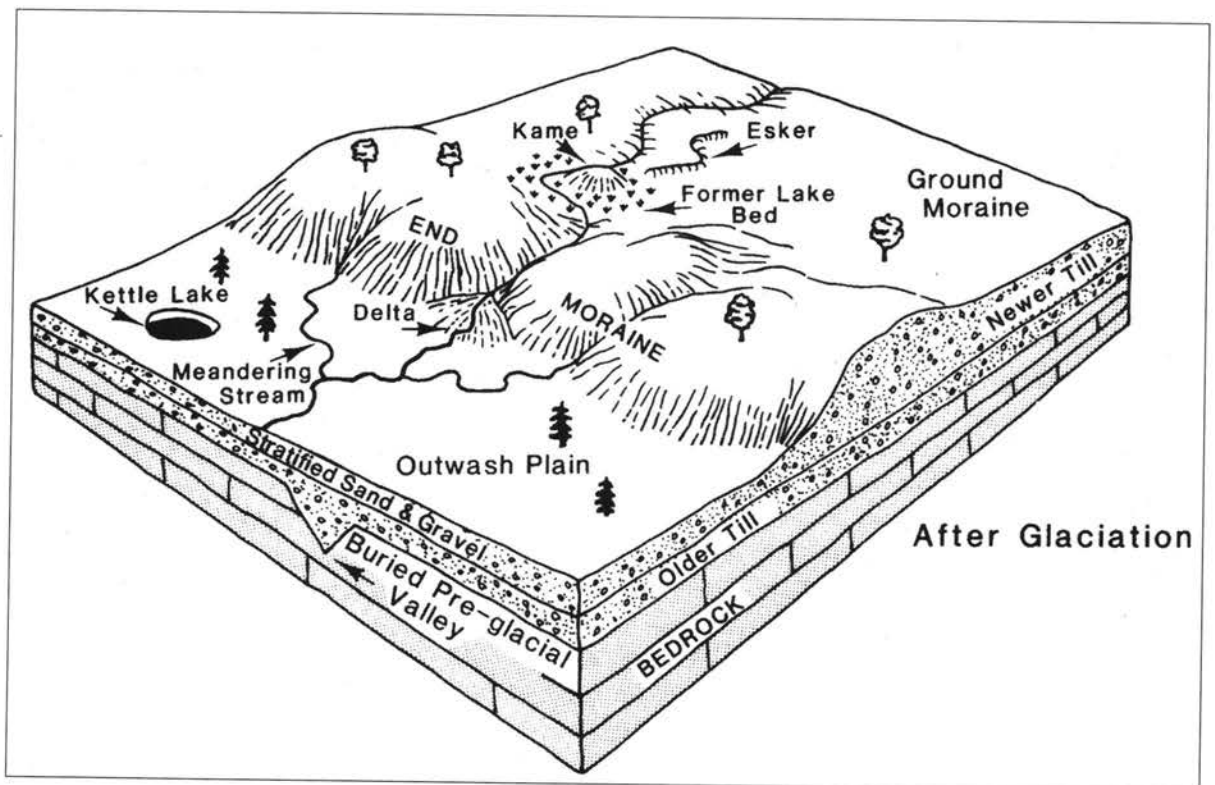
- glacial tills (unconsolidated material),
- sand and gravel, and
- clay and silts.

Large amounts of this glacial material were transported by the meltwater and deposited as stratified sediments under the glacier and along the ice margin (glaciofluvial ice-contact deposits), and beyond the ice margin in rivers and streams (glaciofluvial outwash deposits), lakes (glaciolacustrine and lacustrine deposits), and seas (glaciomarine and marine deposits). The deposits and effects of these glaciations are widespread with till being the most common deposit left by the Laurentide Ice Sheet. Three types of till were produced: sandy tills from the erosion of Precambrian rocks; silty tills derived from the erosion of carbonate rocks; and clayey tills

deposited in front of the glacier in local or regional areas of ponding. Considerable volumes of melt water were generated by, and discharged from, the glaciers that once occupied Ontario.

After the glaciers had receded young soils developed on these glacial deposits. The origin of these soils is a result of the deposition process. These sediments determined the properties and types of soils that would form and what type of plants would prosper. It must be remembered that deposition of the glacial material in a particular area originated from other areas, usually to the north. In areas of exposed bedrock, lakes fill basins scoured by glacial action while in regions of glacial outwash, kettle and moraine dammed lakes dominate. In Ontario there are several types of lakes that have been formed by past glaciers or as a result of glaciation.

Ground moraine lakes: Ground moraine is the general term used for any accumulation of glacial origin including boulders, sand, and gravel left on a surface where a glacier was formerly present. Lakes formed by hydraulic force on a ground moraine formed during temporary decreases in the rate of glacial melting when recessional moraines were left behind. Meltwater, streaming under pressure beneath the ice, washed out deep elongate basins



in the drift and lakes occupy these depressions today.

Kettle lakes: These lakes occupy depressions produced by the melting of large chunks of ice that were left within the ground moraine when its parent glacier melted. Kettle lakes are common in low-relief areas such as the outwash plains in the Mackenzie Delta. Kettle lakes do not necessarily form immediately after the glacier's recession. If the ice chunk is insulated by an overburden of drift, it can persist long after its parent glacier has disappeared.

Glacial scour lakes: Glacial scour lakes formed when glaciers eroded bedrock, carving basins that are now filled with rainwater. The Great Lakes and the lakes in Muskoka are examples of glacial scour lakes.

Glacial relict lakes: Glacial relict lakes are remnants of giant lakes that were once filled with glacial meltwater but now exist as separate bodies of water. An enormous lake, Lake Agassiz, formed in North America from the retreating ice sheet that covered 540,000 square kilometres from eastern Saskatchewan to western Ontario and south to include eastern North Dakota and northwestern Minnesota. The modern remnants of this lake include Lake Nipigon and Lake-of-the-Woods.

The glacial advances and recessions and remaining post-glacial formations have contributed to the formation and makeup of our existing lakes and rivers.

References

Hebert, Paul. 2008. Origin and age of lakes. *Encyclopedia of Earth*. Ed. Cutler J. Cleveland. Washington, DC: Environmental Information Coalition, National Council for Science and the Environment. Retrieved 19 January 2009, <http://www.eoearth.org/article/Origin_and_age_of_lakes..>

Hebert, Paul. 2008. Lakes of Canada. *Encyclopedia of Earth*. Ed. Cutler J. Cleveland. Washington, DC: Environmental Information Coalition, National Council for Science and the Environment. Retrieved 19 January 2009, <http://www.eoearth.org/article/Lakes_of_Canada>.

Resources

Thurston, P.C. 1991. *Geology of Ontario*. Ontario Geological Survey. Ministry of Northern Development and Mines.

Ministry of Northern Development and Mines:
www.mndm.gov.on.ca

Geoscape Canada, Natural Resources Canada:
www.geoscape.nrcan.gc.ca

Water Quality

Kathy Prescott

Aquatic ecosystems are very important to life on earth; every living organism requires water for existence. Water is needed for cellular functions in plants and animals. On a more general level, water is needed by humans, other animals, and plants for such things as habitat, transportation, and for recreational purposes. In a cottage setting, water is an integral part of life. Most cottages are located on lakes, which may provide a source of drinking water or a place for waste to be deposited, and lakes provide cottagers with many recreational activities (e.g., boating, swimming, fishing). A healthy lake ecosystem is important for both human enjoyment and for the continued survival of aquatic plants and animals.

Parts of an ecosystem are connected to each other as well as to parts of other ecosystems, much like a giant web. Should one component of the system be damaged or lost, the other components suffer. Since all life depends on water, poor lake quality can have significant negative effects on plants and animals, and their associated life activities. An understanding of lake ecosystems and how water quality can be maintained at healthy levels is important for continued enjoyment of the waterfront.

Defining "Water Quality"

An absolute definition for water quality is difficult to formulate; the accepted quality ultimately depends on the intended use of the water. For example, water that has been determined to be suitable for drinking may be used for irrigation or industrial processes; however, the converse is not true. Water suitable for irrigation or for industry is not necessarily suitable for drinking (Environment Canada 1992).

In general, water quality is defined in terms of the chemical, physical, and biological content of the water. Consequently, the quality of water will

change with time and with geographic location (Environment Canada 1994). Each body of water has a certain quality that is dependent on environmental conditions. Rain transports naturally occurring atmospheric substances (e.g., dust, volcanic gases), which ultimately enter the water system through direct precipitation onto the surface of the water body, and rain that falls on land runs into rivers and lakes carrying with it material eroded from soils and bedrock. Pollutants find their way into the water system in similar ways. Rain will pick up atmospheric contaminants and deposit them in direct precipitation, storm water runoff will carry land-based pollutants, and unwanted substances will enter water bodies directly at point sources such as industrial and municipal effluents. Water quality guidelines and objectives are determined based on the types and amounts of substances found in water. The concentrations of such substances are limited for each particular water use (e.g., drinking, recreation, irrigation). The quality of water can be determined by measurements in either the field or in the laboratory and the results can be compared with the appropriate guidelines to determine the relative suitability for the intended use.

Lake Properties

Depending on their geographic location, lakes have a distinctive natural water quality. Characteristics such as salinity, temperature, pH, and colour are affected by surrounding conditions (e.g., soils, vegetation). Human activities within the watershed will act to alter the natural water quality of lakes through the addition of excess nutrients and chemicals; therefore, the health of a lake is difficult to determine when based strictly on current chemical analyses. For example, two lakes with the same acidic pH may be deemed unhealthy when, in fact, one lake may be a naturally acidic lake and

therefore healthy in its own context, and the other may be acidic as a result of human activities and truly unhealthy in comparison to its natural state. A general understanding of the background chemical characteristics of a body of water is useful when assessing the present state of a lake; however, the natural condition of a lake is not always known and it is often difficult to determine.

Light and Colour

Sunlight that strikes the surface of a lake is either reflected or absorbed by the water. In the purest lake water approximately 40 percent of the light penetrates up to a depth of 1 m, and the remaining light is either scattered or converted to heat (Warren 1971). The behaviour of light within lakes imparts a natural colour to the water. The observed colour results from light being scattered upward from the lake after it has been through the water to various depths and undergone selective absorption (Wetzel 1983). Dissolved organic matter (i.e., humic compounds) is responsible for the majority of colour in lake waters through the scattering of light in the green, yellow, and red portions of the spectrum (Wetzel 1983). Materials suspended in the water column also contribute to lake water colour by scattering and absorbing the light. Inorganic solids yield yellow to brownish-red colours, and algae and pigmented bacteria produce blue-green or yellowish-brown colours respectively (Wetzel 1983).

Temperature

Water temperature is important in an aquatic ecosystem. The circulation of lake water is affected by changes in temperature, the solubility of gases in water depends on temperature, and many biochemical processes are sensitive to temperature. The temperature profile of a lake depends on many factors including geographical location, depth, and season.

Most cottage lakes in Ontario are temperate lakes that follow similar temperature trends. Immediately following ice melt in the spring, lake water is typically near the temperature of maximum density, approximately 4° C (Wetzel 1983; Warren 1971). At this time, the water is a uniform temperature from surface to bottom, and there is little thermal resistance to mixing. Wind and convection currents circulate the water, an event which is referred to as spring turnover (Wetzel

1983). In shallow lakes mixing occurs easily with respect to depth and the body of water generally remains at a uniform temperature throughout the water column during the summer season. Deeper lakes, however, may become thermally stratified.

Increasing air temperatures during the spring season heat the surface water of lakes. Cooler water, which is denser, sinks toward the bottom of the lake. The differences in temperature, and therefore the differences in density, create resistance to mixing through the water column and as summer progresses the lake becomes thermally divided. The upper portion of the lake, or epilimnion, is uniformly warm and easily circulated by wind. The middle portion, or metalimnion, is a zone of rapid temperature transition (Warren 1971). The depth at which the greatest temperature gradient is measured in the metalimnion is referred to as the thermocline. Below the metalimnion is a uniformly cold layer called the hypolimnion. During times of thermal stratification this bottom zone is isolated from wind and convection mixing by the metalimnion and poor water quality may develop through the stratified season (e.g., high organic decomposition, low dissolved oxygen levels). Decreasing air temperatures in the autumn allow for a loss of heat from the lake surface. Cooler, denser water begins to sink and thermal stratification is degraded. The thermal resistance to mixing therefore decreases and the water column is more easily circulated as fall turnover ensues. During winter months ice may form on the lake surface effectively sealing the lake until the spring (Wetzel 1983).

Lakes are often classified according to their general thermal properties. Lakes that are thermally mixed twice per year (spring and fall turnover) are referred to as dimictic lakes. Monomictic lakes will mix only once per year (usually in the fall) and polymictic lakes have continuous circulation. Meromictic lakes have a portion of bottom water that does not mix with the rest of the lake.

Oxygen

Dissolved oxygen is essential to all aerobic aquatic organisms; however, oxygen is only moderately soluble in water (McNeely et al. 1979). The amount of dissolved oxygen in natural waters varies depending on temperature, salinity, turbulence, and atmospheric pressure (Wetzel 1983; McNeely et al. 1979; Warren 1971). The concentration of dissolved

oxygen in lakes is typically less than 10 mg/L (McNeely et al. 1979), and changes in dissolved oxygen result from many factors.

Generally, a decrease in temperature or salinity causes an increase in the solubility of oxygen in water and increased circulation increases the diffusion of gases from the atmosphere into lakes. Daily variations occur as a result of aquatic plant or algal photosynthesis and respiration; higher concentrations of dissolved oxygen occur during daylight when plants are actively photosynthesizing and lower concentrations occur at night when respiration is occurring (Warren 1971). Changes in the dissolved oxygen concentrations in the mixed layer of the lake are typically related to temperature variations. Decreased mixing during thermal stratification may lead to low dissolved oxygen concentrations in the hypolimnion in cases where there are high bacterial or sediment demands for oxygen. High concentrations of hypolimnetic dissolved oxygen (>6 ppm) are required to support populations of cold stenotherms such as lake trout (*Salvelinus namaycush*) in Ontario lakes. Low oxygen conditions can also develop under ice cover, which will seal lakes from wind circulation and disallow diffusion of oxygen from the atmosphere.

Nutrients

Phosphorus and nitrogen are essential plant nutrients in the aquatic environment. Phosphorus is actively taken up by plants (McNeely et al. 1979) and is the nutrient responsible for limiting (controlling) the growth of phytoplankton (algae) in almost all of Ontario's lakes. The most important form of phosphorus for plant nutrition is

orthophosphate (PO_4^{3-}), which is also the most significant form of inorganic phosphorus (Wetzel 1983). Orthophosphate concentrations can change rapidly in natural waters and are difficult to measure. For this reason total phosphorus (TP) is the most widely measured form and TP concentrations of most uncontaminated surface waters in Ontario shield lakes are typically less than 10 $\mu\text{g/L}$. Lakes are categorized with respect to trophic status based on TP concentrations as follows: oligotrophic <10 $\mu\text{g/L}$, mesotrophic 10-20 $\mu\text{g/L}$, and eutrophic >20 $\mu\text{g/L}$.

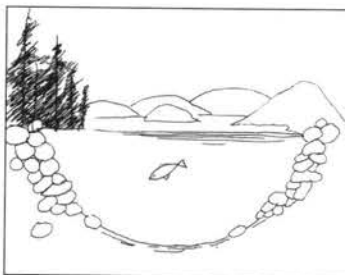
Nitrogen may occur in many different forms including ammonia (NH_3), ammonium ion (NH_4^+), nitrate (NO_3^-), nitrite (NO_2^-), amino acids, and proteins (Wetzel 1983; McNeely et al. 1979). The most stable form of nitrogen in surface waters is nitrate; however, shield lakes rarely contain more than 0.1 mg/L of naturally occurring nitrate (DESC database). Surface waters typically contain less than 0.1 mg/L of ammonia and only small quantities of nitrite; in the presence of oxygen, nitrite is very unstable and will therefore be converted to more stable forms (McNeely et al. 1979). Total Kjeldahl nitrogen (TKN) is often measured as an indicator of the total quantity of organic material (both living and dead) in the range from 200 to 600 $\mu\text{g/L}$.

Eutrophication

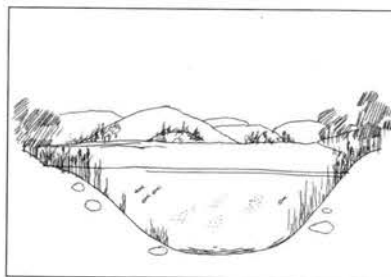
As already indicated, lakes have certain natural water quality characteristics that are dictated by the internal and surrounding environments. The distribution, behaviour, and growth of aquatic plants and animals depend on this natural water quality and organisms will typically thrive as long

Natural stages in the life of a lake

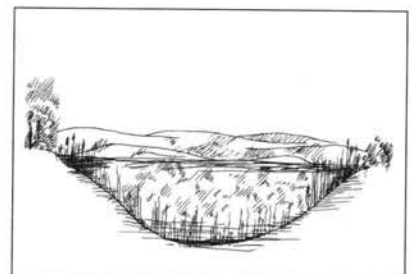
Holdren, C. W. Jones and J. Taggart. 2001. Managing Lakes and Reservoirs. N. Am. Lake Manage. Soc. and Terrene Inst., in coop. with Off. Water Assess. Watershed Prot. Div. U.S. Environ. Prot. Agency, Madison, WI.



A young glacial lake



A mature lake rich in fish and wildlife



An older, highly-fertile lake, rich with algae and filled with sediment

as these conditions persist. Changes in the environment that occur naturally may ultimately change the quality of water in lakes and other surface waters. These changes, however, generally occur at a rate that allows for organisms to adapt

and evolve to the new conditions. Humans have altered these natural processes, the most pronounced of which is the impact on the natural aging of a lake, or eutrophication.

Cyanobacteria (blue-green algae)

Lynn Woodcroft

Blue-green algae are the oldest, simplest members of the plant kingdom. Their fossils have been dated up to 3 billion years old. These tiny microscopic aquatic plants are not true algae. They are relatives of bacteria and scientifically known as cyanobacteria. Blue-green algae are found in a wide array of habitats including freshwater ecosystems. Under normal conditions, blue-green algae are usually barely visible; however, they have the ability to rapidly reproduce to form dense unsightly blooms. Calm days allow the algae to become buoyant and float to the surface. This combined with warm temperature and shallow waters with little current provide the perfect growing conditions for blue-green algae.

The main controlling agent in this picture is the amount of phosphorus and nitrogen that are made available to the blue-green algae. These nutrients are the building blocks of nutrition and are essential to plant life. Blue-green algae naturally occur in lakes; however, human activities provide the perfect conditions for them to thrive. Excess nutrients make their way to lakes by way of runoff from household fertilizers, faulty septic systems, agricultural and storm water runoff. These excess nutrients promote the growth of plants that occupy the waters, including blue-green algae. The best way to prevent algae blooms in your lake is to control or eliminate the source of the problem. Preventing nutrient runoff upstream is a collective effort of the public and the local government. Educate shoreline property owners on the importance of the use of phosphate-free soaps and properly functioning septic systems. Discontinue the use of chemical fertilizers and maintain a healthy shoreline that is plentiful with native vegetation.

Collectively, these preventive measures will help moderate nutrient availability and keep plant growth under control.

A blue-green algae bloom is cause for concern among cottagers. While often the blooms are harmless, there are some blooms that contain species that are capable of producing toxins harmful to both humans and animals. The most common algal toxins are called microcystins. External contact with these toxins can cause irritation to the skin and eyes. If these toxins are swallowed symptoms may include headaches, fever, diarrhea, nausea, and abdominal pain.

Water that is affected by a blue-green algae bloom should not be used to drink, bathe, or for oral hygiene purposes. Pets and livestock should be kept away from it to ensure their safety. Moreover, boiling the affected water will not make it safe and may release additional toxins into the water. This water is not safe for cooking.

Blue-green algae blooms may be difficult to distinguish from other common aquatic occurrences. Often they are blue-green or olive colour and may form thick, dense solid clumps. Fresh blooms often have an odour that resembles fresh-cut grass; however, as the blooms die and decompose they begin to smell like rotting garbage.

If you feel you have witnessed a blue-green algae bloom it is imperative to report it to your local Ministry of the Environment office during the day or The Spills Action Centre after hours at 1-800-268-6060. The MOE will sample the algae to identify the toxins.

Eutrophication

Eutrophication is an important part of the successional process by which lakes change from nutrient-poor (or oligotrophic) conditions to eutrophic conditions, to marsh environments, and finally to land (Warren 1971). Oligotrophic lakes are typically large, deep bodies of water that have few aquatic plants, low nutrient concentrations, and that support cold-water organisms. As lakes acquire more nutrients, they are referred to as mesotrophic until they contain an excess of nutrients, at which time they are deemed eutrophic. A primary characteristic of this aging process is sedimentation (Wetzel 1983). Materials eroded from the watershed, fallen leaves and twigs, and dead organic matter settle to the bottom of lakes and contribute to the filling in of the water body. The build-up of material in the lake decreases its depth and contributes to changing temperature conditions. Excess organic matter also contributes to changes in water chemistry. Decomposing organic material decreases the amount of dissolved oxygen in the water column and recycles nutrients back into the ecosystem. The recycled nutrients then become available to algae and are continuously cycled for long periods of time (i.e., used by algae for cellular processes and then returned to the water column upon their death and decay). All of these factors have further impact on the type of organisms that are supported by eutrophic lake ecosystems. Increased temperatures, decreased dissolved oxygen, and higher concentrations of nutrients produce an environment suited to warm-water organisms and those that are tolerant of eutrophic water chemistry.

In situations where nutrient concentrations are high due to human activities remedial actions are typically aimed at reducing phosphorus rather than nitrogen. Some organisms are capable of producing usable forms of nitrogen through a process called nitrogen fixation, therefore limiting nitrogen would not prevent excess primary production typical of excess nutrients.

Impacts of Waterfront Development on Water Quality

Waterfront properties can have negative impacts on the quality of their lakes. Phosphorus from human waste will migrate even from properly

functioning septic systems to the lake. Additional phosphorus is added to septic systems through detergents used for dishwashing and laundry. Improperly functioning septic systems can greatly accelerate this process. Chemical fertilizers used on gardens and lawns will also contribute nutrients to the lake through storm water runoff.

Although increased nutrients can cause the degradation of lake trout habitat most concerns surrounding excess nutrients are aesthetic. Increased concentrations of algae are unsightly and may produce foul odours during decomposition. If drinking water is drawn from the lake, consumers may also find that taste and odour problems can result from the excess growth of certain species of algae. In extreme cases, blue-green algal blooms will form toxins that can have human health implications

In addition to nutrient loading from waterfront activities other harmful substances may reach the surface water. Pesticides and herbicides used to control insects, pests, and weeds may leach into the lake, and oil and gas may spill from motorized vehicles (e.g., boats, jet skis). These chemicals may ultimately create problems for aquatic organisms and may render the water unsuitable for human consumption and for recreational activities.

Water Quality and Human Health

Drinking water quality

The water that services municipal homes and buildings is generally treated by a municipal treatment plant to guard against disease, taste, and odour problems. Water from properly maintained wells that are fed by groundwater is typically safe for consumption because the overlying soil acts as a filter. Many waterfront properties draw their drinking water directly from a nearby lake or river and it is not advisable to drink this untreated surface water. There are many ways to treat surface water in order to make it safe for human consumption (see below).

What makes water unsuitable for drinking?

One of the greatest concerns with untreated drinking water is the potential for the presence of pathogens. These microscopic organisms (i.e., bacteria, viruses, protozoan cysts) can cause a wide

variety of health problems including nausea, diarrhea, hepatitis and typhoid fever (McNeely et al. 1979). The transmission of water-borne and water-associated diseases may occur through the discharge of inadequately treated waste water or through runoff from farmland, feed lots, and contaminated soils. Humans may contact disease directly through drinking water or swimming, or indirectly by water used for cooking or cleaning (McNeely et al. 1979).

Giardia and cryptosporidium are two parasites that can be found in water and they produce cysts that, when ingested, can cause illness (Health Canada 1996). The ill effects of ingesting these cysts usually appear within a few days and can last for as long as a month. Both giardia and cryptosporidium are found in the feces of humans and animals. Giardia are commonly found in feces from beaver and the resulting illness, giardiasis, is often referred to as "beaver fever." Cryptosporidium parasites, although also found in humans and other animals, are typically associated with cattle (Health Canada 1996).

How can lake water be treated for drinking?

There are many options available for ensuring safe drinking water while away from a treated source. Disinfection tablets can be purchased for treating water or a few drops of chlorine bleach or tincture of iodine can be added to drinking water (Health and Welfare Canada 1986). These methods will kill most disease-causing organisms; however, they will not kill cysts from giardia and cryptosporidium. Boiling water for at least one minute will destroy the cysts as well as any other pathogens.

Waterfront properties that draw drinking water from a well are not immune to disease. Wells that have not been maintained properly may have cracks and leaks that can allow contaminants to enter. Proper location and maintenance of the well will minimize the potential for contamination; however, well water should be tested for bacteriological quality regularly and for chemical contamination if it is suspected (Health Canada). Many wells and cottages may have additional treatment devices (e.g., filters, UV disinfection unit, distiller), but water should still be tested three times per year. Filters become clogged, UV lamps reach the end of their life, and devices malfunction thereby rendering the water untreated. Regular testing will ensure that all treatment units are

functioning properly. The Well Wise Centre is a non-profit organization dedicated to helping private well owners improve the state of their wells and our shared groundwater resources. Visit them for more information at <www.wellwise.ca>.

What are Canadian drinking water standards?

Water quality standards exist for many inorganic and organic substances found in water. The presence of pathogens, though, seems to be of primary concern for most people. Detecting disease-causing organisms is not easily done; therefore, the microbial safety of water is determined indirectly by using the presence of intestinal bacteria as indicators (McNeely et al. 1979). The most commonly used bacterial indicators are coliforms and bacterial streptococci (McNeely et al. 1979). According to Health and Welfare Canada (1993), the maximum acceptable concentrations for total coliforms in drinking water is zero organisms per 100 millilitres. Since coliforms are not uniformly distributed and are subject to considerable variation, drinking water that meets the following criteria is considered suitable for consumption (Health and Welfare Canada 1993):

1. No sample should contain greater than 10 total coliform units per 100 mL and none of the organisms should be fecal coliform.
2. No consecutive sample from the same site should have total coliform organisms.
3. For community drinking water, not more than one sample from a set of samples taken from the source on a given day should have coliform organisms and not more than 10 percent of the samples, based on a minimum of 10 samples, should have coliforms.

How frequently should drinking water be tested?

The frequency of sampling depends on several factors including the quality of the source water, the past frequency of unsatisfactory samples, and the type of disinfection being used (Health and Welfare Canada 1993). In general, drinking water should be sampled semi-annually for all substances for which guidelines exist (Health and Welfare Canada 1993). Additional samples should be taken as needed (i.e., if a previous sample had high concentrations of substances, a chemical spill occurred, etc.).

Recreational Water Quality

According to Health and Welfare Canada (1992), recreational use of water includes activities that involve intentional immersion (e.g., swimming) or incidental immersion (e.g., windsurfing) of the body in fresh or marine waters. In order to ensure good health and safety while participating in water-related activities, waters should be free from microbiological, physical, and chemical hazards (Health and Welfare Canada 1992).

Microbiological hazards

Several organisms that pose a risk to humans in drinking water also are of interest with respect to recreational waters. Fecal contamination is of primary concern because many pathogens are passed from one host to another in the feces of animals and humans. Faulty septic systems and surface water runoff are potential sources for pathogens.

Although various indicator organisms are available for determining the microbiological characteristics of water (i.e. pathogens, coliform bacteria, coliphages, viruses), many are not good indicators (Health and Welfare Canada 1992). An ideal indicator of fecal contamination would be a specific pathogen that is responsible for waterborne diseases. Pathogens, however, are usually present at low levels and are irregularly dispersed and therefore they are difficult to isolate and quantify (Health and Welfare Canada, 1992). Furthermore, the absence of one pathogen does not ensure that other harmful organisms are not present and testing for all organisms is timely and expensive. Consequently, organisms other than the pathogens themselves are used as indicators of fecal contamination. Examples of such indicators of poor water quality include organisms such as *Escherichia coli*, enterococci, and fecal coliforms. These organisms make good indicators for several reasons: they are not present in unpolluted surface waters; they are incapable of growth in an aquatic environment; they are easily and accurately enumerated; and they are present in numbers far greater than pathogens (Health and Welfare Canada 1992). The presence of these organisms in high numbers, therefore, indicates the potential for the presence of pathogens and waters are deemed unsafe for recreation.

In contrast to drinking water standards that

require an absence of all *E. coli* for consumption, recreational waters are considered to be safe provided that the geometric mean of at least five samples taken during a 30-day period, does not exceed 2,000 *E. coli* per litre. Other bacterial pathogenic organisms such as *Pseudomonas aeruginosa* in surface water can cause skin irritations, eye infections, and external ear infections.

In addition to bacteria, the previously mentioned protozoans *Giardia* and *Cryptosporidium* and several other less frequently encountered pathogenic parasites can be contacted through recreational water use. Avian schistosomes (commonly referred to as flukes or flatworms) that use mollusks as an intermediary host can temporarily infect the skin causing swimmers itch.

Chemical hazards

For lakes that receive industrial effluents or agricultural runoff, there is concern of contamination by inorganic and organic chemicals (e.g., heavy metals, pesticides). In most cases, chemical concentrations in surface waters are lower than drinking water standards and therefore should not pose a threat to human health (Health and Welfare Canada 1992). Due to a lack of sufficient information on many chemicals, it is difficult to place measurable limits for recreational water quality. Decisions for use should be based on aesthetic qualities such as the presence of odour or visible oil and grease, and on other factors such as the proximity of the area to industrial discharges (Health and Welfare Canada 1992).

Minimizing Contamination of Surface Waters

Many actions can be taken to minimize the impact of recreational activities on Ontario lakes. A properly functioning septic system not only prevents health problems, as mentioned above, but minimizes the amount of phosphorus and nitrogen entering the lake.

Reducing or eliminating the use of chemical fertilizers on your lawn and maintaining trees, shrubs, and ground covers will help to reduce nutrient loading and help to prevent erosion of your property. The products that are used in and around your cottage, and the way they are used

Source water protection

The Ontario government has introduced a "source protection" law as part of its commitment to implement the recommendations of the Walkerton Inquiry. The Clean Water Act, legislation provides the framework for source water protection in this province.

The source protection law requires every watershed under the jurisdiction of a Conservation Authority to have a source protection plan. This includes all of southern Ontario and parts of central and northern Ontario. The source protection plans will outline what measures should be taken within the watershed to reduce threats to sources of drinking water.

Source protection means protecting the streams, rivers, lakes, and aquifers that we ultimately depend on for our drinking water. In Ontario this protection is carried out at the level of the watershed—the area within which all surface water drains into the same outlet, such as a lake or river.

Water connects us. It travels great distances and recognizes no political boundaries. The waters we use and depend on are inevitably affected by activities – overuse, wasteful practices, toxic pollution, and the destruction of natural areas – that are occurring tens or even thousands of kilometres away. This makes source protection at the watershed level the best way of taking a "big picture" approach to safeguarding our water.

We have put a lot of trust in water treatment as a way of keeping our drinking water safe but we cannot rely on treatment alone. Putting too much pressure on a water source can overwhelm the treatment system or make it too costly to use. Alternatively, we can take a multi-barrier approach and protect the quality and quantity of the water from its source all the way to the tap. This is the only way to ensure it stays safe and healthy in the long term. For more information visit www.TheWaterhole.ca.

also may have a significant impact on the water quality and clarity of your lake. Knowledge about the phosphate levels in household products (e.g., detergents) is important for making low-phosphate product choices.

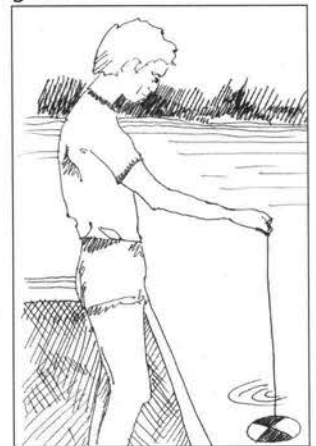
Monitoring Water Quality

Monitoring your lake is an important way to characterize water quality parameters, observe trends to determine if water quality is changing, and to record improvements as a result of remedial actions. Different levels of monitoring exist depending on the information desired. Some monitoring can be done very easily by individual cottagers using commercial water test kits and homemade equipment, by groups of individuals (e.g., lake associations) who have access to more resources, or by larger organizations such as the Ministry of the Environment (MOE) or post-secondary institutions who are able to sample and test for a much broader range of parameters.

Lake Partner Program: Monitoring phosphorous and water clarity

FOCA and the MOE monitor total phosphorus through the Lake Partner Program. The program uses volunteers to collect samples that are analyzed for total phosphorus at the MOE's laboratory at the Dorset Environmental Science Centre. Precise analysis at this facility allows the observation of between-year differences in phosphorus concentrations in lakes across the province (Standard Deviation between duplicate samples = 0.35 µg/L). Lakes on the Canadian Shield are sampled once per year at spring turnover and lakes that are off the Shield are sampled monthly to detect late-summer maximum concentrations in lakes where they may occur.

In addition to phosphorus monitoring, the Lake Partner Program volunteers make monthly water clarity observations using Secchi Discs. Water clarity



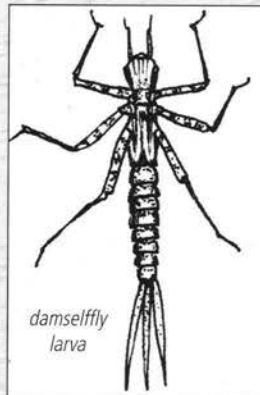
Using a Secchi disk to test water clarity.

Benthic monitoring

Lynn Woodcroft

Biomonitoring is the use of living organisms to determine the environmental quality of an ecosystem. It is an important tool that is often used to assess water quality in freshwater lakes, rivers, and wetlands. Benthic macroinvertebrates are large bottom-dwelling insects, crustaceans, worms, and mollusks that are often used as bio-indicators. Their success as bio-indicators is attributed to the fact that they are long-lived, stationary, and in constant contact with the lake sediments. Macroinvertebrates are divided into three categories according to the levels of pollution they can tolerate. Animals such as the stonefly, mayfly, water penny, and riffle beetle are sensitive to pollution with their presence indicating good water quality. Changes in their presence, absence and abundance may be indicative of environmental conditions that are not suitable for their success.

Organisms such as dragonfly and damselfly larvae, clams, and crayfish can survive in a wide



damselfly
larva

range of water quality conditions. Commonly found in degraded water bodies, aquatic worms, midge larvae, and leaches are indicators of poor water quality when found in abundance. Having the knowledge of poor water quality in a lake or stream enables us to search for source pollution such as upstream tributaries, sewage treatment plants, or faulty household septic systems.

Establishing a database of a lake's macroinvertebrate population allows us to monitor any changes that could indicate environmental changes.

Macroinvertebrate monitoring is a wonderful educational experience for volunteers, giving them the opportunity to glimpse into the lives of aquatic insects as well as increasing public awareness about water pollution.

For more information on the Ontario Benthos Biomonitoring Network (OBBN) and other monitoring programs visit www.citizenscience.ca.

observations assist with the early detection of problems that may occur even in the absence of any change in phosphorus concentrations. Impacts such as climate change and invading species may impact water clarity. The Lake Partner Program contributes relevant Secchi data to The Great North American Dip-In, which collects water clarity data throughout North America during the first week of July.

Bacteria

Detection of bacteria levels in drinking water should be accomplished by sending water samples to a local Ministry of Health laboratory. Sample bottles, protocols relating to sample collection, and cautions with respect to sample perishability are available from the Ministry of Health.

Testing of surface water for recreational purposes

is conducted by the Ministry of Health for designated public beaches only. People wishing to test lake water for bacterial contamination must do so by their own means. There are several cottage associations and private groups that undertake this type of sampling but guidelines must be observed to ensure that meaningful data is collected. Generally, these observations require ambitious sampling programs to avoid the collection of data that may be difficult to interpret.

Although formal testing provides quantitative measures of the quality of a lake, general observation is also an important means of monitoring the health of the aquatic system. Changes in the colour of lake water, the amount of vegetation cover, and the types and numbers of organisms in and around the lake can all signal that a lake is becoming degraded. Observations such as these are important indications that something may

be wrong with your lake ecosystem, thereby suggesting that further study at a more detailed level may be warranted. For more information on how you can prevent water quality degradation at the lakefront see FOCA's Docktalk Program.

References

- Carmichael, W.W., Jones, C.L.A., Mahmood, N.A., and W.C. Theiss. 1985. Algal toxins and water-based diseases. *Critical Reviews in Environmental Control* 15(3): 275-313.
- Environment Canada. 1994. *A primer on fresh water*. The Environmental Citizenship Series. Ottawa: Environment Canada.
- Environment Canada. 1992. Clean water—life depends on it. Freshwater Series A-3. Ottawa: Environment Canada.
- Health Canada. 1996. Giardia and cryptosporidium in drinking water. Ottawa: Health Canada.
- Health Canada. What's in your well? A guide to well water treatment and maintenance (draft). Ottawa: Health Canada.
- Health and Welfare Canada. 1993. *Guidelines for Canadian drinking water quality*. 5th ed. Federal-Provincial Subcommittee on Drinking Water of the Federal-Provincial Advisory Committee on Environmental and Occupational Health. Ottawa: Supply and Services.
- Health and Welfare Canada. 1992. *Guidelines for Canadian recreational water quality*. Federal-Provincial Subcommittee on Recreational Water Quality of the Federal-Provincial Advisory Committee on Environmental and Occupational Health. Ottawa: Supply and Services.
- Health and Welfare Canada. 1986. Drinking water away from home. Environmental Health Directorate, Health Protection Branch. Ottawa.
- McDonald, B.S., G.W. Mullins and S. Lewis. 1991. Macroinvertebrates as indicators of stream health. *The American Biology Teacher* 53: 462-66.
- McNeely, R.N., Meimanis, V.P., and L. Dwyer. 1979. *Water quality source book: a guide to water quality parameters*. Inland Waters Directorate, Water Quality Branch. Ottawa: Environment Canada.

- Warren, C.E. 1971. *Biology and water pollution control*. Toronto: W.B. Saunders. Pp. 43-63, 330-33.
- Wetzel, R.G. 1983. *Limnology*. 2nd ed. New York: Saunders College Publishing.

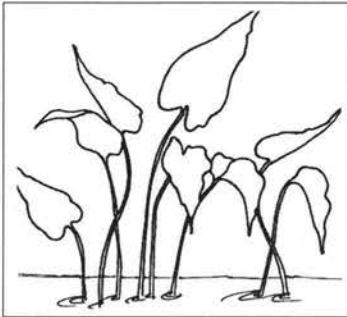
Resources

- Environment Canada:
www.ec.gc.ca/water/e_main.html
 Environment Canada Inquiry Centre
 Toll Free: 1-800-668-6767
- Ministry of the Environment (MOE), Dorset Environmental Science Centre, Lake Partner Program:
www.ene.gov.on.ca/envision/water/lake_partner/index.htm
 P.O. Box 39, 1026 Bellwood Acres Rd.
 Dorset ON P0A 1E0
 Phone: 1-800-470-8322
 E-mail: lakepartner@ontario.ca
- Federation of Ontario Cottagers' Associations (FOCA): www.foca.on.ca
- Health Canada: <http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/index-eng.php>
- Ministry of Health on Long-Term Care:
http://www.health.gov.on.ca/english/public/contact/phu/phuloc_mn.html
 Includes a list of health unit locations across Ontario.
- Ministry of the Environment (MOE) Public Information Centre
 Toll Free: 1-800-565-4923
- North American Lake Management Society (NALMS): <http://www.nalms.org/>
- Well Wise: <http://www.wellwise.ca/>

Wetlands

Kathy Prescott*

Contrary to historical belief, wetlands possess many advantageous properties. The negative image of these environments has resulted in the loss of many wetlands due to infilling and development. Now that the beneficial characteristics of wetlands are becoming more pronounced efforts are being taken to protect existing wetlands, restore degraded wetlands, and recreate wetlands that have been lost. Federal and provincial policies are available as guidelines for wetland protection and restoration. Cottagers can assume an active role in the



conservation of wetland environments around their cottages by protecting existing wetlands and by avoiding development in environments that may be important wetland areas. Many publications exist that provide general information on the importance of wetlands, and local offices of the Ministry of Natural

Resources can provide guidance with respect to the evaluation, protection, and restoration of these ecosystems.

Wetlands include swamps, bogs, marshes, mires, fens, and other wet environments (Mitsch and Gosselink 1993; Williams 1990). These environments cover approximately six percent of the earth's land surface (8.6 million km²) and can be found in many climatic regions. In general, wetlands are transitional ecosystems located between terrestrial and aquatic environments and they are loosely defined as areas of land that are covered with water for a period of time over the year (Canadian Wildlife Service 1989). Characteristics of wetland environments are the formation of hydric soils and an abundance of water-tolerant plants.

For cottagers, the shoreline of their waterfront property may be considered a wetland, the shallow bays and inlets on their lake may be wetland areas, or a blocked river or segregated pond may create larger wetlands on the land surrounding the cottage lake. Regardless of their size and location, wetlands are valuable ecosystems; however, their worth has been noticed only recently. Wetlands have been regarded as a nuisance, making land unsuitable for agriculture and development due to wet conditions, mosquitoes, and foul odours (Weller 1981; Houser 1974). As a result, many of the world's wetlands have been drained and filled, and important benefits of wetlands have gone unnoticed.

What Are the Functions and Benefits of Wetlands?

Wetlands have many physical, chemical, and biological functions as well as several social and economic values. Like giant sponges, wetlands soak up surface water runoff and attenuate flood peaks and storm flows (Mitsch and Cronk 1992; Williams 1990; Canadian Wildlife Service 1989; Russell 1987), and slowly release stored water during times of drought (Canadian Wildlife Service 1989; Van Patter and Hilt 1985). Wetland water storage allows groundwater recharge to occur (Mitsch and Cronk 1992; Williams 1990) and flood prevention contributes to reducing downstream soil erosion (Russell 1987). Wetlands also trap and retain sediments (Williams 1990; Russell 1987). The presence of vegetation slows the flow of water and promotes the settling of suspended particles. Pollutants and toxic substances are removed via plant uptake, settling to sediments, ion exchange, and bacterial metabolism (Williams 1990; Glooschenko and Grondin 1988). Wetlands are

* Portions of this chapter were taken from Prescott 1996.

Types of wetlands

Lynn Woodcroft

Marshes: A marsh is a wetland that is permanently or temporarily covered with slow-moving or standing water. Their emergent vegetation of cattails, reeds, rushes, and sedges distinguishes these nutrient-rich systems from the rest of wetlands. The roots of these plants remain saturated throughout the growing season allowing for these plants to flourish. A marsh is considered the most productive wetland habitat.

Swamps: Dominated by trees and shrubs, swamps are the most common wetland in temperate areas of Canada. Often flooded seasonally, these wetland habitats are composed of coniferous or deciduous forests. They are both nutrient rich and productive.

Bogs: These peat-covered wetlands are dominated by sphagnum moss and shrubs; however, they are capable of supporting trees such as black spruce. The lack of drainage and

decay of plant material in a bog generates acidic conditions that contribute to its lack of productivity. Bogs are most commonly found in northern Ontario and are rare in the south.

Fen: Fens are dominated by sedges; however, shrubs and trees are often successful at establishing themselves. More productive than a bog, the waters of a fen may be acidic or alkaline. These systems have a high water table, a slow internal drainage, and like a bog are more predominate in the north.

Shallow open water: These wetlands are often found on lakes and rivers but also include ponds and potholes. They are usually small in size consisting of standing or flowing water. These shallow open waters often represent the transitional area between lakes and marshes or between spring high water levels and the water levels in the remainder of the year.

capable of processing human and animal waste material, mainly as a result of primary productivity, sediment deposition, and bacterial action (Williams 1990). This capacity to remove sediments and pollutants has earned wetlands the title of "nature's kidneys" (Kusler et al. 1994; Mitsch and Gosselink 1993).

Productivity and Biodiversity

Wetlands are among the most productive and the most biologically diverse ecosystems of the world (Kusler et al. 1994; Williams 1990). Wetlands provide habitats for a wide variety of plants and animals during all stages of their life cycle. Many fish, birds, mammals, and reptiles rely on wetland areas for breeding, nesting, and feeding needs (Kusler et al. 1994; Environment Canada 1991; Williams 1990; Canadian Wildlife Service 1989; Glooschenko and Grondin 1988; Houser 1974). Cottagers who remove aquatic vegetation from the

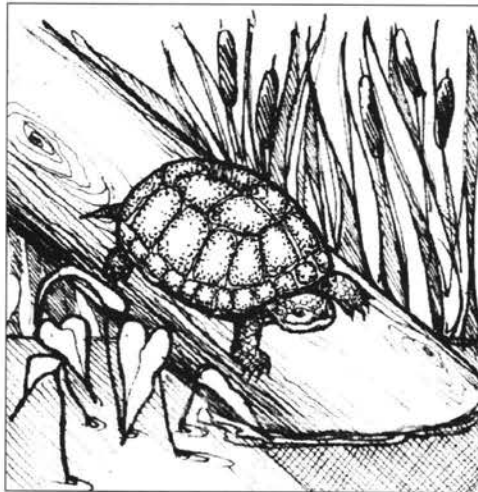
shoreline of their property because it looks unsightly may be destroying fish spawning and nursery areas. The effects of removing this vegetation may later be felt when it becomes difficult to find fish for angling.

Economics

Wetlands provide many economic and social benefits. The vegetation provides people with food and other valuable resources. Wild rice and cranberries are among the foods that are produced in northern wetland environments, and timber and peat are important natural resources (Kusler et al. 1994; Environment Canada 1991; Williams 1990; Glooschenko and Grondin 1988). Wetland animals are important for both commercial and recreational fishing and hunting (Kusler et al. 1994; Environment Canada 1991; Canadian Wildlife Service 1989).

Education and Aesthetics

Wetlands can also contribute to the educational well-being of people (Environment Canada 1991; Williams 1990; Van Patter and Hilts 1985; Bardecki 1982). Wetlands provide a natural scientific laboratory for research and learning at all academic levels. Furthermore, wetlands have a remarkable amount of aesthetic value (Environment Canada 1991; Williams 1990), which is something that is all too often overlooked as an important aspect of



these ecosystems. The beauty of wetland systems shows through in the vast diversity of plants and animals thereby providing a scenic landscape for enjoyment by naturalists, photographers, and canoeists as well as many others (Houser 1974). Not only are the sights something to

behold but the sounds that emanate from the wide variety of insects, amphibians, mammals, and birds provide a symphony for the ear.

Where Are Wetlands Found in Canada?

In Canada, wetlands are found along the shores of oceans, lakes and rivers, across the prairies, and in poorly drained depressions in the Canadian Shield (Canadian Wildlife Service 1989). Canada contains one-quarter of the world's wetland area (Environment Canada 1991) falling second only to the former Soviet Union in richness of wetland resources (Zoltai and Pollet 1983). Approximately 127.2 million hectares, or 14 percent, of Canada's land surface is classified as wetland, with the greatest concentration in Ontario and Manitoba (Zoltai 1988).

Since 1800 an estimated 20 million hectares or approximately one-seventh of Canada's wetlands have been drained or lost to other functions and millions more have been seriously degraded (Environment Canada 1991). About 65 percent of Atlantic coastal salt marshes are gone, 80-90 percent of wetlands immediately adjacent to urban centres have been lost, over 50 percent of potholes in the central prairies no longer exist, and 70

percent of Pacific estuary marshes are lost or degraded (Environment Canada 1991). In southern Ontario alone, it is estimated that 70-80 percent of the approximate 2.4 million hectares of wetlands that existed historically have been severely altered or have disappeared altogether (Snell 1987).

What Causes Wetland Loss and Degradation?

Wetland areas are lost as a result of natural processes of formation, change, and degradation (Gosselink and Maltby 1990); however, humans have generated the greatest impact in the modern era. Conversions for agricultural and urban development, recreation, lake-level management, landfilling, forestry, and peat mining are responsible for most wetland losses (Environment Canada 1991; Canadian Wildlife Service 1989; Van Patter and Hilts 1985). Agricultural development is the dominant reason for wetland destruction. According to Snell (1987), 81 percent of land drainage in southern Ontario between 1967 and 1982 was for agricultural purposes. Port expansion, industrialization, and urbanization are also very strong forces placing pressure on wetland environments (Pinder and Witherick 1990). In addition to the numerous hectares of wetlands destroyed, degradation and negative impacts on remaining wetlands cannot be ignored. Many activities may not destroy wetlands but instead have indirect effects on reducing water, soil, and air quality in and around the wetland ecosystems (Environment Canada 1991).

What Can Be Done to Prevent a Loss of Wetlands?

Since 1986 the Federal Government of Canada has been working with many committees on the issues surrounding wetland management (Environment Canada 1991). By 1991, a Federal Policy on Wetland Conservation had been developed in an effort to protect these precious ecosystems. The main objective of the policy is to promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions (Environment Canada 1991).

How Can Wetlands Be Restored?

Although protecting existing wetlands is preferred, restoration of lost or degraded wetlands may be

What makes a wetland provincially significant?

Lynn Woodcroft

The Ministry of Natural Resources (MNR) maintains the science-based Ontario Wetland Evaluation System (OWES), which evaluates wetlands to determine their significance for the purpose of land-use planning. It is the foundation for protection of wetlands in Ontario. OWES was originally developed in the 1980s to evaluate wetlands in southern Ontario but it has now been extended to northern Ontario. The system provides a consistent method for evaluating wetland functions and the value they have to society. Each of these functions and values are assigned a numerical ranking and grouped into four main components. The biological component takes into consideration that wetlands differ from one another in terms of their diversity and productivity. The social component of the evaluation focuses on human use including recreation and education. Also included in this component are products of value such as rice, commercial fish and furbearers. The level of effectiveness the wetland has at reducing flooding, its contribution to groundwater

discharge and recharge, along with the level of water quality improvement that it generates all fall under the hydrological component. The final component recognizes the importance of the presence of rare species and the overall quality of the habitat that is available for the wildlife, including fish. The age and geographic rarity of the wetland are also taken into consideration in this component of the evaluation.

Provincially significant wetlands are evaluated using a point system based on the data obtained from the four components following the guidelines of OWES.

A wetland is significant if it

- scores 600 or more points during the evaluation process or
- scores 200 or more points on the biological or special features component.

Information on wetland evaluations can be obtained by contacting a local environmental consultant.

possible; however, restoration is not easy. A good understanding of the entire ecosystem and how the various components interact with one another is necessary before management and restoration actions can be successful. Ideally, restoration projects should involve as little human intervention as possible so that a large degree of future management is not necessary.

Aside from the natural ecological advantages to restoring wetlands, cottagers can reap many benefits. Water quality of their lake may improve, flood events may be minimized, and an increase in wildlife may be apparent. Protecting and restoring wetlands will ensure a habitat for spawning fish and will, therefore, help to maintain healthy fish populations.

Since each wetland environment may be different from another guidelines for restoring these areas are not easy to produce. Furthermore, the desired purpose for the restored wetland will also impact

the type of approach that might be implemented; managing for waterfowl may entail different approaches than managing for fish spawning or water quality improvement. Cottagers can work to protect and restore wetland environments by implementing strategies on their own property (e.g., shoreline vegetation) or can work together to restore a larger wetland adjacent to their lake. Organizations such as Ducks Unlimited Canada, the Royal Botanical Gardens (RBG) in Burlington, local Conservation Authorities, and the Ministry of Natural Resources may be able to provide information on wetland restoration efforts. In a cottage setting, wetlands can be protected in such ways as maintaining aquatic vegetation along shorelines, improving land-use techniques that would otherwise contaminate wetlands with chemicals and high loads of erodable soils, preventing infilling of wetland areas for development, and prohibiting dredging. In addition

Human innovation that replicates nature: constructed wetlands

What is a constructed wetland?

Also known as managed marshes, artificial or treatment wetlands, and engineered ecosystems a constructed wetland is a wastewater treatment facility. It is a designed system that simulates the functioning of natural wetlands with the use of the same natural elements: saturated substrates, wetland plants, microbial communities, and, the all, important water.

The main objective of wastewater treatment is to reduce nutrients and pathogens to a minimal level so they have an acceptable impact on surface waters. Although a wide range of technology is available, for small-scale projects it is important that the technology is as maintenance free as possible and uses as little energy as possible. These systems can even be applied to residences and cottages as well.

Constructed wetlands are efficient at removing contaminants such as suspended solids, nitrogen, phosphorous, heavy metals, and more from residential, municipal, and industrial waste and storm water. They can process

- sewage for single households and small communities,
- residential and municipal effluent,
- industrial wastewater (tertiary treatment),
- agricultural wastewater (milkhouse wash water, nutrient-rich runoff),
- aquaculture waste,
- stormwater runoff,
- acid mine drainage, and
- landfill leachate.

Treatment ponds or lagoons represent one extreme of low maintenance and practically zero energy use but they do not always provide the treatment level required in the area available. Constructed wetlands are a hybrid technology bridging the simple pond approach with more intensive technologies, such as trickle filters. In the case of the Haliburton Fish Hatchery, waste water is produced when excess food and excrement are swept from the floor of the raceways. The waste water has to date been treated in a lagoon with

discharge to a stream. Although the Ministry of Environment approved this treatment approach based on the fact that the hatchery's discharge has never been out of compliance, the hatchery and Fleming College's Centre for Alternative Wastewater Treatment (CAWT) wanted to be proactive and install a novel constructed wetland to improve the treatment and to provide an opportunity to conduct onsite research to better their understanding of the function of the wetland in this situation.

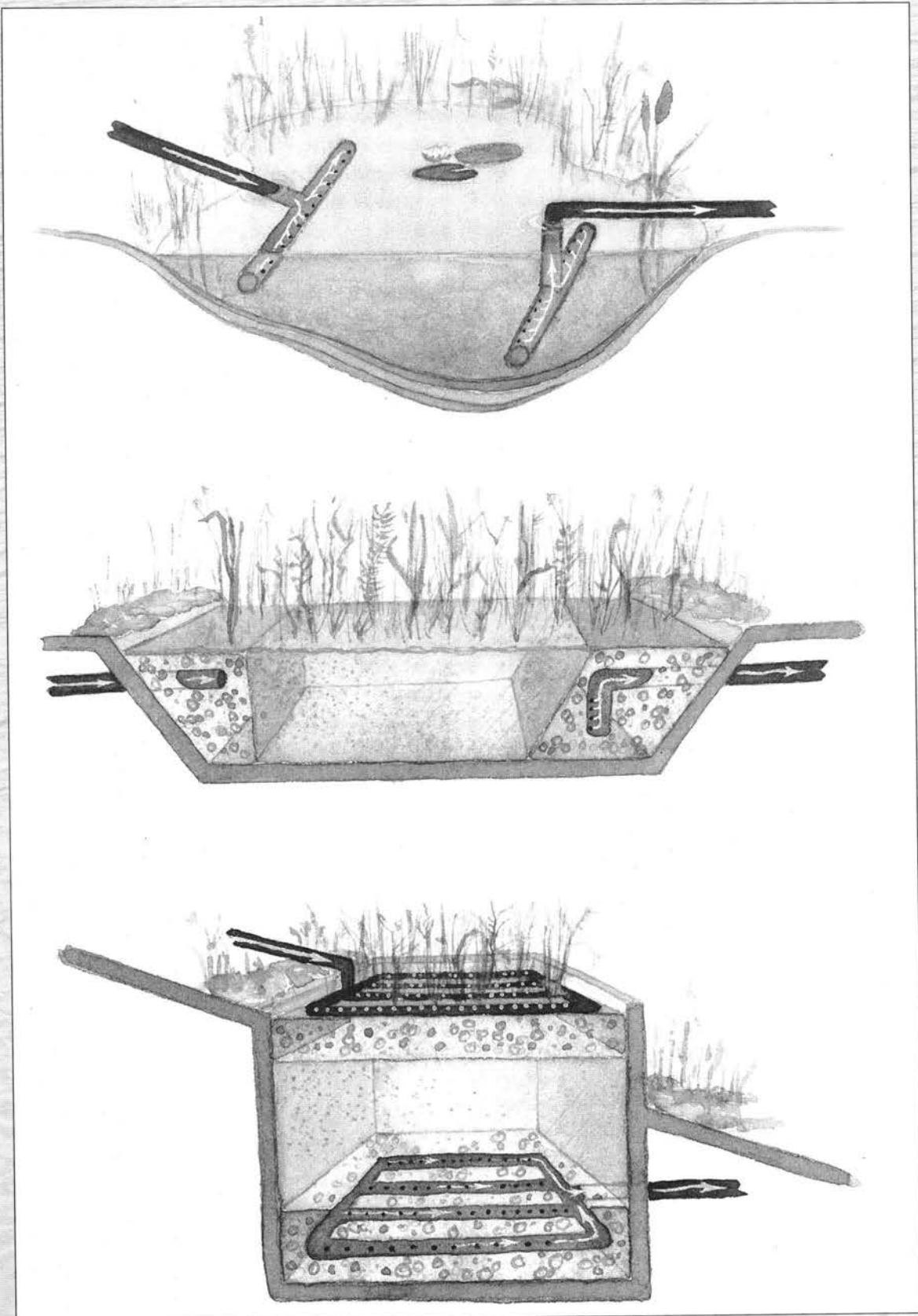
The treatment system starts with a clarifier and flow-balancing tank, which will settle out heavier solids and provide surge capacity to accept the peak loading from daily raceway cleaning. Clarified effluent flows by gravity into a layer of gravel at the bottom of the wetland. The effluent from the first pass is collected in a pump chamber and dosed back to a layer of sand sitting over the gravel. Because the sand is free draining, this layer remains aerobic and helps to polish the water and reduce nitrogen. The final step is for the water to flow through a tank containing screened slag, which is the mineral by-product of steel-making. This material is known to absorb phosphorus, which is the nutrient of greatest concern in reducing algal blooms in lakes. The water from the phosphorus filter flows into the existing lagoon and then into the stream.

CAWT are sampling the effluent at various points in the wetland system to collect research data allowing them to better understand where and when the purifying is taking place.

While constructed wetland designs have not been widely commercialized in Ontario, the passive operation and low-energy benefits of the approach make it an attractive technology to address concerns of local water pollution and global climate change.

For more information about alternative waste water management and examples of this technology used in Canada go to <<http://flemingc.on.ca/CAWT/>> and <www.rivercourt.ca/>.

Information for this article was provided by Sir Sandford Fleming College's Centre for Alternative Wastewater Management and Rivercourt Engineering Inc. Special thanks to Brent Wootton and Sara Kelly of Sir Sandford Fleming College and Andrew Hellebust of Rivercourt Engineering Inc.



Three different designs of constructed wetlands showing direction of waste water flow into and clean water flow out of the systems.

to these measures, landowners can develop a wetland conservation plan or consider the use of tools such as land trusts to preserve sensitive areas. These tools can give landowners a detailed action plan for the management of their property and can help them to achieve a wide variety of goals including a reduction in property taxes, improved use for recreation, and harvestable natural products. To help landowners prepare a conservation plan, a workbook titled *A Wetland Conservation Plan* is available through the Land Owner Resource Centre (LRC). The workbook is a step-by-step guide to a wetland conservation plan containing easy to use, fill-in-the-blank forms. Contact the LRC for further information.

References

- Bardecki, M.J. 1982. Educational use of wetlands in Southern Ontario. In *Wetlands Research in Ontario, Proceedings of a Pre-Conference*. Ed. M.J. Bardecki. The Department of Applied Geography, Ryerson Polytechnic Institute, Toronto. Pp. 179-86.
- Canadian Wildlife Service. 1989. *Wetlands*. Ottawa: Environment Canada.
- Environment Canada. 1991. *The Federal Policy on Wetland Conservation*. Ottawa: Canadian Wildlife Service, Environment Canada.
- Glooschenko, V. and P. Grondin. 1988. Wetlands of eastern temperate Canada. In *Wetlands of Canada. Ecological Land Classification Series No. 24*. National Wetlands Working Group. Sustainable Development Branch, Environment Canada. Ottawa: Polyscience Publications. Pp. 199-248.
- Gosselink, J.G. and E. Maltby. 1990. Wetland losses and gains. In *Wetlands: A Threatened Landscape*. Ed. M. Williams. Oxford: Basil Blackwell. Pp. 296-322.
- Houser, A.M. 1974. *Wetlands – down the drain*. Ontario Fish and Wildlife Review 13(3-4): 7-12.
- Kusler, J.A., W.J. Mitsch, and J.S. Larson. 1994. Wetlands. *Scientific American* 270: 64-70.
- Mitsch, W.J. and J.K. Cronk. 1992. Creation and restoration of wetlands: Some design consideration for ecological engineering. *Advances in Soil Science* 17: 217-59.
- Mitsch, W.J. and J.G. Gosselink. 1993. *Wetlands*. 2nd ed. New York: Van Nostrand Reinhold.
- Ontario Ministry of Natural Resources. 1993. *Ontario Wetland Evaluation System Southern Manual*. NEST Technical Manual TM-002.
- Pinder, D.A. and M.E. Witherick. 1990. Port industrialization, urbanization and wetland loss. In *Wetlands: A Threatened Landscape*. Ed. M. Williams. Oxford: Basil Blackwell. Pp. 234-66.
- Prescott, K. 1996. *The application of mass balance and hydrodynamic/pollutant transport models for wetland restoration*. M. Eng. Thesis, McMaster University, Hamilton, Ontario.
- Russell, R.D. 1987. Wetlands and water management. *Canadian Water Resources Journal* 12(3): 34-37.
- Snell, E.A. 1987. Wetland Distribution and Conservation in Southern Ontario. Inland Waters and Lands Directorate, Environment Canada. Working Paper No. 48.
- Van Patter, M. and S. Hiltz. 1985. *Some important wetlands of Ontario south of the Precambrian shield*. Don Mills, ON: The Federation of Ontario Naturalists.
- Weller, M.W. 1981. *Freshwater Marshes: Ecology and Wildlife Management*. Minneapolis: University of Minnesota Press.
- Williams, M. 1990. Understanding wetlands. In *Wetlands: A Threatened Landscape*. Ed. M. Williams. Oxford: Basil Blackwell. Pp. 1-41.
- Zoltai, S.C. 1988. Wetland environments and classification. In *Wetlands of Canada. Ecological Land Classification Series No. 24*. National Wetlands Working Group. Sustainable Development Branch, Environment Canada. Ottawa: Polyscience Publications. Pp. 1-26.
- Zoltai, S.C. and F.C. Pollet. 1983. Wetlands in Canada: Their classification, distribution, and use. In *Ecosystems of the World*, Vol. 4B, Mires: Swamp, bog, fen and moor. Amsterdam: Elsevier Scientific Publishing. Pp. 245-68.

Resources

Canadian Wildlife Service:
wildlife.Ontario@ec.gc.ca

Ducks Unlimited Canada. 1997. *Rural wetlands in Ontario: A guide for landowners*. Stonewall, MB: Ducks Unlimited Canada. <http://www.ducks.ca>

Environment Canada:
<http://www.on.ec.gc.ca/wildlife/wetlands/aboutwetlands-e.cfm>

Gonzalez, N. 1996. *A citizen's guide to protecting wetlands and woodlands*. Don Mills, ON: Federation of Ontario Naturalists. Pp. 86.

Land Owner Resource Centre: www.lronline.com
Toll Free: 1-800-267-3504

Office of Wetlands, Oceans and Watersheds:
www.epa.gov/owow/wetlands

Ontario Ministry of Natural Resources:
www.mnr.gov.on.ca

The Society of Wetland Scientists: www.sws.org

WetKit: www.wetkit.net

Crown-Land Forestry

Samantha Brown

Who owns that large piece of forested land across the lake? Chances are that it is crown land and it is managed by the Ontario Ministry of Natural Resources (OMNR).

Crown land is usually open to the public to use for hiking, hunting, camping, or other recreational activities. Check with your local district MNR office to find out where crown lands are located and their designated uses.

Can I Purchase a Piece of Crown Land?

Over the past few years, the MNR has focused its efforts on working with northern Ontario



communities to make crown land available at market value to support local economic development, rather than directly selling individual crown-land parcels to prospective buyers. If you are interested in a particular parcel of land your best bet is to contact the MNR and inquire about the land. The MNR no longer posts crown-land sales on its website (www.mnr.gov.on.ca).

Why Are Forests Important?

Forests provide habitat for many species of wildlife including birds, mammals, amphibians, insects, reptiles, fungi, and vegetation. Without forests biodiversity in our province would be almost non-existent. To lake dwellers, forests provide much needed erosion and run-off control and provide a balance to the flow of groundwater. Trees, both standing and fallen, provide habitat, shade and shelter for fish, and other aquatic wildlife.

Natural disturbances such as wind storms and

forest fires help forests to renew themselves by getting rid of old or dying trees and making room for regeneration. Some forest harvesting practises seek to emulate natural disturbances to lessen the negative impacts on the ecosystem and provide for a more natural pattern of regeneration.

How Is Crown Forested Land Being Managed?

All forest practices in Ontario are regulated by the MNR. Policies and framework ensure that Ontario's forest ecosystems are managed sustainably. In order to harvest trees on crown land you must be a Sustainable Forest Licence (SFL) holder. SFLs are long-term licences granted for up to twenty years and give the right to harvest all species of trees found in the licensed area. SFL holders must prepare forest-management plans (FMP), gather forest information for the crown, monitor and report on compliance, and conduct forest operations in accordance with approved plans and operational standards for the area covered by the licence. Sustainable Forest Licences are reviewed every five years and may be extended for an additional five years, providing that certain conditions are met.

The MNR, with input from the public, forest industry, and other interested parties has developed numerous technical standards and guidelines that are consulted for forest management planning and field-level forestry practices. These guides provide sustainable management guidelines for specific wildlife habitat, silviculture, biodiversity, prescribed burn planning, water crossings, access roads, etc. For a complete list and PDF versions of each guide visit www.mnr.gov.on.ca and go to the forest-management planning page.

How Does the Public Contribute?

Local citizen committees are appointed to assist in the preparation of forest-management plans across Ontario. The committees are made up of people who live and work in the area or have direct local interest in the plan. The committees participate in meetings and discussions that help to shape the development of FMPs. The public is also notified during the various stages of plan development and are given the opportunity to review plan development and implementation. Talk to your local stewardship council or district MNR office to see how you can get involved.

The public may also review and provide comments on proposed plans, legislation, policies, and regulations by visiting the Environmental Bill of Rights Registry at <www.ebr.gov.on.ca>. All proposals that may impact the environment are posted here for public comment.

References

Ministry of Natural Resources. 2008. Ontario's forests – Forest facts.

66 percent of Ontario is forested

•

7 million hectares of forest is privately owned

•

81 percent of Ontario forests are publicly owned crown land.

Trees in Your Backyard

Frank Knappen and Samantha Brown

Whether your property is on a lot or a woodlot, the information provided here will help the trees in your yard. Caring for your trees will give you enjoyment, shade, attract birds, and improve the aesthetics and value of your cottage. Ignoring your trees will put your cottage at risk, maybe not today or under your ownership but possibly for future owners.

Protect Your Home from Wildfire – Be Fire Smart!

The risk of your cottage burning from a wildfire can depend on what type of forest is nearby. The fact that you are near water should not lull you into thinking that you are safe. At highest risk is a coniferous forest, followed by a mixed forest of conifers and hardwoods, and at least risk is a hardwood forest. The forest need not be natural; man-made conifer plantations are still at risk for wildfires. If your property is located in the northern boreal forest than it is at a higher risk than a property in the southern deciduous or Carolinian forest.

Many waterfront properties are located in the wildland-urban interface. This is the area where buildings and urban infrastructure meet the woods. If you live in the interface area then you may have to contend with the threat of wildfires some day. There are many things you can do to reduce damage to your property in the event of a wildfire.

The Ministry of Natural Resources (MNR) is partnering with FOCA to utilize FOCA's extensive reach into the "urban-rural interface" to promote fire prevention in Ontario's rural communities. FOCA will be presenting and providing the Fire Smart program through education and outreach to cottagers. For more information visit www.foca.on.ca.

What does your property insurance say about

fires? Insurance companies are becoming more aware of the risks of wildfires and a few are requesting a hazard assessment. Be prepared to do some Fire Smart protection around your property.

Remove or reduce the number of evergreen trees in the area is a Fire Smart message that may contrast with keeping your property natural and providing wildlife corridors, shade, and erosion control. Keeping the area immediate to your buildings clear of hanging branches and providing pathways for fire to travel is necessary to protect your investment. With careful planning you can have a Fire Smart property that is still ecologically friendly.

Tree Injuries Caused By People

Let's clear up a falsehood: unlike humans, a tree cannot heal an injury, it can only seal over the wound. The damage is always there. The longer a wound is exposed, the longer disease has a chance to infect the tree. Your actions will affect the health and vigour of your trees.

Using a whipper-snipper or a lawnmower too close to any tree, especially a young one, can damage the bark and cambium layer at ground level. Do this too often and the tree will not be able to seal over all those scratch marks. Do this on a yearly basis and the tree will start to rot at ground level. Then, one day, a strong wind or even a breeze, will cause that tree to fall over. Before this happens, other signs will be visible on the tree such as an unhealthy crown and more dead branches than expected.

Some ways to prevent this basal damage is to plant flowers or shrubs around your trees. You can also place guards around young trees. An MNR Extension Note "Tree Guards Protect Your Trees" will provide you with suitable advice even though the intent of the article is for dealing with rodents.

Rodents do the same thing as your whippersnapper in that they chew away at the bark.

There are two excellent and colourful publications by Dr. Alex L. Shigo, "Your Tree's Trouble May Be You" and "Wounded Trees Mar Our Environment." Both give sound advice about what to look for in a healthy and unhealthy tree and what you should not do to a tree.

If a Tree Falls on a Building, Who Will Pay?

Check what your insurance states about trees, or limbs, falling on your cottage. Also, check what your car insurance says about falling trees. Many of you will be surprised that you are not covered. It might be listed under an "Act of God" and you will be left to pay for any damages and repairs, even for visitors and neighbours.

Tree Maintenance

You enjoy your trees for many reasons including shade, beauty, fruits or nuts, and screening. These good reasons can turn sour when something goes wrong. Yet there is a way to minimize this risk and it needs to be done yearly. Assess all the trees around your cottage. Look to see if any trees are leaning toward your property and driveway and if any limbs are overtopping these places. Now it is time to make a decision. You may see it as only a small tree or limb and leave it to be cut another day, or the tree has special meaning to you and you do not want to touch it, or you cannot fathom cutting down any tree. While you procrastinate yearly, that tree is growing and leaning more over your cottage or car.

If the tree is small you can cut it down with a bow saw or pruning saw. A small limb can be removed with a secateur, hand pruner, or hand shear. If the leaning tree is of medium size, then you may need a small chain saw to do the work. For a larger tree or overtopping branch you will need an expert, such as an arborist. Procrastination can turn a cheap and easy task into a very expensive job, especially if wires and other property are involved.

What is the difference between a medium-sized tree and a large tree? If you feel you cannot cut down the tree in a safe manner, then that tree is too large for you. In the past, a neighbour, logger, local farmer, or a friendly hydro person may have been able to do this work for you for free. Be

aware that the labour laws have changed. If you are paying anyone to do any cutting around your property that person needs a chainsaw operator's certificate. If you do the cutting yourself you will be selling that wood you will need certification. If you are bartering for services you may need a lawyer should anything go wrong. For more information, fact sheets, and to find a certified arborist in your area visit the International Society of Arborists (ISA) supported website at <www.treesaregood.com>.

A final point is to be made about cutting down any tree. Some municipalities have tree-cutting bylaws that may affect your ability to remove trees. A number of these bylaws are based upon sound ecological forestry principles. Check if your area has a bylaw and its conditions. In any case, safety should be the number one concern.

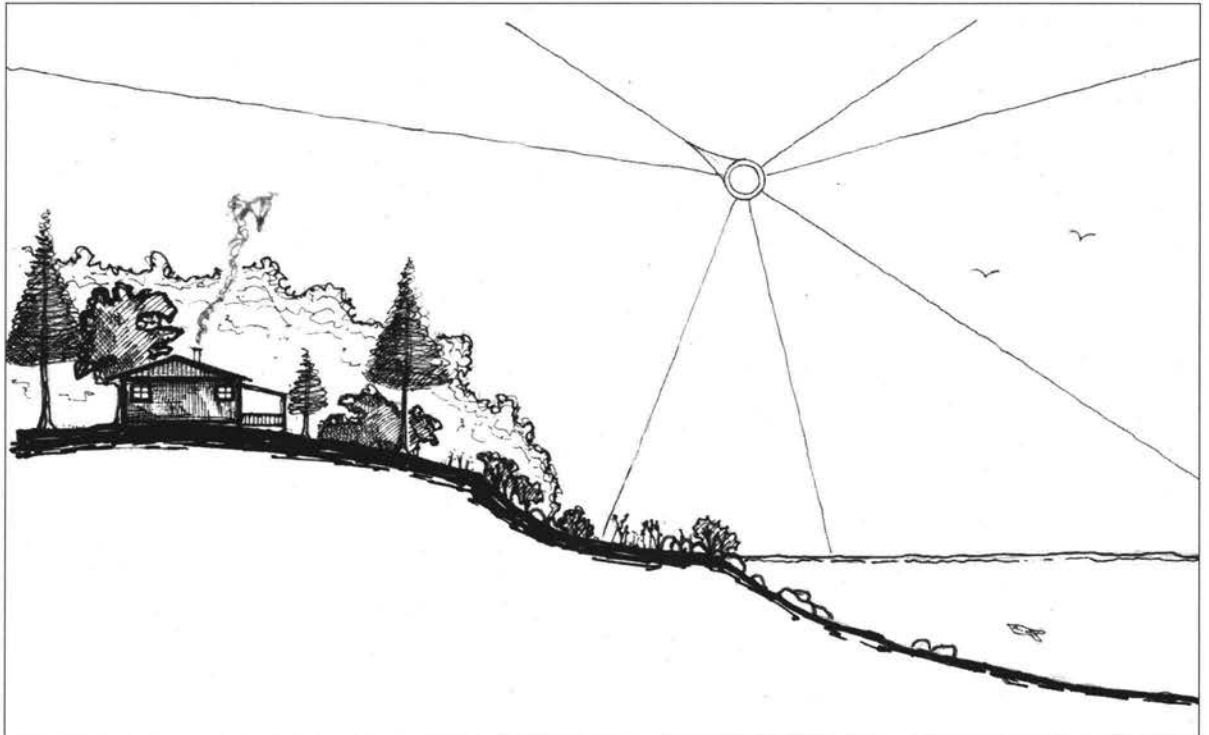
Trees and Your Septic System

If you have a septic system, not a holding tank, then there are a number of tree species that must not be allowed to grow close to the system. The roots of any tree go way beyond the "drip point" of their crown. On average, the roots are as long as a tree is tall. However, some trees have roots that go even further. Those roots can get into your septic tiles and block or break them, making your system ineffective. The cost of repair will be high. Hardwood species such as aspens, cottonwoods, Manitoba maples, poplars, willows, and softwoods such as cedar typically have these root characteristics. If any of these species are growing near your septic system and they are small, they should be removed. If they are large, remove both the tree and its roots.

Viewscope

In the last decade a number of entrepreneurs have come forth to offer their services for providing a better view of your waterfront property. Many of these people are landscapers, arborists, or just someone with a keen eye for design and the means to provide assistance. These services may be called a variety of names including shoreline landscaping, lake-friendly landscaping, cottage viewscaping, and the water's edge.

Services being offered are pruning, cutting, or planting the right trees and vegetation around your property so that you will have a more pleasing view of the water and beyond. FOCA, the Land



Resources Centre (LRC), and Peterborough Green Up all have very good information and factsheets regarding the types of trees to plant on your shoreline and other shoreline restoration tips. The key point here is that you should not totally clear the land or clear cut the trees around your property. If you have a good eye and can use the proper tools then you can do this yourself. Keep in mind that trees and branches grow and this task will have to be repeated every year or so. If you want to plant trees on your property the book *Growing Trees from Seed* by Henry Kock is a superb resource.

Ontario Woodlot Association

If your cottage property is forested with ten acres or more then seriously consider joining the Ontario Woodlot Association (OWA), which has local chapters. This organization is meant for the lay person who does not have a forestry background, even though it has such members. They offer meetings, workshops, and tours to help you understand what is happening, and can happen, to your woodlot. They even deal with current natural disturbances such as high winds and ice damage.

Importantly, the OWA is a big supporter of the Managed Forest Tax Incentive Program that seeks to maintain, or enhance, a healthy forest.

Landowners who apply and qualify for this program could have their property reassessed at 25 percent of the municipal tax rate for residential properties. The OWA will gladly make you more aware and educated about forest management and how to meet your objectives on your property.

The OWA also provides links to many of the organizations mentioned throughout this guide and more such as the Canadian Food Inspection Agency (www.inspection.gc.ca), which monitors terrestrial invasive insects such as the Asian longhorned beetle that targets hardwoods and the emerald ash borer that has decimated all types of ash trees in southern Ontario and is moving northwards. The Eastern Ontario Model Forest is organization that has produced some excellent publications about tree planting such as *Choosing the Right Tree*. The OWA website will also link you directly to Stewardship Councils, which provide landowner resource information, ideas, and sometimes funding for tree planting and management programs.

Planting Trees

If you have decided to plant trees on your property there are a few things you should consider before you get started.

There are a number of tree-planting programs

and not-for-profit organizations that provide resources and support for tree planting in Ontario. Depending on the number of trees that you wish to plant, you may be eligible for funding or assistance in obtaining seedlings, equipment, and professional advice. Many organizations provide educational workshops for landowners on topics ranging from tree planting to sugar-bush management to pine plantation thinning for a reasonably low price and are often conducted outdoors in a hands-on fashion.

If you are purchasing individual trees to plant in your yard or along your shoreline it is important to ensure that the plants you purchase come from the same seed zone where they are to be planted. A seed zone is a geographic area defined by ecological characteristics such as soil type, air temperature, and length of growing season in which a seed will grow and thrive to its full potential. If you plant a Carolinian tree species such as the tulip tree from a seed zone in southern Ontario in a zone in the Boreal forest it may not survive or will exhibit poor growth. To see a map of the seed zones and to learn more visit www.treesontario.on.ca/learn.

Online Resources

The Rideau Valley Conservation Authority has a very good website called the Land Resource Centre Online (www.lrconline.com), which has information and factsheets on a number of topics such as "Backyard Maple Syrup Production," "Cavity Trees Are Refuges for Wildlife," "Designing and Caring for Windbreaks," "Management Options for Abandoned Farm Fields," "Options for Controlling Beaver on Private Property" and more. Noteworthy to the waterfront property owner are "Maintaining Healthy Trees" and "Naturalizing Your Local Park or Backyard."

Resources

Canadian Food Inspection Agency:
www.inspection.gc.ca

Forest Gene Conservation Association:
www.fgca.net

International Society of Arboriculture: www.isa-arbor.com; www.treesaregood.com

Land Resources Centre Online: www.lrconline.com

Ontario Forestry Association: www.oforest.on.ca

Ontario Woodlot Association: <http://www.ont-woodlot-assoc.org/>

Stewardship Councils:
www.ontariostewardship.org/

Trees Ontario: www.treesontario.on.ca

BIODIVERSITY AND THE WATERFRONT

Shorelands

C. Brad Peterson

The shoreland is often the focus of cottage recreational activities. The term shoreline implies the immediate area where land and water meet; however, it refers to at least the first 10 to 15 metres of land extending from the water's edge. By association, shorelands may also include the ribbon of life found in the riparian land corridor and the shallow water around a lake or along a river. A waterfront has similar characteristics but can include intense industrial, commercial, residential, and public recreational uses.

Character

In addition to recreational activities and spiritual relaxation, shorelands are important for water supply. They provide critical habitat for fish and wildlife. A shoreland is comprised of natural form, predominantly vegetation and often with thin soils over bedrock in the Precambrian shield, and built form that includes mostly residential development interspersed with some commercial development.

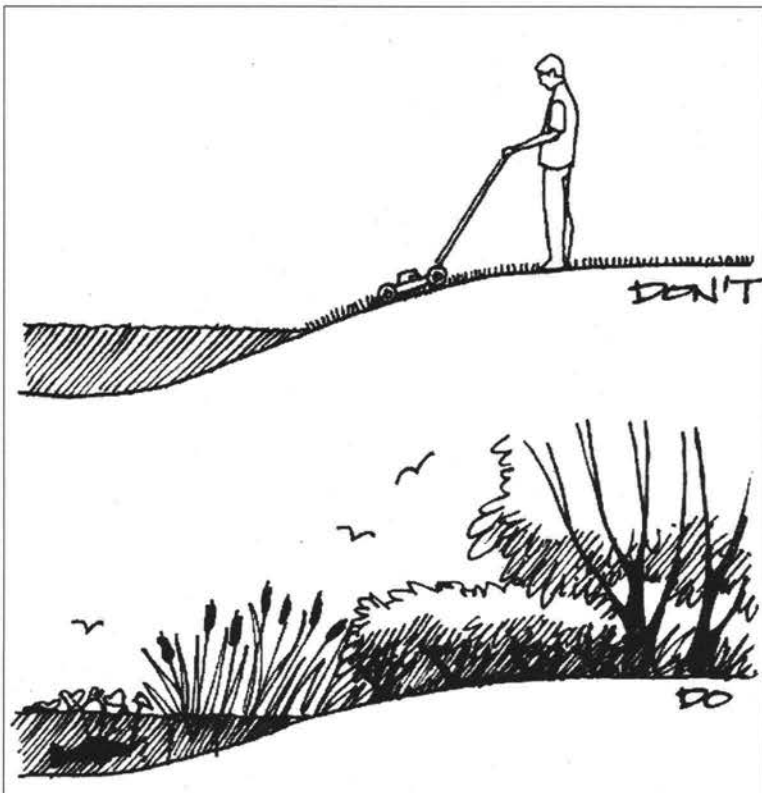
Shorelands are a dynamic environment where aquatic, terrestrial, climatological, and subterranean (i.e. ground water) forces meet and interact. Fluctuating water levels, the effects of ice, water currents, wave action, prevailing wind, storm tracts, changing climate, not to mention impacts due to human development, contribute to a combination of cumulative and sometimes rapid changes over time.

Such an intensively used and sensitive area requires careful consideration for any development and provides many opportunities for positive and enjoyable management over time. Figure 1 reviews shoreland habitat zones, common themes in shoreland management, and the five concerns and opportunities for good management discussed below.

Shoreland Management

Before getting started, there are four main management or protection strategies to choose from.

1. Preservation is the retention of a natural shoreland with designated access to the lake to avoid impact. This involves simply leaving shorelands in a natural state.



Why not a beach?

The sand that you import and spread over the shoreland for sunbathing and wading areas is temporary. That sand will be washed into the lake by wave and ice actions. This causes siltation of the water, which can lead to the suffocation of fish eggs and the destruction of fish habitat. Try a beach set back from the water's edge (more like a sandbox) and keep a natural buffer between it and the water's edge.

A healthy shoreline...

can be designed, landscaped, and tended but it is simplest and best to let it grow wild. The important factor to remember is that the plant material used is deep-rooted and helps to prevent the shoreline from eroding and that fertilizers and pesticides are kept out of the area. Observe what is already naturally occurring and effective, and encourage that same structure of plants and other materials. For more ideas on shoreline design see the references at the end of the article.

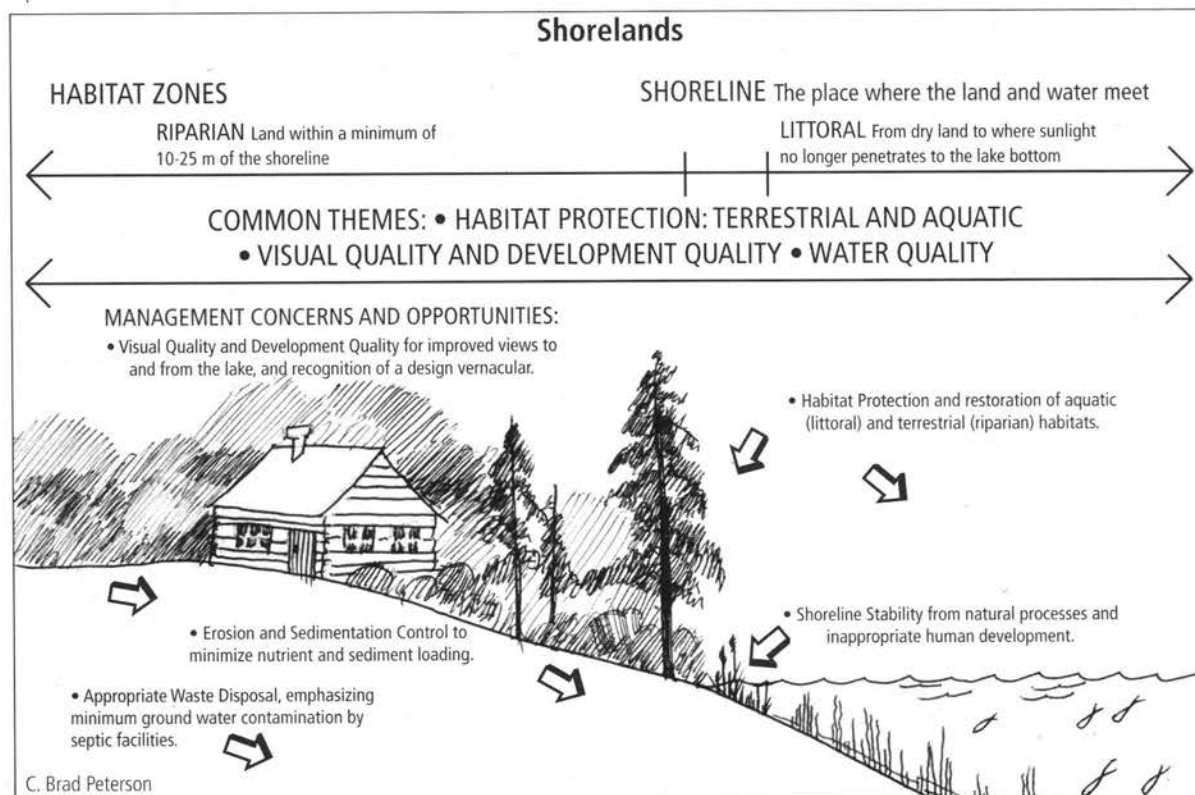
2. Naturalization is leaving the shoreland alone to return to its natural state after some disturbance.
3. Enhancement involves the planting of native species and removal of non-native species.
4. Restoration involves at least the planting of native species and may involve other site rehabilitation techniques in cleared or other previously disturbed sites.

Any of these strategies can be applied to the management concerns and opportunities discussed below. Choosing one strategy over another will

depend on the extent and severity of the problem, and the amount of time and other resources that can be successfully mobilized to address the problem. Several non-profit, government, and private-sector consultants are available to assist shoreland property owners and associations in addressing shoreland concerns (see Resources).

Management Concerns and Opportunities

The dynamic and diverse nature of shorelands suggests five focal points of concern. Not surprisingly these concerns, or opportunities, are



often interrelated. Common themes that run through this work are: improvement in water quality, which is directly associated with erosion and sedimentation control, and reduced nutrient and toxic-substance loading; terrestrial and aquatic habitat protection or improvement; and visual quality, which includes development quality and quality of life. Specific areas of concern and opportunity involve:

1. Shoreline stability;
2. Habitat protection and shoreland development;
3. Erosion and sedimentation control, which includes infiltration and nutrient retention;
4. Visual quality and Development quality; and
5. Appropriate waste disposal, with emphasis on minimizing groundwater contamination.

Shoreline Stability

Shorelines, the fluctuating zone where water and land meet, may "blow out" or become unstable and erode due to natural forces or inappropriate human development and intensive use.

Consequences of shoreline instability include loss of property, increase in suspended solids, destruction of fish and other shoreland habitat, and possible premature aging of the lake. A stable natural shoreline with living vegetation that anchors soil slows this process. Shorelines should be left natural or stabilized after disturbance.

The first line of defence is to retain the shoreline in its natural state. Natural shorelines adjust to natural disturbance events and are often remarkably stable. Rocks, wide-sand beaches, and in some cases wetlands help to dissipate energy from moving water and wave action. On dryer land, plants with deep roots help to anchor soil.

A number of techniques can be used to control shoreline erosion. Successful approaches often mimic nature's own design. Simply planting appropriate, usually deep-rooted native vegetation can be very effective.

Another related approach is bioengineering, derived from age-old techniques that use native vegetation alone or in combination with other non-living materials (wood, rock, etc.) in a number of configurations to stabilize a lake shore or river bank environment. Standardized techniques include facines, brush layers, brush mattresses, and wattle fences, which are sometimes used in association with carefully placed boulders, rock, wooden cribs

or, in more urban areas, rip-rap, armour stone, and rock gabion baskets. Erosion control blankets can also be used. Uses of non-living solutions include the sole use of rock rip-rap, gabion baskets, or armour stone with filter cloth.

Often a hybrid between a standardized technique and observed characteristics of a stable local natural shoreline will point to an appropriate solution. Among other factors, consideration should be given to the type of soil and substrate conditions, ground-water seeps, cost and timing of work, the type and quantity of plant materials required, and the need for permits. The benefit of simple planting and bioengineering techniques is that living materials respond to and acclimatize to stress, and provide wildlife habitat. Plants tend to reproduce and persist as shoreline conditions evolve. Non-living structures do not; concrete retaining walls, rip-rap, armour stone, rock gabion baskets, and sheet-steel pilings are static. They are unattractive, expensive to build, prone to ice damage, fail to dissipate wave action, harm aquatic habitat through greater solar radiation, and lack vegetation for cover and food sources for wildlife.

Softening a hard shoreline can help to extend its life and protect it from the damages of natural forces. For example, planting native species between armour stone and rip-rap is an option that can help reinforce the structure of the soil. The most useful deep-rooting plant species will be found locally, often in a similar configuration as they may be used. Plants may include red-osier dogwood, sweetgale, various shrub willow species such as Bebb's, sandbar, sage-leaved, pussy, and shining willow, along with broad-leaved meadow-sweet. Other plants such as lowbush blueberry, alder, and nannyberry can be used to diversify habitat. A more natural solution should resist the forces (both water and land-based) that work to destabilize the shore. Such work should be done by qualified individuals. For more information see the resources section or consult with your local Conservation Authority or OMNR.

Habitat Protection

In waterfront communities habitat restoration efforts along continuous reaches of denuded shoreline are more likely to be successful than focusing on restoring small, locally disturbed sites. The natural shoreland environment contains a

There are many organizations that can assist you in designing, planning, and maintaining your shoreline. See Resources below for contact information.

As one would expect...

the best habitat is undisturbed shoreland. A wider shoreline provides the best buffer but any width helps. If you are already having erosion problems or nuisance species such as Canada geese congregate on your shore then a three metre buffer is recommended. This will help to slow the erosion process and creates undesirable habitat for geese.

distinct terrestrial or riparian zone, an aquatic or littoral zone, and may contain a wetland community. In these zones, diversity of habitat is achieved by planting layers of vegetation. If littoral or wetland plants are present, a variety of submergent, emergent, and floating-leaved species may be appropriate. On land, herbaceous vegetation, small and large shrubs, followed by small and large trees can encourage greater wildlife species diversity. Shoreline plantings may also form a forest edge that offers a measure of protection against storms, desiccation, strong winds, and bright sunlight.

Terrestrial environments

Wildlife use shorelines as natural travel corridors. It is best to leave these areas as natural and as accessible to wildlife as possible. Dogs and cats should be controlled, especially during the avian breeding and rearing season. Plants located along the shoreline will help to shade and cool water.

In addition to planting shoreland stabilizing plants, most other native shrubs and trees have wildlife value. Some important species include gray dogwood, black elderberry, hawthorn, pin cherry, and chokecherry. Native species of oak, pine, spruce, ash, birch, basswood, and maple are also excellent for wildlife. Remember to plant what occurs naturally in accordance with habitat preferences of the species.

Do not plant non-native, exotic, and possibly invasive species that have been touted in the past as beneficial for wildlife. These include autumn olive, Russian olive and multi-flora rose, among others.

Aquatic environments

Fish, water birds, and shore birds, not to mention aquatic-based reptiles, amphibians as well as macro- and micro-invertebrates (including mollusks) are among the species that will benefit from aquatic habitat restoration. Generally speaking, docks and other sheltering structures can improve fish habitat. Floating and cantilever docks followed by post-supported docks have least impact on habitat. Water and ice eventually destroy crib and concrete docks and they require more lake-bottom surface area thus reducing the amount of lake-bottom habitat present. Visit www.dfo-mpo.gc.ca and download "The Dock Primer" for everything you need to know about installing a waterfront-friendly dock.

Basking logs and elevated perching logs have been included in some shoreline and wetland designs for turtles and frogs to sun themselves. Larger stones can also be used below and above water levels to improve fish habitat and provide perching opportunities for water birds and shore birds. To determine what types of fish are using the habitat around your shoreline, contact your local MNR or DFO office. Different species of fish require different types of habitat, from coarse gravel to seasonally flooded grassy areas.

Since improvement of aquatic habitat is an activity that occurs in water and is very specialized, this work can only be carried out under the direction of qualified personnel with the appropriate approvals and permits.

Wetlands

Wetlands are areas with plants that grow in wet soil conditions. Wetlands of any size and description should be left undisturbed. They are incredibly important areas that often contain rare habitat for plant and animal species, including orchids, swamp rose mallow, wood turtle, spotted turtle, least bittern, and the prothonotary warbler. Wetlands maintain and improve water quality by filtering contaminants and excessive nutrients, help to protect shorelines, and are visually interesting.

It is important to maintain existing natural drainage and minimize the amount of sediment, nutrients, and contaminants that enter a wetland; avoid disturbing fish spawning areas and other rearing and nesting sites; and maintain a wide

buffer of upland habitat, which will protect wetlands from disturbances and nearby land use.

If a wetland has been disturbed it can be difficult to restore. Active restoration is a specialized field of restoration ecology and should be carried out by qualified individuals. Benign neglect may be the best approach if disturbance is minor and invasive species are not present.

Work in and around wetlands is strictly regulated. It is best to call the OMNR, your local Conservation Authority, or municipality for any required approvals or permits. Parks Canada may need to be contacted if you are located on a federal waterway such as the Trent-Severn or the Rideau.

One pound of phosphorous (typically found in most fertilizers) can produce up to 500 pounds of aquatic plants if it reaches the lake.

Erosion and Sedimentation Control

This section covers erosion and sedimentation entering a water body from adjacent uplands. A certain amount of sediment and organic-materials loading is natural in undisturbed ecosystems. This process can be greatly increased on disturbed sites such as the waterfront lot. Typically, very small silt-sized particles and larger soil particles will enter a lake during rainstorm events, spring runoff, or during high-wind events. Commercial fertilizers and pesticides can be diluted in runoff water or carried along with small particles to the lake. Soil particles, diluted nutrients, and toxic substances are harmful to lakes.

Sediments can smother reproductive environments of fish and other wildlife. Nutrients and toxic substances can alter levels of primary production and wreak havoc in the natural balance of food-web pathways.

It is important to control erosion and sedimentation during the initial building of the cottage, pathways, dock or boat house while soils are exposed and the land surface is not stabilized with vegetation. It is also important to demonstrate good stewardship practices after construction through appropriate shoreline stabilization and landscape development.

Prior to construction, the maintenance of a natural vegetated buffer along the shoreland is certain to help control soil erosion and sedimentation. A minimum of 1 metre and an optimum of 30 metres of shoreland should remain undisturbed. Allow for storm water infiltration to occur as opposed to immediate runoff.

During any construction activity be sure to

stabilize exposed soils immediately with burlap, silt fencing, or erosion-control blankets. Use a cover crop of oats, barely, or annual rye if soil is exposed for more than two weeks. Place and maintain silt fencing or straw bales in low regions of the downslope side of disturbed areas to keep sediment from entering the water body. Dredging causes long-term damage to the environment. Dredging requires appropriate permits and should be minimized whenever possible.

After construction, stabilize the site with vegetation as discussed in this article and elsewhere in this manual. Follow healthy procedures for maintaining your landscape as discussed in the following section.

Visual Quality and Development Quality

It is important to preserve and protect the appearance of naturally vegetated shorelands. Visual and scenic qualities contribute to property values and overall appreciation of the cottage environment. Visual quality is linked to well-established cultural preferences and contributes to quality of life for everyone. It is also an indicator of shoreland maintenance and environmental integrity. Retaining shoreland vegetation for visual purposes is entirely consistent with other habitat protection, shoreline stability, and erosion and sedimentation control objectives.

In maintaining views, it is crucial to strike a balance between seeing and being seen—in other words, viewing the lake and being viewed from the lake. Quite acceptable results are achieved by retaining a suitable number of native trees, shrubs, and other ground flora along the shoreline. In some cases the limbs of trees blocking views to the lake can be removed instead of removing the entire tree. The same technique can be used for bringing more sunlight into the cottage at certain times of the year. Tall trees close to buildings and cars, possibly prone to windthrow, may be topped to a safer height (consult with a professional arbourist). At the same time, vegetation will provide a reasonable amount of privacy from the lake or waterway.

Views can be managed by retaining natural ground cover including ferns and shrubs and without grading and importing soil or grass. Avoid raking- leaves and disturbing the natural forest "duff" layer, and avoid cleaning out woodlands of smaller growth to create a city park-like setting.

Nature does a much better job of maintaining itself with no effort from the landowner.

The application of fertilizers and pesticides is unnecessary and discouraged; commercial fertilizers are very harmful to lakes. Organic gardening techniques are ideal for the cottage since they do not rely on chemical fertilizers and pesticides but focus on improving the natural fertility of soil. If you must fertilize, consider organic options such as well-rotted compost. Fertilize sparingly and do not use fertilizers next to the shoreline or when precipitation is forecast. Slow-release tablets can be used in planting holes. Use organic mulches such as partially decomposed deciduous leaves, pine needles, or wood chips to control weeds and retain moisture in the garden.

Many opportunities arise to instill a sense of "native is beautiful" without closing the door entirely on non-invasive horticultural flowers, food, and landscape plants. One rule of thumb is simply to minimize one's maintenance regime and restore native species to most areas. Try planting woody plants native to the area in order to keep the natural vegetation matrix and never plant invasive species such as periwinkle or other spreading and self-seeding herbs. Keep non-invasive exotics physically closer to the cottage rather than designing the lot as a suburban landscape transferred from the city.

Development should not interfere with the viewing and appreciation of high-quality landscape features, namely falling water, rapids, rock cliffs, hilltops, other natural landmarks, and scenic views from well-travelled roadways or smaller cottage access roads. Likewise, roadways serving the shoreland should blend in with the setting and terrain and should have proper slope and drainage, a safe curving alignment and road surface, and should retain significant tree cover and other vegetation.

The height and colour of any structure should be appropriate to its setting and terrain, including slope, tree cover, setbacks, and architecture. Structures, including TV towers and dishes should not protrude above the height of the tree canopy and they should be set well back from the shoreline, be screened by vegetation, and have a dark neutral or black colour instead of white.

Exterior lighting should be subdued so as not to interfere with the night vision of those using the

waterway, the habitat of nocturnal animals, and privacy.

Check with your municipality for minimum building setbacks and protection of natural shoreline requirements; 15–30 metres is optimal. Local municipal official plans may have sections on minimum building setback allowances from the water's edge, and minimum natural vegetation coverage of shoreland for each waterfront property. Other land uses in the area may be taken into account during development planning; provisions may be required for buffering, screening, setbacks, lot dimensions, built size, and other matters.

Appropriate Waste Disposal

Usually surface and ground water enter the lake in the shoreland environment. Water quality, specifically ground-water contamination by septic effluent that involves nutrient and toxic-substance loading, is likely the most important stewardship issue facing cottage owners. Please refer to Part 3: Sustainability at the Lake for a complete discussion of this critical issue.

Reducing nutrient and toxic-substance inputs at the source is the first line of defense. The handling of gasoline and oil, and the disposal of household wastes such as paint, cleaners, batteries, and gas cylinders must follow appropriate procedures outlined by your municipality, and the Ontario Ministry of Environment and Energy (see Resources). Under no condition should fill materials such as top soil, subsoil, concrete or aggregate materials be dumped in a water body or wetland.

Efforts taken to have a clean environment today will ensure a clean and safe environment for those who enjoy our lakes in the future.

Regulatory Frameworks

Shorelands are protected by law in Ontario. Conservation Authorities, OMNR, MOE, the Department of Fisheries and Oceans, and Parks Canada have laws and regulations governing docks, boathouses, and other shoreline structures. Many municipalities may also have regulations in their official plans and zoning bylaws that limit the type and location of shoreland structures. Strict regulations are in place to control erosion and sedimentation entering water bodies from upland environments.

Failure to comply with regulations can be

expensive for landowners, who may face fines and requirements to return unapproved projects back to their natural condition.

As an encouragement to protect significant natural areas, landowners may be eligible for tax-incentive programs or other financial incentives for protecting, enhancing, and maintaining forests, wetlands or other special natural areas on their properties.

Performing Good Work

The major activities surrounding the management of shorelands are:

- Retain shorelands in their natural state and disturb other natural areas as little as possible.
- Plant local native vegetation where appropriate to stabilize shorelines, increase wildlife habitat, shade and cool shoreline waters, buffer upland erosion and sedimentation, and provide framed views and visual screening.
- Minimize sediment, nutrient and toxic substances entering the water body through surface runoff and from the land by way of groundwater.
- Design or maintain your shoreline, landscape, and built structure for visual quality and appreciation through the protection of natural features.

Non-profit organizations and partnerships with government agencies and private consultants continue to perform good work for the protection of shorelands. Lake associations may function in part as a land trust or can work with a local land trust to help protect or restore significant natural and cultural heritage.

References

- Brown, Doug. 1997. *Paudash Lake Shoreland Restoration Project*. Paudash Lake Conservation Association. (Available from FOCA)
- Canadian Wildlife Service. 1997. *Working Around Wetlands? What You Should Know*.
- Lightly, Marion. 1996. A shore thing. *Nature Canada* (Summer): 19-22.
- MAPLE. An immediate start to shoreland restoration. 10.
- MAPLE. The lure of the lake.

- MAPLE. *Shoreline Classification Survey Manual*. 1998.
- McComas, Steve. 1994. *Lake Smarts*. Terrene Institute.
- Ontario Ministry of Environment and Energy. Protecting the environment in your home. *Environmental Living*, Vol. 1.
- Ontario Ministry of Environment and Energy. Protecting the environment in your yard and garden. *Environmental Living*, Vol. 2.
- Ontario Ministry of Environment and Energy. Protecting the environment when building or buying your dream cottage. *Environmental Living*, Vol. 3.
- Ontario Ministry of Environment and Energy. Protecting the environment at the cottage. *Environmental Living*, Vol. 4.
- Ontario Ministry of Environment and Energy. Protecting the environment in the great outdoors. *Environmental Living*, Vol. 5.
- Ontario Ministry of Natural Resources. 1993. *Working Around Water*. The Queen's Printer.
- Restoring Nature's Place. 1996. Ecological Outlook Consulting and the Ontario Parks Association.
- Stevens, John, ed. *Living Near the Water*. Burnstown, ON: General Store Publishing House.
- U.S. Army Corps/Engineers North Central Division. N.d. *The Role of Vegetation in Shoreline Management*. Michigan Department of Natural Resources Coastal Zone Management Program and Government of Canada Department of Fisheries and Oceans.

Resources

- Canadian Wildlife Service: www.cws-scf.ec.gc.ca/index_e.cfm
- Conservation Ontario: www.conservation-ontario.on.ca
- Department of Fisheries and Oceans Publications: www.dfo-mpo.gc.ca/regions/central/pub/index-eng.htm
- Federation of Ontario Cottagers' Associations: www.foca.on.ca

Landowner Resource Centre: www.lrconline.com

Mutual Associations for the Protection of Lake
Environment in Ontario

MAPLE: www.rvca.ca/maple

Minnesota Department of Natural Resources:
www.dnr.state.mn.us/eco/pubs_restoration.html

Muskoka Heritage Foundation and Muskoka
Watershed Council: www.muskokaheritage.org

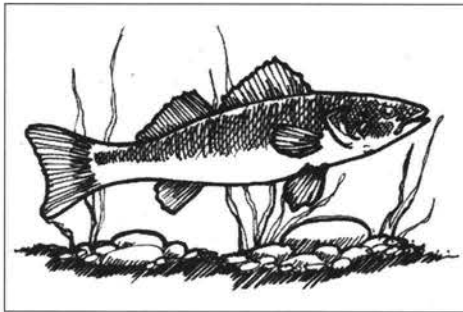
University of Minnesota:
<http://wrc.umn.edu/outreach/shore/>

Freshwater Fisheries

Kathleen Mackenzie

(edited by Helen Ball)

A stable fish population is not only a valuable recreational resource but also an indicator of a healthy ecosystem. Fish species vary from lake to lake in response to oxygen levels, temperature, food, and physical habitat. Species and abundance may change over time due to human-induced physical habitat changes, changes in water chemistry, the introduction of non-native species, and overfishing. The littoral (shallow water) zone is especially important to fish production; keeping the upland shoreline and in-water shoreline areas



natural also is very important for preservation of fish populations. The Ministry of Natural Resources (MNR) rarely will recommend stocking to increase fish resources but will provide information on

techniques for natural habitat preservation and enhancement.

The people of Ontario have inherited a priceless legacy in Ontario's fisheries resources. Although the MNR is responsible for fisheries management in the province, it takes the concerted efforts of government agencies, industries, and interested communities and individuals to ensure a healthy fishery is passed on to future generations. The fisheries resource is vitally important because fish are indicators of environmental change. If the health of aquatic ecosystems declines, fish populations soon suffer. Like the "miner's canary," fish populations provide early warning signals of environmental degradation. The MNR has a wide variety of information on fish species and habitat, management of fisheries, population and

production estimates, and sport fishing regulations. Habitat information, mapping and assessment reports, scientific research papers, as well as reports done on specific lakes in the MNR district are on file at local MNR offices in the form of creel surveys, stocking records, and netting reports.

Fish Requirements

The lakes, ponds, rivers, and streams of Ontario form a home for a variety of different species of fish. The location of the different species of fish depends on the various characteristics of the body of water. For successful growth and survival, fish require certain conditions in their environment. Parameters of interest include sufficient dissolved oxygen in the water, moderate temperatures, adequate food, and a healthy habitat. Many human activities in, or near, the water can change the quality of the aquatic environment. When changes occur, fisheries may be harmed.

Oxygen

Usable oxygen in lakes comes from aquatic plants and from the atmosphere through wind and wave action. In shallow lakes, mixing of the water by wind maintains oxygen levels. Deep lakes, however, are not recharged continually with oxygen because wind is not able to circulate the full volume of the water body. Low oxygen levels may then cause stress to fish, which in turn may lead to death. If a lake experiences fish kills the cause may be insufficient mixing due to wind and wave action. There are other factors that may contribute to low dissolved oxygen. Large amounts of decaying organic material (i.e., algae or aquatic plants) and warmer temperatures may lead to decreased oxygen levels, to a point where fish populations are affected negatively.

Temperature

Temperature is important to fish for two reasons: fish have preferred temperature ranges within which they live and temperature affects oxygen levels (cold water is richer in oxygen than warm water). Lakes can be classified as "cold-water" lakes or as "warm-water" lakes according to the type of fish found. Typical cold-water fish species include lake, brook and rainbow trout, splake and whitefish. Species such as walleye, smallmouth bass, muskellunge and pike, are found in warm-water lakes.

Food

Fish require different food sources at different times of their lives. A diverse, stable ecosystem will provide this variety of food. If the conditions of a lake change, even in a seemingly insignificant way, a food source that is critical at a particular life stage for a fish species might be adversely affected.

Physical habitat

A variety of habitats are required by fish throughout their life cycles for spawning, nursery, rearing, and forage activities and for protection and migration. Spawning and nursery areas are generally easy to identify due to the presence of eggs or males guarding their nests. Spawning sites have been mapped for most of the Kawartha Lakes as a first step toward protecting their fish populations.

Stresses

The fish community is an assemblage of fish composed of many species competing among themselves for food and space. When the aquatic community functions properly it is like a balanced scale. However, if one part of the community does poorly, another part takes advantage of this thereby upsetting the natural balance. Factors that upset this balance are called stresses. Stresses are categorized generally into three types: physical, chemical, and biological stresses.

Physical stresses

Each year thousands of shoreline development proposals are submitted to the MNR, Conservation Authorities, and Parks Canada. The majority of these projects deal with shoreline alterations such

as the removal of rocks, weeds, and wood debris to "clean up" the shoreline or they propose the addition of sand, docks, and decks. These "clean ups" may provide better swimming and docking facilities for cottagers but the impacts to the fish community are devastating.

The most important areas for fish in a lake are along the shore. The band of shallow water around a lake, referred to as the littoral zone, may account for 80 to 90 percent of the total fish production of a lake. Boulders, dead wood, and weeds may not be pleasing to the human eye but they are essential elements for the habitat of many aquatic species. Boulders and rock rubble provide ideal spawning grounds for many fish such as lake trout, walleye, and smallmouth bass. They are nursery areas for young fish and produce food for crayfish and other aquatic organisms. Rocks that are exposed every autumn when water levels drop can be used by walleye to lay their eggs in the spring or can provide important cover to spawning bass. Boulders on the shoreline also help to dissipate the force of the waves on the property thereby reducing erosion.

Erosion of the shoreline contributes to increased siltation. If silt and sand are carried by wind or water to a spawning area, fish production may be greatly reduced or even destroyed. For example, crevices found among rocky areas are essential for the development of many fish species' eggs. Throughout the development of these eggs a fresh supply of oxygen is required. Sediment build-up can reduce the availability of crevices and coat the eggs with fine particles of silt, which suffocates the larvae.

Aquatic vegetation is an essential component of any healthy lake ecosystem. Plants provide protection, food, and oxygen to numerous fish and wildlife species. Normally, lake shorelines are resistant to erosion because of the stabilizing action of plant growth. Aquatic vegetation also uses excess nutrients and helps to minimize resuspension of the lake bottom thereby reducing turbidity. If plants are removed or reduced in number, fine soil and organic matter may be transported into the water resulting in an increase in turbidity and an increase in nutrient input to the lake.

The removal of aquatic plants along shorelines may also eliminate feeding areas or protective

cover for newly hatched fish. The first year in the life of a fish is one of constant struggle. One of the most serious threats is the possibility of being eaten by a larger fish. The best defense a young fish has against predation is to hide in the cover of aquatic and shoreline vegetation. As well as being nursery areas, these sites are also major production areas for food. Many of the insect larvae and forage important to fish diets come from these areas. Removing weeds to facilitate boat handling, to improve swimming conditions, or to provide water access may ultimately remove a hiding place for a school of vulnerable young fish.

Waterfront property owners must obtain a MNR shoreline work permit, or a federal permit in the case of the Trent-Severn and Rideau Waterways, in order to remove any aquatic plants from the lake. Further information on aquatic plant control is available from the MNR office in your area or from your local district MOEE office.

Fisheries habitat is protected under the Fisheries Act and is administered by Fisheries and Oceans Canada. Conditions of approval for various types of shoreline and in-water works are implemented through provincial legislation such as the Public Lands Act, the Lakes and Rivers Improvement Act, and the Conservation Authorities Act on provincial waters and through the Historic Canals Regulations on federal waters in Ontario. These acts ensure that shoreline work cannot in any way adversely affect fisheries habitat, including spawning nurseries and feeding areas. You are now required by law to obtain permits for any work on private- and crown-land shorelands. Information and permit applications can be obtained from local MNR, Conservation Authority, and, where applicable, Parks Canada offices. Shoreline work-permit applications are reviewed to determine what effects the proposed development will have on fish and wildlife habitat. Government agencies work with property owners in order to meet the needs of cottagers while maintaining a healthy fishery. Consequently, site inspections and modifications to projects may be required to mitigate harmful effects.

Chemical stresses

Development near the shores of Ontario lakes has increased the inflow of nutrients. The term used to describe this process is eutrophication. As

shorelines become developed and activities intensify the natural process of eutrophication is accelerated. Early signs of this process include dense mats of algae growing on rocks near shorelines and a decrease in water clarity. The primary nutrient associated with eutrophication is phosphorous. Although phosphorous is present as a natural nutrient, it is also introduced by private- and municipal-treatment facilities, land clearing, and other human activities. Improperly installed and poorly maintained septic systems and the use of fertilizers increase nutrient levels, which often results in decreased oxygen availability and increased water temperatures. This can have serious effects on fisheries, particularly in lakes that support fish species such as lake trout.

Acid precipitation is another chemical stress. The sensitivity of a lake to acid precipitation is determined by two factors: 1) the acidity of precipitation, which is determined by the proximity of the lake to wind plumes from highly industrialized areas; and, 2) the type of rock around the lake. If limestone is present in the watershed it will neutralize acid rain, whereas granite cannot neutralize acid rain. Most lakes in the Canadian Shield are high in granite composition; therefore, the susceptibility to acid-rain damage in this area is great.

Acid rain, or runoff, is particularly harmful when it arrives at the lake in pulses, such as after a heavy rain or snowmelt. If acid snowmelt coincides with the hatching of fish eggs a significant decline in hatching success can occur. These changes in water chemistry may also lead to problems for invertebrate organisms that form the basis of food chains in many lakes.

Biological stresses

OVERFISHING

Fishing pressure is one of the most important stresses on fisheries. Fishing is a valued recreational pastime and is a significant contributor to local economies. Anglers fished over 11 million days in the southern region of Ontario. If the amount of fish harvested exceeds the number of fish required to maintain the fishery, fish populations decline. When a species is overharvested, angler catch rates will drop off, the average age of the catch will decline, fish will mature at younger ages, and growth rates will alter.

INTRODUCTION OF NON-NATIVE SPECIES

The introduction and establishment of exotic species in Ontario has caused ecological, economic, societal, and public-health impacts that threaten the value of our water resources. Eurasian watermilfoil, round goby, purple loosestrife, spiny waterflea, and zebra mussels are examples of exotic species affecting our waters. The main sources of aquatic nuisance species are ballast water, aquaculture, water diversion, and aquaria. Exotic species have the potential to cause significant ecological impacts because they have been introduced into a habitat in which there are no natural controls. One of the primary impacts is the displacement of native species through competition for food and other resources, predations, and alteration of habitat and food webs. For example, zebra mussels change the physical environment by increasing water clarity and decreasing the suitability of habitat for walleye. Others, such as black crappie, may compete directly with adult walleye for limited resources and prey on young walleye.

Monitoring Fish Populations

TAGGED FISH

The MNR tags many species of fish in order to study populations, growth rates, movement and migration, and behaviour. There are many types and colours of tags. Often the tag is attached by a thin

thread just in front of the dorsal fin. Tags are usually about one cm long, with numbers on one side. If you catch a tagged fish, please record the body of water where the fish was caught, tag identification number, fish length, weight, and overall condition, and report results to the local MNR office.

Regulations

The "Ontario Sport Fishing Regulations Summary" outlines general and new regulations for Ontario residents and non-residents fishing in MNR divisions throughout the province. Law enforcement, licences, catch limits, size limits, fishing seasons, gear restrictions, ice fishing, and some species identification information are also included. This information is available wherever licences are sold. As of January 2008, 20 Fisheries Management Zones (FMZs) replaced the original 37 fishing zones in Ontario. New catch limits and regulations accompany this change (see "Ontario Sport Fishing Regulations Summary" for more information).

Stocking

Stocking hatchery fish has assisted rehabilitation efforts in the past by re-establishing wild stocks or diverting fishing pressure from overharvested native populations. Modern technology continuously provides fisheries managers with

VIRAL HEMORRHAGIC SEPTICEMIA (VHS)

VHS is an infectious disease that affects many of Ontario's native game-fish species including walleye, yellow perch, muskellunge, smallmouth bass, rock bass, chinook salmon, black crappie, and white Bass as well as many baitfish and other species such as the freshwater drum. Disease outbreaks are most likely to occur during the spring when fish are reproducing and water temperatures are fluctuating.

VHS does not affect humans and fish that are carrying the disease are safe to eat. It is spread through the water by infected fish and through their bodily fluids. It can also be spread to other bodies of water via vehicles, boats, equipment,

fish, and bait that have come in contact with the disease.

VHS has been found in many of the large bodies of water that border the province including the three Great Lakes, Lake St. Clair, the Detroit River, St. Lawrence River, and the Niagara River.

How can you help to slow the spread?

Always clean your boat and any equipment before moving to another body of water and never dump bait into the water. Dispose of it and all fish guts in the garbage. Visit <http://www.mnr.gov.on.ca/en/Business/LetsFish/index.html> for more information

Ecological framework for fisheries management (EFFM)

The OMNR is implementing a new initiative for managing fisheries in inland lakes in Ontario. There are three components to this new program:

1. The 37 Fishing Division boundaries were redefined and merged into 20 Fisheries Management Zones (FMZs) and, where possible, fishing regulations were standardized and based upon science. The 2008–2009 Summary of Fishing Regulations for anglers contains these changes and is now much easier to use and understand.
2. Public involvement in fisheries management will be enhanced over the next few years with the creation of Fishery Management Zone Advisory Councils in each FMZ. Advisory

Councils will help determine fisheries objectives for the FMZs and will also provide advice regarding fisheries management actions.

3. A key component of the ecological framework is monitoring the status of the fisheries resource and to detect change in its condition over time. A new program has been implemented in order to monitor and report on the status of Ontario's fisheries. Broad-scale monitoring of 1650 proposed lakes will occur over a five-year cycle. Monitoring will include water-quality sampling, netting of the fish community, fish-habitat measurements, and evaluation of angling pressure on the resource.

improved methods of studying aquatic communities. Through these studies it has been discovered that the technique of continuous stocking was accepted with an incomplete understanding of the long-term effects on the native fish community. Although stocking is still used to rehabilitate degraded fisheries, to establish new fisheries, and to provide "put, grow, and take" fisheries these programs are costly and do not always provide good returns. Wherever possible the MNR tries to manage native self-sustaining populations.

Over 95 percent of the fish caught in Ontario are the result of natural reproduction. Most are native species that have evolved since the last ice age and have adapted to the ecosystems in which they live. As a result, they are very predictable, cost-effective to manage, and have little risk of failure. These species will continue to form the basis of Ontario fisheries. Hatchery-raised fish used in stocking programs are raised in controlled environments, which results in low survival rates in the wild. Stocked fish have less genetic variability and, therefore, less ability to adapt to a changing environment. Stocked trout will spawn among native lake trout—each may fertilize the other's eggs, which results in hybridization or a blending of the gene pools. This will displace or dilute the genetic makeup of wild stocks, which produce

weaker offspring as a result of hybridization.

Stocking fish in a lake also increases competition for resources (e.g., food, shelter, space) between native and stocked populations. Anglers often complain that there are no fish in a particular lake and that increasing stocking numbers will solve the problem. If there are no fish in a lake, there must be a reason. Lack of habitat for the species or overfishing could be causes of this problem. Each lake has a certain carrying capacity, meaning it only has enough habitat for a limited number of fish. Adding large numbers of stocked fish to a lake that does not have the resources to support them will decrease their chance of survival. Fishing pressure will often increase on lakes known to be stocked. Predation on stocked fish by native lake trout may also be a problem. In some lakes, stocked fish simply become food for the native population. There are high, long-term costs associated with dependence upon fish hatcheries for stocking programs.

Stocking is not usually the answer when there is good natural reproduction occurring in a lake. This is usually evident when large numbers of small fish are being caught. Each lake is thoroughly assessed to determine what method should be used to manage the fishery. Complete lake surveys are carried out prior to stocking. Recommendations to stock a lake usually result from evidence (MNR

fisheries assessment data and angler reports) that the sport-fish species present in the lake are exhibiting poor survival or there is a lack of sport-fish species altogether.

Habitat Protection and Rehabilitation

The effects of either excessive fishing pressure or habitat deterioration can be harmful; together their effects can be disastrous. Few fish populations can survive the stress of overfishing combined with deteriorating habitat conditions. Fisheries managers and the public must work together to understand what is required to sustain a healthy fisheries resource.

Fisheries managers are responsible for assessing the status and stability of fish populations through such programs as index netting and creel surveys. Should assessments reveal that fish populations are struggling, actions are taken to manage the fisheries resource through population controls or habitat protection. Harvest controls such as catch and possession limits may be placed on fisheries resources in order to manage fish populations directly. Habitat protection may be achieved by controlling shoreline and in-water works, as well as through rehabilitation projects. Conservation officers then help to enforce management actions.

Concerned cottagers can help fisheries managers in several ways: increasing personal knowledge on basic fish requirements, needs of certain species, and management techniques and regulations will help cottagers to identify differences between a healthy fish population and one that is under stress; notifying fisheries managers of important fish habitats and changes in fish populations will in turn allow managers to remain up-to-date on changes occurring in specific lakes; careful planning and proper maintenance of cottage property will help to protect fish habitats; and maintaining an active role in fisheries management by participating in volunteer programs and community projects will ensure the preservation and enhancement of fisheries resources in Ontario cottage lakes.

The Community Fisheries and Wildlife Involvement Program (CFWIP) is a part of the MNR's overall strategy to enhance and rehabilitate the fisheries resource through public consultation and community participation. This program strives to improve aquatic habitat. The MNR offers financial assistance and expertise to approved projects. Project proposals are submitted by groups willing to provide volunteer labour or willing to donate equipment and materials to be applied to ongoing programs. Projects under the CFWIP should contribute to natural reproduction and rehabilitation by habitat manipulation. Projects must improve Ontario's fisheries resource and must fit into the MNR's fisheries management strategies. A priority is given to projects enhancing natural reproduction such as the creation of new spawning beds or the rehabilitation of natural spawning shoals by adding rock rubble or cleaning the rocks present. Projects must be for public benefit. For more information on this program contact your local MNR office or visit <www.mnr.gov.on.ca>.

To find stocking information for the lakes in your area contact your local MNR office.

Resources

Anglers Atlas: www.anglersatlas.com

Department of Fisheries and Oceans: www.dfo-mpo.gc.ca/habitat/habitat-eng.htm

Environment Canada's Inquiry Centre: 1-800-668-6767

Fish Ontario Site: www.fishingontario.com

The Fishing Network: www.the-fishing-network.com

Invading Species Hotline:
www.invadingspecies.com
Toll Free: 1-800-472-5552

Ministry of Natural Resources (MNR):
www.mnr.gov.on.ca

Ontario Federation of Anglers & Hunters (OFAH):
www.ofah.org

Wildlife

Ken Allen

(updated by Samantha Brown)

The categories of wildlife are much more extensive than the average person would expect. The Canadian Wildlife Service estimates that there are 150,000 species of wildlife in Canada, only half of which have been described or recorded. Wildlife is an integral and vital component of our heritage as Canadians and we are fortunate to have large and varied ecosystems. These factors contribute greatly to our high quality of life and to the function of the global ecosystem.

For many of us the thought of wildlife instills

powerful images that help to define the very essence of cottage living: the cry of the loon echoing across a lonely lake, the power and majesty of a bull moose, the great "V" of a flock of Canada geese wheeling across the sky.

Wildlife is not only a source of deep and meaningful personal pleasure. Healthy wildlife populations are important to our social and economic well-being.



The vibrancy of our wildlife is an excellent indicator of the health of the environment on which we depend.

Before examining some aspects of the wildlife that we cherish, let me first define the term. Wildlife refers to all wildlife: wild mammals, birds, reptiles, amphibians, fish, invertebrates, plants, fungi, algae, bacteria, and other wild organisms (Canadian Wildlife Service 1993). In this chapter I will limit the definition of wildlife to include only mammals, water birds, amphibians, and reptiles (fish, land birds, plants, and other wild organisms are covered elsewhere).

It is important to consider the conservation of

the habitat in which wildlife exists; wildlife and habitat are inseparable. Loss, degradation, and even change of habitat are very detrimental to all wildlife and the future of wildlife cannot be guaranteed without ensuring the future of habitat. Furthermore, we must be aware that what affects one species will very likely affect others.

Preserving Species

Many organisms have become extinct either through the natural process of evolution or through some form of human intervention. Biologists estimate that worldwide between the years 1600 and 1900 one species disappeared every four years, between 1900 and 1975 one species disappeared per year, and today an estimated one to three species are lost per day (Canadian Wildlife Service 1993). This rate of decline is not as severe in Ontario as in other parts of the world but it is a startling warning sign.

The Canadian Wildlife Service (CWS), a department within Environment Canada, coordinates national wildlife and international conservation efforts. A committee of CWS, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) meets yearly to discuss and evaluate the status of species at risk. A status list is produced using the following five categories: extinct (species existing nowhere in the world), extirpated (species not in Canada but exist elsewhere), endangered (species on the verge of one of the first two categories), threatened (species likely to become endangered), and vulnerable (species at risk for a number of reasons) (Canadian Wildlife Service 1993).

We are exceedingly fortunate in Ontario to have an abundance of wildlife, most of which does not appear in any of the above categories.

Helping the Wildlife in Our Region

When we endeavour to help one species we often indirectly help others who share similar habitats. At the very least, we become more conscious of other species.

Consider, as an example, the common loon (*Gavia immer*). Many people are familiar with the common loon and have special stories about this bird. Loons have a life span of 15 to 30 years and, as far as we know, mate for life. Most small lakes only have one pair, which probably return to the same lake each year. The loons on your lake may have been there longer than most of your neighbours (Canadian Lakes Loon Survey n.d.). Loons gather their food under water and their legs are placed far back on their body making them very fast swimmers; however, they are clumsy on land. Nests are located right next to the water, on a small island or on a mound of vegetation in a marsh, and loons try to place their nests in areas protected from the prevailing wind and wave action. Loons lay only one or two eggs and the young leave the nest within a day of hatching.

Here are two little known facts about these remarkable waterfowl. Test yourself first and then try these on your family and friends:

- What is the top speed a loon can fly?
- What is the record depth a loon has dived?

If you answered 80 km/hr to the first question, double it to 160 km/hr for the correct answer. The second answer is a depth of 61 metres, although they are more likely to dive to a maximum of about 30 metres (Canadian Lakes Loon Survey n.d.).

If a nesting place is in danger you might want to consider some options for protection. First, if your lake has a dam that controls water levels do what you can to keep the water level more consistent. (This may be difficult since most lakes are a part of a system and the Ministry of Natural Resources keeps tight control of water levels). Second, consider building a permanent nesting home for them in the form of an artificial island. Directions for an island are available from the North American Loon Fund.

When Wildlife Becomes a Problem

Some animals can disrupt our life at the cottage in a variety of ways, most of which are natural life activities for these organisms. Nonetheless, these animal actions may compromise our enjoyment of waterfront properties. Animals that cause problems include bears, beavers, coyotes, mice, porcupines, raccoons, skunks, geese, and wasps.

Wild-animal problems are solved often when people discover a new way to deal with food sources or hiding spots. Do you have a better method of storing food or a more efficient way to dispose of food waste? Entrances to animal hiding spots (e.g., under the deck, the rafters of the boathouse) need to be closed off, preferably when you know that the organisms are away from the site. Guidelines for dealing with specific animals are available from publications prepared by the Ministry of Natural Resources and the Aspen Valley Wildlife Sanctuary (see the following article for more problem-animal solutions).

Sometimes a trap may be needed so that the animal can be taken off the premises. In extreme cases the animal may need to be exterminated; however protected species may not be exterminated. People must exercise caution if the animal is exhibiting strange behaviour, which may indicate a danger of rabies. In this situation contact either the Provincial Ministry of Health or the Federal Department of Agriculture for advice and assistance (the telephone numbers for each of these departments are listed in the Blue Pages of your telephone book).

Be bear wise

- There are between 75,000 and 100,000 black bears every year in Ontario that are active from spring until fall.
- If a bear's natural food supply is poor than it will search for alternative food sources, which can include garbage dumps, garbage cans, composts and even cupboards in buildings.
- To report bear problems contact the Bear Reporting Line at 1-866-514-BEAR.
- For more information about peacefully coexisting with bears visit the MNR website at <www.mnr.gov.on.ca>.

Hunting and Trapping

We are fortunate to have animals that reproduce in sufficient quantities and that the government still assumes responsibility for regulating hunting and trapping. Depending on the animal or fowl concerned, there are specific hunting and trapping regulations regarding the quota of animals or fowls that can be taken by the hunter or trapper so that each species will continue to be a renewable resource. Individual licences need to be obtained for hunting moose, deer, bear, and wild turkey. An

Monitoring Programs

There are many community monitoring programs occurring across Canada that are run by volunteers. The Ecological Monitoring and Assessment Network (EMAN) is made up of linked organizations and individuals involved in ecological monitoring in Canada to better detect, describe, and report on ecosystem changes. The Citizen Science Network (www.citizenscience.ca) has a directory of community-based monitoring and citizen science organizations from across Canada, as well as a rich toolkit of relevant resources, and an online listing of events.

additional licence is required for small game. Many small animals are excluded from hunting even with a licence (e.g., beaver, bobcat, lynx, martin, and mink). For migratory game birds there are more requirements in addition to the small game licence. Further, on application for a first-time licence training courses are mandatory. Permission to trap animals is even more restrictive.

Hunting and trapping today are being closely scrutinized. Not only is there concern for the environment but the ethics of hunting and trapping are constantly under review. It is difficult to predict

what things will be like in the future. Public pressure is causing government organizations to regulate firearms, to monitor the habitat of various animals and birds, to make certain each species is in abundant supply, and to continue to update standards to be compatible with our cultural norms (Ontario Ministry of Natural Resources 1995). See the hunting regulations that are produced by the MNR biannually for rules, restrictions, zones, and safety information.

Protecting Wildlife and their Habitat

There are numerous ways that an individual or a lake association can be influential in helping wildlife on a broader scale as well as close to home. One of the resources with the broadest outreach is

the Ministry of Natural Resources' own Community Fish and Wildlife Involvement Program (CFWIP).

To be eligible for funding, a project must conform to CFWIP objectives and comply with the local MNR district's wildlife management objectives. CFWIP will consider any project that contributes to the improvement of numbers, habitat, or management of wildlife. Priority will be given to volunteer projects that enhance wildlife production, improve landowner-recreationist relations or involve a cooperative effort among groups with divergent outdoor interest (i.e., naturalists and hunters).

Projects can be large scale, such as building a wetland boardwalk in a approved area, or an emergency deer-feeding centre, but they need not

The Community Fish and Wildlife Involvement Program (CFWIP)

is a program of the MNR that supports volunteer projects that aid fish and wildlife and improve opportunities for outdoor recreation. The MNR will provide financial aid and expertise to approved projects. Types of projects that are eligible include habitat rehabilitation, monitoring, stocking, and environmental education.

be this complex. Various small and inexpensive endeavours that can be done locally include building houses for song birds or bats, allowing dead trees to remain standing as a habitat for birds, trimming of lower branches to improve a view of the lake rather than cutting the tree down, creating a brush pile from discarded tree limbs to create a possible home for small animals, trimming known deer trails, and planting native flower seeds or trees in open areas. The CFWIP field manual and guidelines can be viewed at the local MNR office. In order to properly manage a species of wildlife it is important for the MNR to know the distribution and density of the population of that species. The MNR, as well as other non-government organizations, conduct surveys on a number of species such as deer, moose, herons, loons, and loggerhead shrikes. The public is encouraged to help monitor various populations, especially those classified as endangered or rare.

References

- Canadian Wildlife Service. 1993. *A Wildlife Policy for Canada*. Ottawa: Environment Canada, Publication No. CW69-4/76-1993E.
- Canadian Wildlife Service. 1994. *The Economic Significance of Wildlife-related Recreational Activities: The Importance of Wildlife to Canadians*.
- Canadian Lakes Loon Survey. N.d. *General Information on Common Loons*. Port Rowan, ON: Long Point Bird Observatory.
- Ontario Ministry of Natural Resources. 1996. *Vulnerable, Threatened, Endangered, Extirpated or Extinct Species of Ontario*. Toronto: Ontario Ministry of Natural Resources.
- Ontario Ministry of Natural Resources. 1995. *Ontario Hunting Regulations Summary, Fall 1995-Spring 1996*. Toronto: Ontario Ministry of Natural Resources.
- Environment Canada Inquiry Centre: Toll Free: 1-800-668-6767
- Federation of Ontario Naturalists: www.ontarionature.org
- Kawartha Turtle Trauma Centre: www.kawarthaturtle.org
- The Nature Conservancy of Canada: www.natureconservancy.ca
- North American Loon Fund
Main Street, Humiston Building
Meredith NH 03253
Phone: (603) 279-6163
- Ontario Federation of Agriculture: www.ofa.on.ca
Toll Free: -800-668-3276
- The Ontario Field Herpetologists: Ontario Herpetofaunal Summary
R.R. #1
Walsingham ON N0B 1X0
Phone: (519) 586-3985
- Sciencsational Sssnakes: www.scisnake.com
- Wildlands League: www.wildlandsleague.org
- Wildlife Habitat Canada: www.whc.org
Phone: (613) 722-2090
- World Wildlife Fund Canada: www.wwf.ca
Toll Free: 1-800-26-PANDA

Resources

- Bird Studies Canada: www.bsc-eoc.org
- Canadian Amphibian and Reptile Conservation Network: www.carcnet.ca
- Canadian Wildlife Service: www.cws-scf.ec.gc.ca
- Canadian Wildlife Federation: www.cwf-fcf.org

Living with Wildlife

Aspen Valley Wildlife Sanctuary

Sightings of wildlife are often a highlight of our visits to "cottage country." Wild animals are fascinating to observe and our encounters with them provide a refreshing insight to the natural world. Since these creatures live in cottage country year-round, we must remember that we have come into their world and are asking them to share it with us. Although "conflicts" with wildlife may arise, some understanding of the animal's characteristics and needs will help us take a humane approach to resolving or preventing problems.

Bears

Black bears feed mainly on summer and fall berry crops such as raspberries, blueberries, and mountain ash, as well as acorns and beechnuts in the fall. Natural foods vary greatly in abundance from year to year. Shortage of food and reduction of habitat will bring bears into areas of human habitation where food or garbage around homes, cottages, and campsites become attractive to them.

Bears in your backyard?

Keeping bears out of your backyard is simple—make sure you clean up after yourself! Helpful hints:

- Store garbage in steel bear-proof containers if possible or alternatively in airtight containers secured inside a storage area and not to be put out until the day of pick-up. Keep containers clean.
- Freeze meat scraps until garbage pick-up day.
- Rinse all recyclables and also store in a secured area.
- Clean up outdoor grills after use.
- Keep pet food inside at night.
- Cover compost well with soil and leaves (if unwanted guests still visit stop composting).

- Never compost meat, dairy products, or sweets
- Ensure bird feeders are animal proof and cannot spill on the ground.

Since bears become habituated to available food sources it may take several days for the bear to move on after the attractant is removed.

Did you know?

- A black bear's diet is primarily vegetarian. Although black bears are omnivores, plant foods make up the majority of a bear's diet (up to 90 percent). Preferred foods include berries, nuts, greens, insects, and meat.
- Black bears are peaceful creatures that normally shy away from people.
- Newborn bear cubs are little bigger than a chipmunk, born in late January or early February while their mother is hibernating. Cubs weigh between 1/2 to 1 lb (200-500 grams)!

Beavers

Beavers make an essential contribution to our natural environment. The ponds they build provide a healthy freshwater habitat for many other living things including aquatic invertebrates and a variety of amphibians, fish, reptiles, birds, and mammals such as moose and otter. Animals that may not live in or near the pond itself will visit this productive community in search of water and food.

By holding water in the beaver pond, beaver dams prevent water run-off, especially after a heavy rainfall. In times of drought, beaver ponds provide a readily available supply of water and replenish groundwater. By slowing rapidly flowing water, beaver dams also prevent flooding and erosion.

Beavers are also excellent forest managers. Beavers usually fell fast-growing deciduous trees, preferably aspen as well as willow, white birch, or alder. A beaver will take these trees from the

water's edge allowing sunlight through and space for longer-living trees to grow. They do not often harm commercially valuable hardwoods such as maple or oak, but if you wish to protect a specific tree encircle it with 2" x 4" x 3' heavy wire fencing, leaving a 6" space between the wire and the tree trunk: anchor firmly.

A beaver in the boathouse?

Periodically a beaver may move into a boathouse; you have provided a dark, quiet place for a home. To deter beavers, scatter mothballs and wash areas with bleach. When the beaver has left seal off vulnerable areas with wire fencing. When you leave the cottage for the winter, sink fencing across the boat access. Leave lots of mothballs or other non-toxic, offensive smelling material.

Because beavers store their winter food supply on the pond or lake bottom, you may sometimes notice freshly chewed sticks in the crib of a dock. This is merely a beaver's lunchroom, not it's house! It is important to remember that beavers are interested in eating bark and fresh twigs and not the dock.

To control the water level in your pond, you may want to use a beaver baffle or seek other beaver management options. The Ontario Ministry of Natural Resources Extension Notes "Options for Controlling Beaver on Private Land" is available at the Land Owner Resource Centre (www.lronline.com).

Mice

Mice have adapted very successfully to living in close proximity to humans and are regular visitors to cottages and camps. These little creatures, like all wild animals, are seeking food and shelter. Do not give them the opportunity should you not wish to cohabitate with these tiny opportunists. Because they can squeeze through the smallest of entry points, extra effort must be taken to keep them out.

A mouse in your house?

Quick-dry cement is best for sealing holes on the outside of buildings. 6 mm metal screening should be placed over vents, under open porches, and sheds. Steel wool can be used around pipes in the kitchen, bathroom, and basement. Nail sheet metal over cracks. All openings for water pipes, electric wire, telephone cables, sewer pipes, drain sprouts,

and vents must be sealed. Doors and windows must be tight fitting. Plastic sheeting or screening, caulking or wood are unsuitable as mice will chew through them. However, contrary to popular belief, mice do not typically chew on wires, although they once used the cloth in old "loom" wires for bedding.

By preventing access to all food sources you will force these little marauders to move on. Dry goods such as sugar, cereals, pasta, nuts, and grains should be kept in glass or metal containers with tight lids. Root vegetables should be kept in a rodent-proof cupboard or refrigerator.

For an easy method of removal, simply place a five gallon bucket or garbage bin near a counter with seeds or peanuts in the bottom. A mouse will easily find its way into the bucket but will not be able to get out. However, do not leave a bucket or other live trap unattended (i.e., use this method only if you are able to check on it every few hours) as you will subject the mouse to undue stress and possible inhumane death.

Raccoons

Raccoons are very adaptable creatures and thrive in a diversity of habitats. As omnivores, they will eat just about anything! Raccoons have compensated for human encroachment into natural areas by moving back into our neighbourhoods where food

Mouse proof!

- Rinse all empty bottles and jars and store them upside down.
- When leaving for the season ensure any dry food left is secured (e.g., in an unused freezer, bread basket, etc.) and not even hand soap or candles are left out.
- Properly clean areas mice have been using with gloves and an effective disinfectant.
- Trapping alone is not an effective method of rodent control. Unless access points are closed up more animals will continue to move in.
- Poisons result in a lingering, inhumane death with much suffering and will have the same effects on other animals, including pets.
- Glue boards should never be used as they cause immense suffering from suffocation, dehydration, injury, or stress.

and shelter is often readily available. Any open food source on your property will encourage these opportunists to stay.

The raccoon is a very curious, intelligent creature that has front paws much like small human hands. These hands are very sensitive and raccoons often locate their food entirely with their sense of touch. They are skilled at opening doors, latches, jars and are adept at getting into almost any garbage can regardless of the devices designed to keep them out. Do not give them the opportunity—properly store and secure your garbage.

Raccoons in the chimney?

Raccoons like dark, warm places with small entrance holes. Although they do not hibernate, raccoons will curl up in a den (e.g., a tree cavity, hollowed log, or even an attic or chimney) throughout harsh winter weather. Raccoon babies are born in April or May in the winter den. For the first ten weeks, the mother will leave her young as she forages for food on her nightly journeys. If she is away too long, the kits may whimper or whine when they become hungry and this is often a first clue to their presence in or around the cottage.

If a raccoon family has moved into your premises, it is best to wait out baby season. After ten weeks, the kits will join their mother on evening jaunts and eventually the family will move on. After this time, you can close up any points of entry. Never light a fire in an attempt to smoke any animal out of a chimney as this is very cruel and dangerous. A disturbance such as a radio playing or a light source will cause the mother to take her babies elsewhere. However, only when the mother and her kits have been seen outside should a cottage/home owner begin to repair the entrance area. Separating a mother raccoon from her young will result in their slow and inhumane death. Furthermore, a mother separated from her young will do considerable damage trying to get to them.

Skunks

Skunks are one of the most commonly misunderstood wild animals and are actually gentle, intelligent creatures. When treated with respect and granted appropriate space, they are enjoyable and harmless creatures to have around. Known for its odour, a skunk does not spray without reason and will provide ample warning

before doing so. When threatened a skunk will lift its tail, stamp its feet, arch its back and growl. If the message is not understood, the skunk will turn its back end toward its assailant, flip up the tip of its tail, and spray as a last resort.

Skunks have adapted to a wide variety of habitats and food sources including plants. They prefer open areas, thick brush, and forest edges over dense forest habitats. They may choose to live under foundations, porches, decks, sheds, or a woodpile. Skunks will come out at night to hunt for grubs, worms, and mice. In the winter skunks usually find hollow logs, groundhog holes, or dig burrows to nestle down. On mild days they will awake and forage for food.

A skunk under your deck?

To close off an entry hole under a porch, deck or shed, dig a trench around the perimeter. Place galvanized 1" x 1" wire mesh into the trench, bending it outward at the bottom and fill in the trench. Leave an opening large enough to allow the animals to get out. To monitor when the animals leave, place a barrier such as a ball of paper or soil in the exit hole. Monitor the opening daily after sunset to see if the barrier has been removed. Check for footprints.

Ensure that all the animals have gone before closing an entry hole permanently. Place a bit of food such as fish or peanut butter inside the hole so that only an animal inside could get it. Cover the hole with wire mesh in such a way that it can be removed to check the food or if an animal is left inside. If the food remains untouched for several days you have been successful.

Do not attempt to remove skunks in the winter or spring. Skunks may stay in their dens for several weeks during harsh weather. Since access to alternative den sites is limited due to the snow and ice, removal should not be attempted. Babies are born in May and will be at least eight weeks of age before they are seen outside with their mother. Note that it may take the runt several days longer to leave the den with the rest of the family.

Squirrels

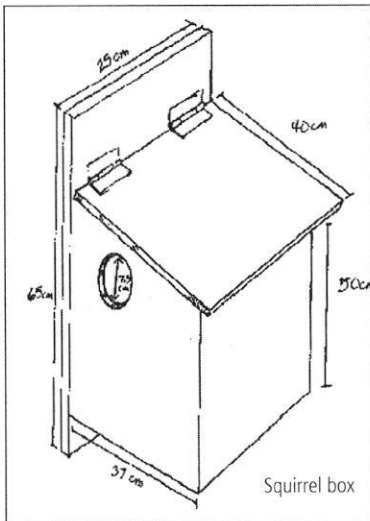
Red and eastern grey squirrels are intelligent, curious creatures that are adaptable to a variety of habitats. Active during the day, they are primarily herbivores that feed on roots, stems, bark, shoots,

leaves, fruits, nuts, seeds, fungi, flower bulbs, and occasionally insects. Since they store food for the winter they are kept busy collecting and hoarding seeds. Red squirrels will stockpile food in one or more central locations, whereas grey squirrels will bury a nut or two at a time dispersed over a wider area. Since they often store more than they need and do not always remember all of their hiding places, squirrels contribute to reforestation by scattering seeds that will take root in a new location.

Squirrels in the attic?

Grey or red squirrels generally build their nests high up in trees, in hollow trunks, or forks between thick branches. Although they do not hibernate, they will spend long hours in their nests during winter. Red squirrels will stay in their nests for days whereas grey squirrels will leave their nests every day. Squirrels may take up residence in your home or cottage and are invited in by dark, warm places with small entrance holes such as an attic, roof, or shed. Entrance holes can be as small as a golf ball. A sure sign of red squirrels nearby is large stores of pinecones, nuts, and fungi.

Before attempting any removal methods the time of year must be carefully considered. Babies are



born and raised between March and May and then again between August and October. When babies are fully mobile and seen coming outside for food you may encourage squirrels to move out with the use of battery-operated

lights and radios. Relocating squirrels is not a viable option as once you remove one, another will move in. Once the squirrels are mature and mobile during the day, close all entrance points (common entry points include eaves, vents, and fascia at the corners of buildings) and offer an alternative: put up a squirrel house! A squirrel family will take over a nesting box that has a 1 inch hole at a top corner.

Avoid Conflicts

Wild animals that come into contact with humans are merely seeking food or shelter. Do not provide these opportunities if you do not wish to encourage them. Helpful tips:

- Put garbage out on the day of pickup, not the night before.
- Freeze meat scraps and bones until day of pickup.
- Use tight-fitting lids on garbage cans that cannot come off when disturbed or secure garbage in a shed or garage.
- Secure garbage-can lids with bungee cords and put a heavy weight on the lid.
- Attach garbage cans to something permanent.
- Rinse cans and bottles well for recycling (don't leave sharp edges on cans).
- Cover compost well with soil and leaves (if unwanted guests still visit stop composting).
- Never compost meat or dairy products.
- Ensure bird feeders are animal proof and cannot spill on the ground.
- Do not leave pet food and water bowls outside.
- Keep shingles and eaves in good condition.
- Uncapped chimneys, openings into attics, rotting roofs and loose shingles are all invitations for wildlife to move into buildings.
- Screen bathroom, stove, other vents and attic openings with heavy 2.5 cm x 2.5 cm wire (not chicken wire), leaving a 5-6 cm overlap on each side.
- Trim branches that overhang buildings and remove unused TV towers.

Problem Solving

Please be respectful and patient should conflicts with animals arise. Consider the following:

- Never light a fire in an attempt to smoke animals out of a chimney as this is inhumane and very dangerous.
- Before closing any entry hole to your residence permanently be sure you are around the following few days to monitor for noises that indicate animals are trapped inside.
- Do not use chicken wire to block access points as it can stretch and an animal could get its head caught in it.
- Battery-operated sources of light or sound (such as a radio left playing) may cause an animal to find a new home (use low-voltage lighting in

attics or other small spaces). Avoid electrical devices as animals may chew on the wires.

- Outdoor, movement-activated floodlights may scare off any nocturnal visitors (raccoons may become accustomed to outside lights).
- Never use poisons. They subject animals to intense pain and suffering and other animals, such as pets, may ingest the poison.
- If an animal has fallen into a window well, drape a blanket, board, or anything they can grasp over the edge and leave it. During the night when all is quiet the animal will be able to climb up and leave. For a skunk use a plank on a gradual sloping angle with lattice pieces every 8 to 10 cm.

Things to Remember

- Never attempt to corner or capture a wild animal!
- Do not disturb animals when they have young. Know the life cycle of the animal you wish to remove. If mothers are separated from their young, they may do considerable damage trying to get to them. If the mother is removed and relocated the babies will die an agonizing death.
- Live trapping and relocating an animal is not a long-term solution. The removal of individual animals without taking steps to eliminate access to denning/nesting sites and food sources will just leave space for another animal to inhabit. Most wild animals are territorial and relocating them may create new problems elsewhere.
- Animals should be encouraged to leave your premises on their own with minimal disturbance to avoid unnecessary stress and suffering.
- If the situation warrants removal of the animal from your cottage or other building seek the assistance of experts who employ humane removal techniques and simply let the animal go onsite.

Misconceptions

Babies

Often young animals found alone are assumed abandoned. This is usually not the case. Leave the animal alone and watch it from a distance. If after a few hours the mother has not returned there is a chance the animal is an orphan.

Mange

Rabies is often confused with mange (a parasitic skin infection that causes hair to fall out in large patches), a condition often seen in foxes. Secondary infections cause open sores and crusting that often lead to blindness. The result is a prolonged death, often from starvation. An animal cannot recover on its own but mange can be treated. The animal must be live trapped.

Helping Wildlife

Loss of habitat is the worst threat facing wildlife today. Habitat is the place where a particular animal lives—where it finds food, water, shelter, and space. As human populations expand into natural areas there is less room for wildlife. The following simple projects can help wild creatures meet their survival needs on your property:

- Build a brush pile, which provides shelter for mice, rabbits, and chipmunks
- Put up nesting boxes
- Build a bat house
- Plant a butterfly garden
- Landscape to attract birds and other wildlife (visit www.wildaboutgardening.org)
- Maintain a chemical-free lawn
- Leave shorelines natural (for projects in and around the water and permit information visit www.dfo-mpo.gc.ca)
- Bird-proof your windows
- Effectively manage your woodlot for wildlife
- Plant trees

With a little understanding humans and wildlife can coexist peacefully. Sit back, relax, and enjoy wildlife on your property!

Resources

Visit the following websites for great project ideas, wildlife information, and enjoy wildlife while participating in valuable wildlife monitoring programs.

Adopt-A-Pond: www.torontozoo.com/adoptapond

Canadian Federation of Humane Societies:
www.cfhs.ca

Canadian Lakes Loon Survey: Visit Bird Studies
Canada www.bsc.eoc.org

Canadian Wildlife Federation: www.cwf-fcf.org

Federation of Ontario Naturalists:
www.ontarionature.org

Frog Watch:
www.naturewatch.ca/english/frogwatch

Marsh Monitoring Program: www.bsc-eoc.org/mmpfrogs.html

Wild About Gardening (CWF):
www.wildaboutgardening.org

Attracting Birds and Butterflies to Your Property

Drew Monkman

Feeding birds and providing nectar and larval plants for butterflies such as Monarchs are two of the easiest and most effective ways to enjoy nature at the cottage. Not only do these activities contribute to a greater appreciation of our native birds and butterflies but they also help to draw attention to the environment in general.

Many cottagers miss out on a great deal of pleasure by only feeding birds during the winter months. This is a shame because the greatest feeder activity of the year usually occurs in the spring and fall; October is probably the best month of all. The mix of resident birds and migrants can



make for quite a show. Large numbers of southward-bound white-throated and white-crowned Sparrows, along with dark-eyed Juncos usually arrive in cottage country just before Thanksgiving and will often linger for several weeks. By early November, the first American tree sparrows arrive too. However, because these species usually don't land on

feeders it's essential to scatter lots of seed on the ground. In some years, November also sees the arrival of the first northern finches such as redpolls and siskins.

Spring is also a busy time at the feeder. Northern finches often put in a return visit in the spring and they sometimes linger for a month or more before continuing northward. By late March common grackles, song sparrows, and even red-winged blackbirds flock to feeders, and by April white-throated and white-crowned Sparrows will be heading north once again and looking for handouts. If you are lucky, a fox sparrow may even drop in for a few days. Come May you also stand a

good chance of attracting neo-tropical migrants such as rose-breasted grosbeaks or even indigo buntings. Grosbeaks will often come to cottage feeders all summer long, sometimes with their whole family in tow. Providing food during the fall, spring, and summer is in no way harmful to the birds and will not in any way disrupt migration.

Winter, of course, is the traditional season to feed the birds. It is a time when the feeder is often the only source of contact with wildlife. Even if you are only at the cottage for the odd weekend, you should still make a point of putting out food. The birds won't starve if the feeder becomes empty when you're away. Resident birds do not depend solely on feeders to survive and they actually need to consume a variety of wild foods. Studies with chickadees have shown that even removing the feeder in mid-winter does not result in greater flock mortality than would normally occur in flocks that don't visit feeders. Northern finches such as common redpolls, pine siskins, and pine grosbeaks will only turn up at feeders if there is a large natural food crop to attract them to the area in the first place. As soon as the natural food is gone, so are they.

When it comes to what foods to offer the birds, black-oil sunflower seed attracts the greatest number of species. Just remember to also scatter some on the ground. Millet, too, is popular with ground feeders, especially dark-eyed juncos and American tree sparrows, which prefer these smaller seeds. To attract siskins, goldfinches, and redpolls you will need to provide niger seed in a hanging-tube feeder. Woodpeckers are kept happy with commercial suet cakes or beef suet from the butcher.

There is no harm in continuing to put out seed in the summer season. American goldfinches, in particular, will provide entertainment all summer

Milkweeds

Belonging to the genus *Asclepias*, most milkweeds are sun-loving perennials. They are also excellent nectar plants and will attract many different species of butterflies. Choose from among the following species.

- Butterfly weed (*Asclepias tuberosa*). Height: 1 to 2 feet; blooms in July and August; a drought-tolerant prairie plant with attractive clusters of orange flowers. It is a superb nectar plant.
- Common milkweed (*Asclepias syriaca*). Height: 3 to 5 feet; blooms mostly in July; a drought-tolerant roadside species with dull purple flower clusters and a nice fragrance.
- Showy milkweed (*Asclepias speciosa*). Height: 3 to 5 feet; blooms in July and August; also drought-tolerant, it has beautiful pale pink flowers.
- Swamp milkweed (*Asclepias incarnata*). Two subspecies are available, "incarnata," which grows 4 to 5 feet tall and "puchra," which is only 2 to 3 feet; blooms in July and early August; prefers dampish areas; bright pink to red flowers.
- Tropical milkweed (*Asclepias curassavica*). Height: 3 to 3.5 feet; an annual; blooms in summer and early fall; glossy leaves and brilliant red-orange flowers; excellent plant for windy areas.

long if you make niger seed available. You should also turn your attention to attracting hummingbirds, which are by far the most engaging of our summer guests. Ruby-throated hummingbirds begin to arrive in Ontario in the first week of May. Because most flowers are not yet in bloom, their main source of wild food at this time of year is tree sap, courtesy of the small holes drilled in tree bark by yellow-bellied sapsuckers. In addition to providing sap these holes also attract small insects that the hummingbirds quickly gobble up. If you are able to get your nectar feeder up early, you can help the birds survive if the weather turns unseasonably cold or if wild food becomes scarce. Use a solution of one part sugar to four parts water. The mixture should be changed once a week. Hummingbirds return to the same summer territory year after year.

When providing food for birds, it's important to keep in mind that feeders increase the danger of window kills. If window kills are a problem at your cottage, you may want to try placing your feeder either closer to the offending window or further away. If the feeder is within eight feet of the cottage, birds flying away from the feeder and toward the window won't be able to get up enough speed to seriously injure or kill themselves. Similarly, by locating the feeder 30 feet or more from the cottage, birds are more likely to recognize the reflected image in the window as part of a building and therefore avoid flying into it. You can

also minimize the number of window kills by drawing the curtains or blinds when you are away. This will eliminate much of the window's mirror effect and reduce the number of collisions. Window decals or objects such as ribbon hung outside the window can also make a difference. They produce an interference pattern that reduces the mirror effect. Finally, a bug or summer screen placed on the outside of exterior glass will both cut down on reflectivity and act as a more "gentle" barrier.

The critical time for protecting birds from window collisions is during the spring and fall migrations. This is roughly from mid-April to late May and from mid-August to mid-October. Nearly all of the species whose populations are most threatened—warblers, thrushes, flycatchers, to name a few—are migrants. While it's always upsetting when any bird dies as a result of a window kill, discovering that your window has been responsible for the death of an uncommon or rare species is tragic.

Planting shrubs and flowers that are attractive to butterflies is another way to enjoy more contact with nature at the cottage. By focusing on attracting monarch butterflies cottagers can play an important role in helping to protect this increasingly threatened species. A large variety of other butterfly species will also come to these same plants. Butterfly gardens for monarchs can be thought of as refueling and breeding sites along the monarchs' migration routes. They offer two

Nectar Plants

The following species are the plants you definitely want to include.

- Butterfly bush (*Buddleia davidii*). A must-have shrub; height 5 to 10 feet; blooms from July through to frost; blue, purple, and white varieties; attractive to hummingbirds and many insect species; quite drought-tolerant.
- Purple coneflower (*Echinacea purpurea*). Perennial; height: 2 to 3 feet; Blooms July and August; large purple flowers with bronze, dome-shaped centres on long stems; drought resistant but can tolerate moist soil.
- Mexican sunflower (*Tithonia*). Annual; height: 4 to 6 feet; Blooms summer/fall; vivid orange-scarlet single flowers; also attracts hummingbirds.
- Verbena (*Verbena bonariensis*). Perennial and annual available; height: 3 to 6 feet; blooms summer/fall; clusters of tiny lilac purple flowers; very fragrant.
- Joe Pye weed (*Eupatorium purpureum*). Perennial; height: 5 to 7 feet; blooms from July to August; small pink flowers in large dome-shaped clusters; prefers moist soil.

types of resources. First, they provide milkweed plants on which the insects lay eggs. Second, they contain nectar plants to satisfy the energy requirements of the adult butterflies. Nectar plants are especially important in the late summer and fall when the monarchs are migrating thousands of kilometres to the mountains of central Mexico. The plants can be easily integrated with an existing garden. An essential requirement, however, is that the site receive at least six hours of sunlight a day.

Your butterfly garden should have at least ten milkweed plants, with two different species of milkweed. The plants will flower at different times and the monarchs will use your property for a longer period. Nectar sources, too, should be chosen so that they will bloom sequentially or continuously during the season. This means providing a number of different species. The milkweed and nectar plants should be planted fairly close together with about six to ten plants per

square metre. As far as maintenance is concerned, try to use natural compost for fertilization and stay away from any insecticides.

Other good choices of perennials include asters (*Aster*), goldenrods (*Solidago*), pincushion flower (*Scabiosa caucasica*), showy stonecrop (*Sedum spectabile*), hollyhock (*Althaea rosea*), and lantana (*Lantana camara*). As for annuals, you might wish to include zinnia (*Zinnia elegans*), French marigold (*Tagetes patula*), and cosmos (*Cosmos sulphureus*). Late-blooming varieties of lilacs are a good choice for providing spring nectar.

Creating a garden that is attractive to monarchs is one small way you can contribute to the conservation of this beautiful insect and, at the same time, enjoy hours of entertainment watching butterfly activity. For more information visit the Monarch Watch website at www.monarchwatch.org.

Native Vegetation

Aileen Merriam

(reviewed by Gray Merriam, C. Brad Petersen, and Mark Wideman)

We are becoming more aware of the many advantages of using native plants in cottage landscaping. They have adapted to their particular habitats over the centuries and thrive without fertilizers, pesticides, and damaging cultivation practices. More cottagers now appreciate the beauty and complexity of individual native plants and the communities they form.

Our former practice, which emphasized cultivation of exotic, non-native plants and lawns, resulted in the introduction of invasive exotic species that now, in many places, usurp the habitats of native plants and the wildlife associated with them. Over time this has created serious problems where cottage gardens are widely interspersed with Ontario's most beautiful, pristine natural habitats. Good stewardship of the land in cottage country is more critical than in urban settings. Good commercial sources for native plant materials now exist. Information from government and non-government organizations is available to help to reach the goal of protecting and restoring our local environment.

Cottagers maintaining native vegetation and its associated native wildlife contribute to the health of wider regional ecosystems. Good stewards try to pass the land to the next generation in as good or better condition than when they received it. Cottagers who wish to be good stewards must start with a deep respect for nature's creations and processes. We should consider our cottage lots as an integral part of a wider environment that needs to be compatible with wild plants and wild creatures as well as with humans. Because separated parks and other protected areas cannot ensure long-term survival of our native species, it is essential that we provide good stewardship for non-protected areas.

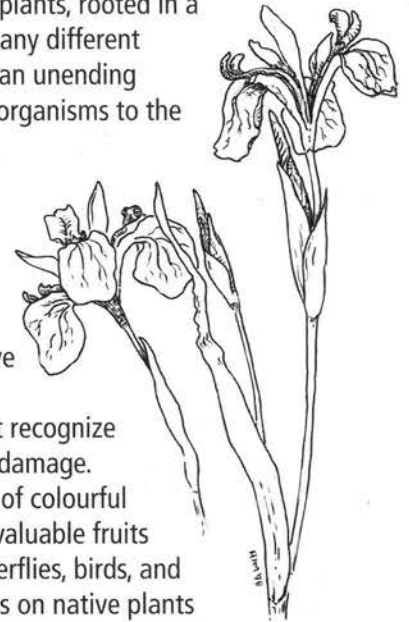
An important part of good stewardship is the

protection and restoration of native plants in the areas we manage. The payoff is an interesting and aesthetically pleasing cottage landscape—and nature does the work! You can retire the lawnmower and spend rewarding hours discovering

Advantages of Using Native Plants

No matter what landscape we inhabit in Ontario, from the boreal forest in the north to the south-western Carolinian zone, we are surrounded by a rich array of native plants. These plants, rooted in a variety of soils and adapted to many different habitats, provide life support for an unending variety of animal life, from microorganisms to the larger birds and mammals we delight to see. Important symbiotic relationships have developed among native wildflowers, trees, soil fungi, insects, and other native flora and fauna. Introducing non-native species inevitably upsets the balance, often in ways we do not recognize until it is too late to prevent the damage.

Each season brings its parade of colourful flowers, interesting foliage, and valuable fruits along with associated bees, butterflies, birds, and more. Cottagers deciding to focus on native plants gain many aesthetic rewards. The red and yellow of wild columbine (*Aquilegia canadensis*), the pinks of wild geranium (*Geranium maculatum*), and herb robert (*G. robertianum*), and the blues of violets (*Viola* spp.) brighten open spaces and provide food for bees and butterflies. Cardinal flowers (*Lobelia cardinalis*) glow along streams, to be replaced in late fall by the bright red berries of native holly (*Ilex verticillata*). A blue-spotted salamander (*Ambystoma laterale*) disappears into the soft



bright green of thick mosses and sunlight filters through the darker green fronds of ferns.

We get satisfaction from knowing that around our cottages and in the surrounding landscape our actions help native plants and animals to survive both on the land and in waters.

Also, learning opportunities abound for us. What different habitats can you find in your area? Which plants thrive together and why? What causes some trees to prefer slopes that face to the south? Why does water arum (*Calla palustris*) grow in the sun along the shore and not with the trilliums (*Trillium* spp.) under the trees? When do the Jack-in-the-pulpits (*Arisaema atrorubens*) and hepaticas (*Hepatica* spp.) open up in the spring and what would a year-long calendar of plant-flowering dates look like for your area? If we take the time to look closely we will find the natural world around us endlessly fascinating.

Over the course of thousands of years, native plants have adapted to the places where they are found naturally. They are easy to maintain once established in similar habitats. The housekeeping is done for you: no need to mow, fertilize, fight insects, or worry about sufficient water.

Disadvantages of Using Non-Native Plants

Non-native plants require constant maintenance and their cultivation can be harmful to the cottage environment. Mowing a lawn hastens runoff, reducing the amount of rainwater percolating into the soil and the groundwater. Runoff containing fertilizer from lawns and gardens speeds up eutrophication of adjacent waters; runoff and spray drift from pesticides kill lake or stream life and destroy beneficial insects.

Non-native plants not only displace native plants but may also alter the microclimate where they are planted, making it unsuitable for the entire original community. For example, Norway maple (*Acer platanoides*) with its dense foliage can shade out plants that normally grow on the forest floor, thus causing increased erosion of the bare soil. In too many instances, exotic species not only usurp the place of native species but also become invasive and uncontrollable. These are often species from far away that are reproductively aggressive and that may lack the natural controls, such as insects, found in their native habitats. Examples are purple

loosestrife (*Lythrum salicaria*), which now dominates hectares of wetlands, and periwinkle (*Vinca minor*) and garlic mustard (*Alliaria petiolata*), which have invaded many of our woodlands.

Getting Started: Learning the Possibilities

Deciding to landscape your cottage using native plants opens up many learning opportunities. For most people the first step will be to find out what plants grow on and near their site. Many good field guides are available to help identify trees, shrubs, vines, and ground vegetation such as ferns and flowers. Some guides are suggested below in the Resources section. Look for those that relate to your specific area.

It is important to learn whether your site contains rare or endangered native plants that need to be protected. Local field naturalists may be available to provide help if you are unsure if your region has special plants at risk. At this stage you can also find out whether non-native plants, including invasive species, are a problem that needs your attention.

Most cottages are close to more than one habitat type. You may be able to investigate nearby wetlands, meadows, or forests. When you study different habitats, think about how your site is similar or different. Be aware of smaller "microhabitats" that locally influence what will grow best on your site. Within each habitat category, there are many factors to consider.

- Is the site sunlit or shady?
- How much moisture does the area receive through the seasons? Does it hold the water or is it well-drained?
- Is it flat and windy, or hilly?
- Do any slopes face south and the sun, or north? What temperature extremes exist?
- Is the soil based on acidic granite, alkaline limestone, or mixed glacial moraine?
- Are the majority of trees coniferous, deciduous, or mixed?
- What are the effects from buildings, septic beds, roads, and pathways?

These and other factors produce smaller habitats that have quite different microclimates from their surroundings and affect which plants will thrive in a given area.

Individual plants are always part of an

interconnected larger community that includes surrounding plants, the soil and its organisms, birds, mammals, and insects. Knowing what a given plant requires from its surrounding community is important to successful gardening. For example,

many native plants including orchids such as the pink lady's slipper (*Cypripedium acaule*) and the common white trillium (*Trillium grandiflorum*) need specific soil microorganisms around their roots.

As well as studying the local plant life,

Matching Plants to Conditions

Lorraine Johnson

From the early spring appearance of bloodroot poking up through the snow, through the parade of summer colour, to the restful golds of autumn, the native-plant garden offers an array of beauty throughout the seasons. The key is to match plants to the conditions of your site. The three general categories are woodland, meadow, and wetland and each of these is associated with different light conditions (shade, part-shade, part-sun, and sun), different moisture conditions (from wet through to dry), and different soil conditions (for example, rich, deciduous woodland soils, acidic coniferous woodland soils, thin soils over rocks, wet meadow soils, dry meadow soils, rich and moist wetland soils).

Some plants tolerate a wide range of conditions; others are quite specialized in their needs. The following list offers suggestions to get you started.

Combinations for shady sites with well-drained, woodland soil

- wild ginger, Jack-in-the-pulpit, Dutchman's breeches, trillium
- wild geranium, eastern columbine, bloodroot
- baneberry, foamflower, Christmas fern
- mayapple, Solomon's seal, blue cohosh, maidenhair fern
- ostrich fern, violet, mayapple, hepatica, trout lily

Combinations for alkaline woodlands

- maidenhair fern, eastern columbine
- wild ginger, bloodroot, sharp-lobed hepatica, foamflower

Combinations for acidic woodlands

- Canada mayflower, wintergreen
- bluebead lily, bunchberry, creeping snowberry, twinflower
- partridgeberry, winterberry
- round-lobed hepatica, barren strawberry

Combinations for shady and dry sites

- wood phlox, white wood aster
- foamflower, hay-scented fern
- large-leaved aster, New York fern

Combinations for sunny and well-drained, moist sites

- wild geranium, blue flag
- wild bergamot, coreopsis, blazing star
- beardtongue, evening primrose
- bee balm, cardinal flower, beardtongue
- swamp milkweed, ironweed, culver's root

Combinations for sunny and wet sites

- marsh marigold, blue flag iris
- swamp milkweed, boneset, Joe-pye weed, Canada lily

Combinations for sunny and dry sites

- butterfly milkweed, black-eyed Susan, little bluestem
- stiff goldenrod, New England aster, heath aster
- cup plant, nodding onion, coreopsis

Combinations for sunny and acidic sites

- bearberry, cinquefoil
- swamp milkweed, butterfly milkweed, Canada lily

Lorraine Johnson is the author of *The New Ontario Naturalized Garden* and *100 Easy-to-Grow Native Plants for Canadian Gardens*. Past-President of the North American Native Plant Society, she writes regularly for publications such as *Canadian Gardening* and *OnNature*.

consideration needs to be given to the naturally occurring wildlife that we want to encourage around the cottage. To maintain suitable habitat for them, we must ensure that there are sources of nectar and pollen, and seeds and berries throughout the seasons. Many plants provide insects and hummingbirds with nectar in the summer and food for other animals later in the year. Plants are the main factor in the habitats of most animals.

Planning Your Site

A garden is part of the surrounding natural community. For success, plan to work with the natural vegetation and capabilities of your site and the surrounding landscape. Remember also the four distinct seasons we are fortunate to have in Ontario: doing so can add to the scope of a well-

planned area of natural vegetation around your cottage.

Consider where buffers are needed, such as between disturbed places and any natural water habitat. The buffer of native vegetation should be sufficiently wide to enable it to absorb or filter out any nutrients in natural runoff as well as fertilizer or toxic materials from built areas, driveways, or lawns.

Buffers along the shorelines of lakes and edges of creeks, rivers, and other wetlands protect their waters from too much nutrient input and its adverse effects on water plants and animals. If natural vegetation is established in only part of your site, start along watercourses, little valleys and along the shore.

If the site is already rich in native plants, start by protecting the valuable plants and habitats that you have. On an undeveloped site, carefully locate any buildings, docks, paths, and other infrastructure to minimize damage to existing valuable plant resources. Plan also to save the topsoil from construction areas to use in your repair of disturbed areas. If the site is greatly altered, decide what end result is desired. Do you want to retain open areas as a native prairie, encourage woodland vegetation,

or encourage a mosaic of various habitat patches?

Open areas restored with native prairie or meadow grasses, sedges and wildflowers, rather than exotic lawn grasses, provide a rich habitat for native insects, birds and small mammals and a pleasant prospect for the cottager. In contrast, a typical suburban-style lawn is sterile, often receives damaging additions of fertilizer and biocides, and requires mowing and other maintenance that consumes resources and takes time from enjoying the cottage.

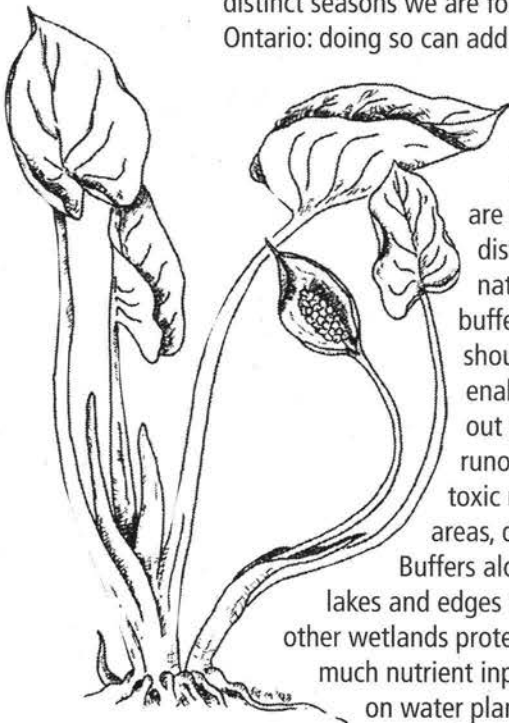
If you want to bring back woodland vegetation, think about letting it regenerate naturally from adjacent wooded land. This changing progression will result in a more complete woodland community, including shrubs and ground vegetation as well as trees. Where this is not possible, you may want to first plant pioneer species to provide shelter for shade-tolerant, slow-growth canopy species. Later you can add to the shrub and herb layers.

With these points in mind you can sketch out the plan for your site, make a list of what vegetation you want to encourage or to plant and start to look for materials. Restoring Nature's Place (Daigle and Havinga) gives a table of over 300 native plants in Ontario that are commercially available. The table lists Life Zones, type of community, soil requirements, and shade tolerance for each plant. This book is also an excellent source of information on restoring meadows, prairies, forests, and freshwater ecosystems.

Getting To Work

The native topsoil preserved prior to building on the site should be used to cover any disturbed areas as soon as possible. It will contain seeds, plant roots, and other organic material such as soil microorganisms that will help to restore the native plants and natural processes important for a functioning system. Minimize use of imported topsoil and other materials. It can bring with it seeds of weeds, including invasive exotics; as well, other factors such as texture or pH may not be appropriate for your site.

Where to get the native plants you decide to use on your site is often controversial. The plants you obtain from areas adjacent to your site will be the ones with the most appropriate genotypes (i.e., the plants best adapted for your site). It is best to grow



from seeds; disturbance is minimized and the original plant remains in its original location. Conservation organizations do not condone digging native plants from healthy natural areas. Gardeners who still decide to obtain some plants in this way must take responsibility to ensure they do not deplete or otherwise damage the original site, that they use clean tools, and monitor the area for weed growth over time. Transplant only from your land or from that of an obliging neighbour and never from parks or protected areas.

1. Collect seeds from local plants, always being careful to take less than ten percent of the supply. Try to collect from different areas rather than repeatedly using the same area.
2. Rescue and transplant plants that would be destroyed by construction, or by vehicle or foot traffic. Remember that many plants grow well only in association with specific soil microorganisms; some of the soil they are rooted in needs to be transplanted with the plant. Plants thus rescued need to be replanted into an area of very similar soil conditions.
3. Obtain cuttings from healthy specimens of plants, such as willows (*Salix* spp.) or dogwoods (*Cornus* spp.), which will root when planted into an appropriate site.
4. Purchase seeds or plants from a reputable local nursery that specializes in native vegetation. Be careful which plants you choose – ideally they should be nursery-propagated from local sources. Ask the nursery owner or look for special tags. Remember that large multinational distributors probably get their plants and seeds from distant sources not suitable for your site.

Beware of seemingly simple solutions such as a “meadow in a can” because these often contain seeds from non-local plants and often contain seeds of exotic invasive species such as Dame's rocket (*Hesperis matronalis*) or sweet clover (*Melilotus alba*).

Finally, remember that the native plants you choose will always grow best when planted in a location that closely matches their original habitat in soil type, moisture regime, light availability, and plant neighbours.

Help is at hand

As we become more aware of the damage done to native ecosystems by exotic plants species more sources of help are becoming available. Publications exist that suggest plants that are appropriate to use as well as that alert us to invasive exotics and how to identify and control them. Organizations dedicated to preserving native vegetation can help guide us to seed and plant sources. Many local nurseries are specializing in native plants and there are a growing number of environmental restoration and design consultants who have studied both the problems associated with and the possible solutions to maintaining our native plant heritage.

Lake stewards may find that some cottagers on their lakes consider the actions recommended in this chapter to be difficult and time-consuming—they may just want to get out of town and relax. These cottagers can at least be encouraged to practice “benign neglect” on as much of their property as possible, especially near the water. This

See a list of nurseries that supply native plants on the Wild about Gardening website, www.wildaboutgardening.org

Keeping insect pests out of the garden

N. Matthews

- Provide habitat for insect-eaters such as praying mantis, lady bugs, bats, toads, spiders, and birds.
- Plant a variety of plants together. Marigolds, onions, garlic, and herbs help keep harmful insects away.
- Water gardens in the morning as night-time humidity creates a breeding ground for insects and disease.
- If absolutely necessary use natural pesticides such as soap-based non-toxic sprays or diatomaceous earth.

will allow natural processes to start the work of healing disturbed areas. They might then be encouraged to try to eliminate any invasive exotics; this would still take less time than maintaining an urban-style lawn. Small steps in this direction by a number of cottagers can be very beneficial to the overall environment. Good stewardship in cottage landscaping is well worth our thought and effort and it will reward us with ease of maintenance and beauty throughout all the seasons.

Resources

Publications

- Alex, J.F. 1992. Ontario Weeds: Descriptions, Illustrations and Keys to their Identification. Ontario Ministry of Agriculture and Food.
- Ambrose, John. 1990. Ecological concerns in native landscaping. *Wildflower* 6, 1: 29.
- Ambrose, John D. 1995. Going native: The importance of the right planting stock for restoring the natural landscape. Proceedings of the Tree Plan Canada "Branching Out" '95 Forest Restoration Workshop.
- Argus, G.W. and D.J. White. 1977. *The Rare Vascular Plants of Ontario*. Ottawa: National Museums of Canada.
- Audubon Guides. *Eastern Trees. Eastern Forests. Eastern Wildflowers. Eastern Birds*. New York: Knopf.
- Baldwin, K.A. and R.A. Sims. 1989. *Field Guide to the Common Forest Plants in Northwestern Ontario*. Toronto: Ontario Ministry of Natural Resources.
- Brown, Lorraine. 1993. A garden of rarities: Ontario's prairie heritage. *Seasons* 33, 2.
- Chambers, B., K. Legasy, and C.V. Bentley. 1996. *Forest Plants of Central Ontario*. Edmonton: Lone Pine Publishing.
- Cobb, B. 1956. *A Field Guide to the Ferns and their Related Families of Northeastern and Central North America*. Boston: Houghton Mifflin.
- Daigle, J.-M. and D. Havinga. 1996. *Restoring Nature's Place: A Guide to Naturalizing Ontario Parks and Greenspace*. Ecological Outlook Consulting and Ontario Parks Association.
- Diekelmann, J. and R. Schuster. 1982. *Natural Landscaping: Designing with Native Plant Communities*. New York: McGraw-Hill.
- Gavine, K. 1995. *Natural Invaders: Invasive Plants in Ontario*. Don Mills: Federation of Ontario Naturalists.
- Hoepfner, Eva. 1987. Wildflower meadows: Trials and triumphs with the latest in ground covers. *Harrowsmith* 12, 1: 62-73.
- Hosie, R.C. 1979. *Native Trees of Canada*. Toronto: Fitzhenry and Whiteside.
- Johnson, L. 1995. *The Ontario Naturalized Garden*. Vancouver: Whitecap.
- Leopold, A. 1949. *A Sand County Almanac*. New York: Oxford University Press.
- Mitchell, P., C. Plosz, A. Booth, and S. Hilts. 1997. *Greening the Land: Principles, Guidelines and Cases*. Guelph: University of Guelph.
- Muskoka Heritage Foundation. 1995. *The Steward's Guide*. Bracebridge: Muskoka Heritage Foundation.
- Mycio-Mommers, ed. 1996. *Backyard Habitat for Canada's Wildlife*. Canadian Wildlife Federation.
- Newcomb, L. 1977. *Newcomb's Wildflower Guide*. New York: Little, Brown and Company.
- Peterson Field Guide Series. *Wildflowers. Trees and Shrubs. Birds. Ferns. Reptiles and Amphibians. Insects*. Boston. Houghton-Mifflin.
- Pringle, J. and B. McKean. 1992. *Rare Wildflowers of Ontario*. Hamilton: Royal Botanical Gardens.
- Sauer, L. 1992. Bring back the forests: Making a habit of reforestation, saving the eastern deciduous forest. *Wildflower* 8, 3.
- Soper, J.H. and M. Heimburger. 1982. *Shrubs of Ontario*. Toronto: Royal Ontario Museum.
- Stevens, J.A., ed. 1994. *Living Near the Water: Environmental Design for Shoreline Properties*. Burnstown, ON. Available from General Store, 1 Main St. Burnstown ON K0J 1G0. 1-800-465-6072.

Websites

I Can Garden: www.icangarden.com

Carolinian Canada: www.carolinian.org

Federation of Ontario Naturalists:
www.ontarionature.org

Landowner Resource Centre: www.lrconline.com

North American Native Plants Society:
www.nanps.org

Ontario Association of Landscape Architects:
www.oala.on.ca

Ontario Forestry Association: www.oforest.on.ca

Ontario Wildflowers: www.ontariowildflowers.com

Royal Botanical Gardens: www.rbg.ca

Society for Ecological Restoration: www.ser.org

Tallgrass Ontario: www.tallgrassontario.org

University of Guelph Arboretum:
www.uoguelph.ca/arboretum

Wild About Gardening (CWF):
www.wildaboutgardening.org

A Guide to Invading Species

Beth MacKay

(updated by Samantha Brown with inserts)

There has been a dramatic increase in public concern regarding impacts that the introduction of non-native species will have on the long-term integrity of our aquatic ecosystems. This escalated concern has corresponded with a marked increase in the number of these organisms that have been discovered in the Laurentian Great Lakes. Anxiety has also mounted over possible repercussions to our recreational and commercial use of Ontario waters, as well as economic impacts associated with the introduction of non-native species. Although we have a cursory understanding of the issue, further research is necessary in order to answer the many questions posed and address concerns. This chapter outlines current concerns and identifies a number of the more insidious invaders found in Ontario. Methods to prevent their spread and sources of further information are also provided.

Sure, you've heard of zebra mussels but did you know that since the 1800s, at least 140 non-native species have become established in the Great Lakes? Also known as invading or nonindigenous species (NIS) these include plants, fish, algae, crustaceans, and mollusks. Some of these organisms are relatively benign, having little or no negative effect on the aquatic ecosystem. However, others such as the zebra mussel have impaired beneficial uses of the Great Lakes and threaten the integrity of waterways throughout North America.

Native to other continents, many of these species were brought to the Great Lakes in the ballast tanks of ships entering these waters. Ballast tanks, used to maintain ship stability, can hold hundreds of thousands of gallons of water that may contain organisms capable of surviving in the Great Lakes. When the ballast water is discharged as cargo is loaded and unloaded at Great Lakes ports these

organisms are introduced to North America.

To reduce the risk of unwanted species in the Great Lakes, guidelines and legislation for the shipping industry require that ships carrying freshwater ballast from foreign ports exchange their ballast for salt water. Also, current research into the filtration of ballast water and other methods of treating ballast are being conducted by scientists investigating the potential to eliminate or kill live organisms in ballast tanks of ships unable (for safety or other reasons) to comply with current regulations.

What Is the Problem?

Species that become successful invaders share characteristics that give them competitive advantages over our native species. They generally have few predators in their new habitat, they are aggressive and adapt well to varying environmental conditions, and they have a high reproductive capacity. As a result, populations of the invaders can grow rapidly, causing increased competition for resources among native and non-native species.

The competition for resources contributes to ecosystem changes and instability in fish and wildlife populations—changes that can directly affect our use of the Great Lakes. For example, the presence of NIS can lead to degradation of fish communities and benthic (bottom dwelling) species, decreases in plankton populations (algae), taste and odour problems in drinking water, degradation of aesthetics, loss of fish and wildlife habitat, and degradation to beaches through fouling by zebra mussel shells and aquatic vegetation. We know from experience that once established NIS can rarely be eradicated.

In the case of zebra mussels their ability to foul the water intake lines and internal systems of

industrial, municipal, and private facilities creates an enormous economic burden for industry, government, and, ultimately, federal and provincial taxpayers. Also, the presence of zebra mussels and round goby may contribute to increased levels of contaminants in fish and wildlife, which could lead to consumption restrictions for humans.

Naming the Nasties

The short list of the more invasive species that we should all be on the lookout for include zebra mussels (and their cousin the quagga mussel), ruffe (a fish), gobies (two species of this fish exist in the

Great Lakes—round goby and tubenose goby), spiny water flea (an invertebrate), purple loosestrife (a plant), and European frog-bit (a plant).

Zebra mussels (*Dreissena polymorpha*) and their cousin the quagga mussel (*Dreissena bugensis*) are small, fingernail-sized mussels native to the Caspian Sea region of Asia. They were discovered in Lake St. Clair near Detroit in 1988. Tolerant of a wide range of environmental conditions, zebra mussels have now spread to all the Great Lakes and are showing up in many inland lakes in North America.

Zebra mussels

(reprinted with permission of the Ontario Federation of Anglers and Hunters)

Female zebra mussels can produce between 40,000 and 1 million eggs per summer. These develop into microscopic, free-floating larvae called veligers. At about three weeks they begin to form shells and the sand-grained sized larvae start to settle and attach to any firm surface using "byssal threads." They will cover rock, metal, rubber, wood, docks, boat hulls, native mussels, and even aquatic plants.

Zebra mussels filter plankton from the surrounding water. Each mussel can filter about one litre of lake water per day. The feeding activity of zebra mussels results in changes in the normal energy and contaminant cycles within a water body. As a result, some extreme changes to the ecosystem have been documented such as increased plant growth, changes in distribution and abundance of some fish species, changes in distribution and behaviour of migratory waterfowl, shifts in benthic species abundance and composition, decreases in native clam populations, decreases in some algal species leading to an increase in water clarity, and increases in algal species that affect drinking water quality and pose risks for wildlife and human health.

Ruffe

The ruffe, a fish species native to southern Eurasia, was introduced to North America from the ballast water of a ship. The fish were initially introduced to Duluth-Superior harbour in the mid-

1980s and in 1995 they were found in Lake Huron at Alpena, Michigan.

Ruffe are generally less than 20 cm in length and have no commercial value; however, they do impact existing commercial and recreational fisheries through competition with native fish for food and other resources. They have also been reported to eat lake trout and whitefish eggs. Ruffe can be identified by their perch-like body shape. Their colouration is similar to walleye, with rows of dark spots between a very sharp spiny fin. Glassy eyes, a small downturned mouth, and gills covered with sharp spines are also distinguishing features of this fish species. Once introduced into a lake or river, ruffe are almost impossible to control; therefore, it is vital to control their spread. Never take bait from one water body and release it into another.



Gobies

Native to Europe, gobies were first discovered in the St. Clair River in 1990. Two species exist in Ontario waters: the tubenose goby and the round goby, which is the more common. Since they were introduced gobies have spread rapidly throughout the Great Lakes. They are capable of spawning several times a year, a characteristic which has allowed the goby to establish large populations in some areas. Populations of the native mottled sculpin and logperch have declined as goby numbers have increased. The sculpin and

logperch are an important food source for native predator-fish species such as trout, walleye, bass, and sturgeon. Although these predators also feed on goby, they do not appear to reduce their numbers.

The goby is a relatively small (up to 25 cm), bottom-dwelling fish. Gobies are mottled brown in colour and look similar to the native mottled sculpin. One feature that is unique to this species is that the front (pectoral) fins on the underside of the fish are fused, forming a suction disk that it uses to fasten to the bottom in fast current.

Spiny water flea

(reprinted with permission of the Ontario Federation of Anglers and Hunters)

Insert figure Flea

The spiny water flea (*Bythotrephes cederstroemi*) looks like an insect, but it is actually a tiny (15 mm long) crustacean with a long, barbed tail spine. A native of Great Britain and northern Europe, the animal was first found in Lake Ontario in 1982. Since then, populations have exploded and the animal can now be found throughout the Great Lakes and in many inland lakes.

The effects that the spiny water flea will have on the ecosystems of the Great Lakes region are unclear. They feed on plankton, potentially competing directly with young perch and other small fish for food. Larger fish can consume the spiny water fleas; however, smaller fish have difficulty eating them because of the prominent barbs on the tail spine.

Spiny water fleas reproduce rapidly. During warm summer conditions, each female can produce up to ten offspring every two weeks. As temperatures drop in the fall, eggs are produced that have tough outer shells and can survive all winter.

Spiny water fleas commonly get caught on downrigger cables and anchor lines, looking like bristly gobs of jelly with black spots. While researchers assess the impact that this organism will have on aquatic systems, it is important that recreational water users take precautions not to spread spiny water fleas through the use of boats and equipment.



Purple loosestrife

(reprinted with permission of the Ontario Federation of Anglers and Hunters)

Purple loosestrife (*Lythrum salicaria*) is a plant native to Europe and Asia that has seriously impacted wetland habitat since its introduction to North America in the 1800s. Spreading along roads, canals, and drainage ditches, and distributed as an ornamental plant, this exotic now has a widespread distribution throughout North America.

Purple loosestrife invades marshes and lake shores choking out cattails and other wetland plants. The plant can form dense, impenetrable stands which provide unsuitable habitat for the hundreds of species of birds, mammals, insects, amphibians and reptiles that rely on wetlands for their survival. Rare and endangered wetland plants and animals are also at risk from purple loosestrife invasion.

This plant is easily identified by its bright fuchsia flower spikes at the tops of stems, as seen from late June into September. The flower has five or six pink/purple petals and many of these flowers form the tall spike. The leaves attach directly to the stalk, are downy with smooth edges, and each pair is arranged opposite to another in an alternating fashion down the stalk. The woody stalk has four to six sides and often has several branching stems. Mature plants can stand between two and seven feet tall.

Garden hybrid varieties of purple loosestrife, which were once thought to be sterile, have been discovered to cross-pollinate with wild purple loosestrife to produce viable seed. Cottagers can help by not planting purple loosestrife or any of its cultivars around their cottage home. Several methods exist for controlling the spread of purple loosestrife, unfortunately, complete eradication of this plant is impossible. If purple loosestrife is identified in an area, at or near your cottage, contact the Invading Species Hotline (1-800-563-7711) for an information kit on how to control this plant.

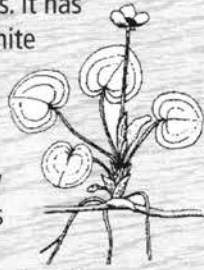
European frog-bit

(reprinted with permission of E. Haber)

European frog-bit (*Hydrocharis morsus-ranae* L.), originally from Europe and Asia, is currently found in southeastern Ontario. It was intentionally

introduced for horticultural purposes and kept confined until 1939 when it spread to the nearby Rideau Canal and Brown's Inlet. It began to spread into the Ottawa River and is now found in tributaries and isolated wetlands.

It is a free-floating plant found in open water marshes and standing water pools. It has lily type leaves with 3-petaled white flowers. This plant produces winter buds, called turions, which sink to the bottom and remain dormant until spring. They have well developed root systems that form dense mats blocking sunlight that allow native plants below the mat to survive.



Currently, European frog-bit is found in a limited area, but in the areas where it is found, it crowds out native wetland plant species.

Common Reed, *Phragmites australis*

(taken from "Invasive Nuisance Species: Past, Present and Future" by Gerald L. Mackie)

Common Reed is a widely distributed clonal grass species, found all over Europe, Asia, Africa, Australia and North America. The origin of the species in North America is unclear. The species was thought to be native because it was found in peat cores dated 3,000 years old. However, the rapid expansion of the common reed in recent years, particularly along the Atlantic coast, has led ecologists to believe it is introduced. Genetic analyses have shown that in fact there are two strains present, one being introduced and the other being native. At present, invasive *P. australis* occurs throughout the whole of the United States, except Alaska and Hawaii. The species is most abundant along the Atlantic coast and in freshwater and brackish tidal wetlands of northeastern Canada and United States and as far south as North Carolina. Populations are currently expanding in the Midwest.

The reed is found in marshes and in shallow water along the shoreline of lakes, ponds, swamps, ditches, streams, canals, rivers, and estuaries. Once established, *Phragmites* spreads by rhizomes and stolons, often forming dense colonies along shorelines and shallow water areas. Rhizomes supply the plant with water by

creeping along the ground to a ditch or depression that contains water. The rhizomes may grow up to about 2 m (7 ft) per year and be as long as 20 m (66 ft).

Common reed is cultivated in Europe for the production of fibre and is used in constructed wetlands for the removal of nutrients and pollutants. It is also used as packaging material. Young shoots are readily eaten by cattle and horses, but as the plant grows it becomes tough and unpalatable. It is used in the Mediterranean region and elsewhere for building dwellings, lattices, fences, arrows by Indians, and for weaving mats and carrying nets. The stalks, called culms, exude a manna-like gum which is eaten. The rhizomes and roots also serve as emergency food. The reed is also used in the manufacture of pulps for rayon and paper.

In North America the species is considered a threat to biodiversity in natural areas. Its invasion alters the structure and function of diverse marsh ecosystems by changing nutrient cycles and hydrological regimes. Dense stands in North America decrease the quality of wetland habitat, particularly for migrating waders and waterfowl species. Dense colonies of common reed impede water flow, recreational activities such as fishing, and restrict views from shoreline areas.

Eurasian watermilfoil

(taken from "Invasive Nuisance Species: Past, Present and Future" by Gerald L. Mackie)

Eurasian Watermilfoil, *Myriophyllum spicatum*, is native to Europe, Asia, and Northern Africa. It seems most likely that it was introduced at several locations in or just prior to the 1940s, probably in the Washington D.C. area in shipping ballast. The plant was first collected near Lake Erie in Ohio between 1942 and 1949. Other sites of introduction may relate to the aquarium trade since it is considered to be a useful aquarium plant. The Eurasian watermilfoil spread quickly through eastern Canada and the U.S.A. by a number of



vectors including fishermen, boaters, and waterfowl.

Watermilfoil is a highly invasive and aggressive species that colonizes reservoirs, lakes, ponds, streams, small rivers and brackish waters of estuaries and bays. It is most abundant in the 1-10 m depths of mesotrophic to eutrophic lakes. The plant is rooted to the bottom and grows toward the surface. Stems of Eurasian Watermilfoil near the water surface branch profusely and usually form a dense canopy that reduces light availability for other submersed species.

Eurasian Watermilfoil dies back to propagating root crowns during the winter months and reproduces and spreads primarily by vegetative fragmentation. Fragments are produced during much of the year with roots often developing on a fragment before it is released by the plant. Flowering and seed production are common, however, the seeds exhibit prolonged dormancy and their germination is erratic. Even in areas where the plant is common, no seedlings have been found. Long range dispersal is primarily by fragmentation, the fragments being transported over long distances by water currents, boat trailers or even waterfowl.

The most notable nuisance aspects of Eurasian Watermilfoil are: shading out and out competing desirable native species to form mono-specific colonies over large areas; dense mats and colonies can restrict swimming, boating, bank fishing; negatively impact aesthetic appeal; fragments and floating mats may clog water intakes at power generation facilities and potable water intakes; and finally, dense stands provide habitat for mosquitoes and may increase populations of some species of mosquitoes. Eurasian Watermilfoil grows so densely that it tends to displace all other species.

Biological control has good potential for effective control of Eurasian Watermilfoil. Experiments are now underway to determine the effectiveness of an aquatic weevil, *Euhychiopsis lecontei*, native to the Kawartha Lakes area in Ontario, as a biological control agent. The weevil eats the leaves and stems of watermilfoil. Females lay eggs on the apical meristem (growing portion of plant), close to the surface of the water. The eggs hatch in 4 to 7 days into larvae. The larvae

feed on leaves near the top of the plant for 9 to 14 days and then pupate. After 5 to 17 days, the pupae hatch into adults that feed on the leaves and stems. The adults over-winter in moist to wet soils near shore.

Garlic mustard

(taken from "Invasive Nuisance Species: Past, Present and Future" by Gerald L. Mackie)

The Garlic Mustard, *Alliaria petiolata*, is native to Europe and was first introduced at Long Island, NY in 1868, probably for food or medicinal purposes. However, its invasive potential has revealed itself only in the last 10-20 years. The lag time followed by a period of exponential growth is common among many invasive species. Garlic Mustard is described as "a cool season biennial herb." It can be distinguished from other woodland plants by its odour of onion or garlic when the leaves or stems are crushed.

Garlic Mustard is common in moist, calcareous, shaded soil of riverine floodplains, forests, roadsides, edges of woods and trails, and forest openings. Disturbed areas are especially susceptible to rapid invasion and dominance. Garlic mustard poses a severe threat to native plants, especially Trillium, and animals in forest communities. Once introduced to an area, garlic mustard out competes native plants by monopolizing light, moisture, nutrients, soil and space. Rodents and other wildlife species that depend on these early plants for their foliage, pollen, nectar, fruits, seeds and roots are deprived of these essential food sources when garlic mustard replaces them.

Seeds of Garlic Mustard can remain viable in the soil for five years or more, so management is a long term commitment unless seed production is prevented. Hand removal of siliques and plant rosettes will limit the plant to light infestations or even eradication. Care must be taken to remove the plant with its entire root system because new plants can sprout from root fragments. Once removed, the plants and pods should be bagged and then burned. For larger infestations, or when hand-pulling is not practical, flowering stems should be cut at ground level to prevent seed production. If stems are cut too high, the plant may produce other flowers at leaf axils.

For very heavy infestations, applications of a systemic herbicide (e.g., Roundup) have been shown to be effective. The herbicide may be applied at any time of year, including winter, as

long as the temperature is above 50° F (10° C) and rain is not expected for at least eight hours. Roundup will kill other plants so care must be taken to protect them (e.g. with spray shields).

What Can Be Done?

Since human activity is primarily responsible for spreading these species to new areas, it is vital that the public be actively involved in preventing the spread of NIS to protect fish, wildlife, and vital habitat from the detrimental effects caused by introduction. The Invading Species Awareness Program for Ontario was initiated in 1992 to raise public awareness regarding NIS and to promote practical, effective methods for preventing their spread. The program operates as a partnership of the Ontario Ministry of Natural Resources and the Ontario Federation of Anglers and Hunters. There are many things that cottagers, boaters, and anglers can do to prevent introducing NIS to new areas when pursuing recreational activities.

One of the major ways that NIS are spread between lakes is by boat traffic. If you are a boater, angler, waterskier, scuba diver, sailor, or canoeist there are some important things you can do to prevent the transport of harmful exotic species from one lake or river to another.

1. Inspect your boat, motor, trailer, and equipment. Remove any zebra mussels and other animals and plants that are visible before leaving any waterbody.
2. Drain water from the motor, live well, bilge, transom wells, and other equipment while on land, immediately before leaving the waterbody.
3. Wash or dry your boat, tackle, downriggers, trailer, and other equipment to kill harmful species that were not visible at the boat launch. Some aquatic species can survive more than two weeks out of water. It is, therefore, important to
 - rinse your boat and equipment that normally gets wet with hot tap water (greater than 40° C) or spray your boat and trailer with high-pressure water (250 psi), or
 - dry your boat and equipment for at least five days before transporting them to another body of water.

4. Empty your bait bucket on land before leaving any body of water. Never release live bait into water or release aquatic animals from one waterbody to another.

In addition to careful boating efforts, cottagers, and others who enjoy Ontario waters can help watch for and report NIS in new areas, changes in existing NIS populations, and changes to the ecosystem that may be caused by their presence.

Learn to identify invasive NIS and be on the lookout for them. There are numerous native organisms that can be easily mistaken for NIS. If observers are not sure they are correctly identifying the organism it is important that a sample be collected for identification. Organisms can be frozen or "preserved" in a leak-proof container of rubbing alcohol to prevent them from spoiling. Information including the date, location where the organism was collected (estimate the distance and direction to the nearest town), size of the organism, and an estimate of the total number of organisms observed should be reported to the Invading Species Hotline (1-800-563-7711) or the Ministry of Natural Resources as soon as possible. Samples should be submitted for identification as well.

Visit <www.invadingspecies.com> to download a copy of the "Field Guide to Aquatic Invasive Species" for information on identification, species range, collecting a specimen, and reporting a sighting.

If each and every one of us helps spread the word more people will learn how to prevent the spread of NIS and our aquatic ecosystems will be protected from their detrimental impacts. Experience in dealing with invasive NIS is relatively new because the seriousness of the issue has escalated since the mid-1980s. Information is constantly changing and being updated. Lake stewards are urged to call the Hotline at least twice a year to be sure they have the most up-to-date information.

Resources

Free information on a number of NIS is available by calling the Invading Species Hotline at 1-800-563-7711 (in Ontario). Requests for quantities of brochures for distribution are welcome.

A number of other resources including maps, slide presentations, videos, and displays are also available through the hotline, and knowledgeable staff are always willing to answer your questions or direct you to other sources of information.

Canadian Food Inspection Agency:
www.inspection.gc.ca

Terrestrial invasive alien species including plants, diseases, and pests.

Federation of Ontario Cottagers' Associations (FOCA): www.foca.on.ca

Great Lakes Information Network (GLIN):
www.great-lakes.net

News articles and updates about invasive species in the Great Lake's basin.

Hinterland Who's Who: www.hwww.ca

The Ontario Federation of Anglers and Hunters / Ontario Ministry of Natural Resources' Invading Species Awareness Program:
www.invadingspecies.com

Ontario Invasive Plants Council c/o Stewardship Canada: www.stewardshipcentre.on.ca

Sea Grant Minnesota: www.seagrant.umn.edu

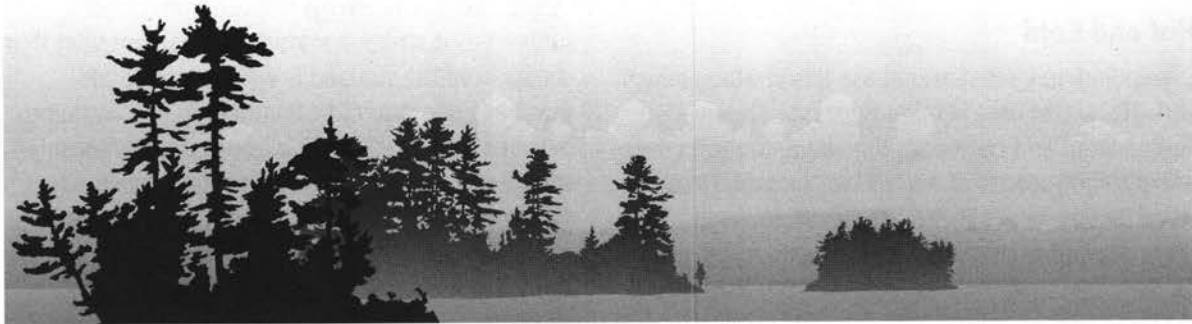
Pat's Boating in Canada (zebra mussels):
www.ncf.carleton.ca/boating/zebra.html

United States Department of Agriculture, National Invasive Species Information Centre:
www.invasivespeciesinfo.gov

SUSTAINABILITY AT THE LAKE

Designing a Sustainable Waterfront Property

Robert Smith



We have all heard the buzz words—climate change, carbon footprint, sustainable, green, eco-friendly—but what do they really mean? To the cottager, as with any homeowner, the terms represent good, thoughtful, and meaningful design. Nothing here is new: the wind, rain, and sun have been with us for a long time. So where do we start? For cottagers two primary aspects to consider are the view and the seasons.

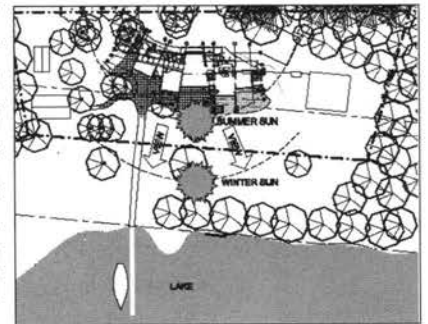
Views

The view is often the primary focus of a seasonal property. Start by walking your site and getting to know it. What features are special about your property? Is it a tree or group of trees? Is it a rock outcropping or a large boulder deposited by a glacier? Furthermore, does your cottage have water nearby or is it located on a shoreline. Locate those special features and use your cottage to frame these elements and the view. With this as your primary focus, you will not forget why you are building there in the first place. I suggest that you start to note these items on a photocopy of your survey when you begin to document your site. This sketch will eventually become your site plan.

Site Plan

Note the topography and begin to work with it, not against it. Note how water naturally runs off the land and where it pools. Many a camper has pitched a tent only to find that during a storm they were located in a temporary creek bed.

While walking your property take special care to note any areas that just feel good. Come back to them later and see if the feeling persists. If so, note them as special locations to be worked into the plan if possible. Wouldn't it be great to have a kitchen located in a special place of well-being?



As you lay out your site plan, take careful note of the orientation. Locate north, south, east and west. Use a compass and note the sun's location at noon; this will give you your primary solar orientation and will begin to suggest where and how the primary environmental considerations will affect your plan.

This is probably a good time to visit your local building official. Take your rough site sketch as a starting point for discussion. You will find them to

be a wealth of information and usually only too glad to help. It's better to open the discussions at an early stage of design as it demonstrates that you value their input. They will be knowledgeable about zoning issues such as setback from property lines, hydro lines, lakes, and rivers. They can review adjacency of well and placement of septic systems. They are also well-informed of the Ontario Building Code, which all buildings must respect.

Seasonal Use

You must decide for which seasons your cottage will be used. A cottage used primarily in the summer months can vary dramatically from one intended for use all year round.

Hot and Cold

Depending on your seasonal use this strategy may vary. The secret here is three fold: your energy source (heat and coolness), the ability to retain that energy, and the rate of energy loss or gain. These three factors work together to determine your thermal comfort and thus your enjoyment of your

cottage. Any letdown in one of these areas dramatically affects the others. Let's examine energy sources.

The conventional sources are well known. Oil, wood, propane, natural gas, and electricity are familiar but may or may not be available at a remote cottage site. These sources today, although convenient, contribute to carbon release and are subject to marketplace price fluctuation. Wood can be labour intensive and messy but it does offer a warm, cozy cottage ambiance and is quite stable in pricing. I will focus here on alternate sources that are not as well-known.

Direct Solar

Direct solar is the energy derived from direct sunlight as it strikes a surface. It is radiant heat that comes from the sun and is well-known to all especially our dear old cat curled up in a warming beam of sunlight. To take advantage of direct solar energy you must increase your solar aspect. Alignment to the south is an obvious advantage and it has been found that slight elongation of the building's form in the east-west direction will maximize the solar effect. Now the south-facing windows present a big challenge. While they let in warm solar heat in the winter they can also do so in the hot days of summer. Deciduous trees planted on the south side will offer some relief with their summertime shade but they also present significant shading with their wintertime silhouette. A good solution is solar-shading devices such as roof overhangs, awnings, and louvres. These must be properly designed with your latitude and building geometry in mind. Solar charts detailing these angles can be found online at www.solardat.uoregon.edu/SunChartProgram.php, a free program sponsored by the University of Oregon. Radiant-heat loss at night and on cloudy days is another big consideration. Heavy interior curtains or insulated shutters resolve this problem but can be costly and require daily operation. Alternate solutions are triple-glazed windows or an insulated window product such as Eco Glass (www.ecoglass.ca). Be careful when selecting your windows for this type of application. A high "E" (emisivity) coating is preferable to the low "E" popular with new windows. Discuss these aspects with your window supplier as proper selection is critical.

Best principles for runoff control

N. Matthews

In general, the best possible layout of property near water will minimize damage to and maximize a healthy environment for earth, air, water, and to habitat of fish, flora, and fauna.

Understanding the natural flow of water

- Water seeks its own level.
- Water flows downhill because of gravity.
- Water will try to permeate float obstacles in its path.
- Water will flow around, over, or under obstacles in its path to seek its own level.

Five main ways to deal with runoff problems

- Absorb: e.g., into soft earth or wood chips.
- Collect: e.g., into a rain barrel or pond.
- Divert: e.g., with ditches or pipes.
- Block: e.g., with retaining wall or dams.
- Filter: e.g., with plants or fine gravel.

Ground Source

Ground-source energy, sometimes mislabeled geothermal energy, is another renewable, stable energy source. This energy is really latent solar energy absorbed by the ground and not heat derived from the earth's core. The outer crust of the earth maintains the average yearly solar radiation; in most of Ontario this is 13° C. Ground-source systems pull that energy out of the ground with a simple heat pump system. It's similar to your refrigerator, only operating in reverse. The knock on this Canadian technology, developed by Canada Mortgage and Housing Corporation (CMHC), has always been the high initial installation cost. Careful consideration of how we retain heat or cold and control of their rate of loss can dramatically reduce these costs. This coupled with its small carbon footprint and the rising costs of conventional energy sources, merits giving this source a second look.

Retaining the Heat

A strategy often neglected in the days of cheap energy is the retention of heat or coolness for as long as possible. This is most easily achieved by thermal mass. Centuries ago the Chinese did it with cooking fires vented through earthen floor systems. The Greeks, Romans, and Egyptians all used thick masonry wall and floor systems to retain the heat or coolness. Modern North American construction has strayed from these lessons of the past with current wood frame techniques. Computer modelling programs have shown that our ancestors knew what they were doing. It's possible to reduce the amount of energy needed to heat or cool a building by 40 to 60 percent by the inclusion of sufficient amounts of thermal mass. This fact makes solar and ground-source energy much more feasible. So how do we do this? The simple answer is any way we can. Methods such as concrete topping of floors, pre-cast concrete floor planks, doubling or tripling the layers of gypsum board, and insulating under the floor slabs and on the outside of the foundation walls will increase the thermal mass. Use your imagination; some people are using recycled plastic containers filled with water imbedded in the structure or under the floor slabs on top of the insulation. Furthermore, placing mass in the path of direct sunlight (e.g., floors) allows the double advantage of capturing passive solar energy with thermal mass.

Slowing Down the Heat Loss

The rate at which your energy is lost or gained is the final consideration. Like a warm winter coat, insulation is key. It is important to know what insulation is doing. Its function is to slow down the transfer of energy (heat) between your cottage and the outdoors. It works equally both ways, also keeping the summer heat out of your cool interior. So in theory, the more insulation the better. The problem of increasing the amount of insulation is of course cost. One way to increase your insulation value is to alter the standard wall assembly as follows. CMHC studies have shown that 25 percent of your heat loss through a conventional wall system is through the wall studs. Sheathing the exterior wall with 1 ½ to 2 inches of insulating sheathing board is a cost-effective way to cut this loss and increase the effectiveness of insulation. Also, a very important thing to remember is air infiltration. If cold air can enter your wall system and work its way to the inside of the wall, all the insulation value is lost.

Air Leakage

Many studies by CMHC over the years have shown that air leakage is the biggest contributor to the reduction of the energy efficiency of homes (and cottages too!). It is so important that the Energy Star program for new construction, which will become the standard of the Ontario Building Code, has at its heart the concept of preventing air leakage (www.oeenrcan.gc.ca/energystar).

No house can be certified unless it passes a blower test to determine its air leakage rate as it compares to preset minimums. Careful attention must be given to the application of the external "air barrier" and how it is connected to the ceiling vapour barrier at the top of the wall and the foundation at the bottom. Sealing around all penetrations and openings such as windows and doors is also critical. Wrapping the jambs of doors and windows will help avoid air infiltration into the wall assembly. Caulking and weather-stripping, long discussed, is critical.

Certified Green Products

Much has been said about green products and it seems everybody is claiming to be green or eco-friendly these days. How is a person to decide what passes the test? For me, there are a number of



important issues: recycled content, renewable resources, environment cleanliness, and overall carbon footprint. A good site for references on this subject is <www.ecologo.org/en>.

Recycled Content

We live in a society of waste generation. Our garbage dumps are overflowing and we are constantly polluting the environment. The building industry uses an incredible amount of our resources (40 percent of national energy demand). The use of materials with significant amounts of recycled content is an easy way to help with this issue.



Renewable Resources

In our global village our resources are finite. When faced with a choice of products I like to choose from those made with renewable resources. Luckily wood, one of our basic components in construction, falls into this group. This is not always an easy decision to make, however, as performance is of course paramount. This is why recycled materials are all the more attractive.



Clean Products

When I talk about clean products I am talking about two aspects. The first aspect includes the toxicity of the product and the phenomena of off-gassing. Many products are made with volatile organic compounds (VOC). Fortunately, a lot of attention has been given to this subject lately and a good range of non-VOC products are available (read the labels and talk to the sales person). Another major source of toxicity is formaldehyde. Unfortunately, most wood products are treated with formaldehyde as a preservative.

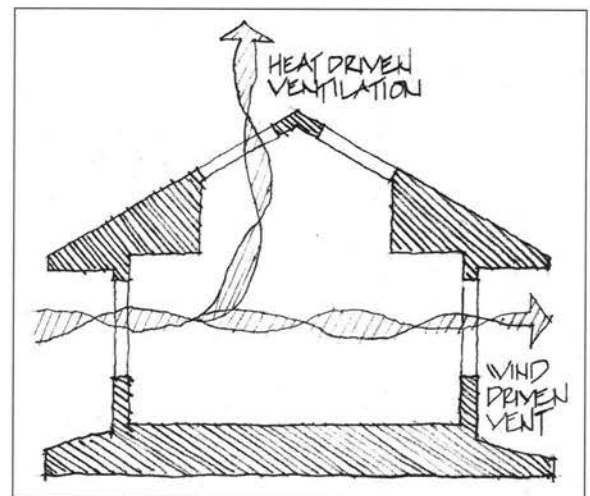
Formaldehyde-free wood and plywood is available but must be requested. The other aspect of clean products is what it takes to make the product and to get it to the job site. If a product is made from recycled and renewable materials but is made in a destructive way, the net effect may be detrimental. An example of this would be wood products made from a slash-and-burn operation in the rain forest. Some say products that are made half a world away are wasteful in their delivery. Modern shipping and transportation techniques often make products made abroad more acceptable. There is no easy answer here and one has to follow one's own best judgement.



Ventilation

Natural ventilation is most desirable in a summer cottage. Locate windows low on the prevailing-wind side and include exhaust windows high on the opposite side of the cottage. A window high in the home can act as a windcatcher, continuously drawing hot air from the home. Remember to ventilate extensively at night when the air is cooler. This will cool down your thermal mass and keep the cottage cool during the day. A more sophisticated system can draw earthen-cooled air from a ventilation intake duct buried in the ground. If your cottage is more of a full season getaway, consider installing a heat recovery ventilation system (HRVC). This removes the heat from exhaust air and returns it to the cottage. Similar systems are available for energy recovery of hot waste water. Again, energy reclamation is the cornerstone of the Energy Star program.

Remember to respect your site. Enjoy the natural features that living in cottage country offers and work with the environment.



Resources

Canada Green Building Council: www.cagbc.org

EcoLogo Program: www.ecologo.org/en/

Intergovernmental Panel on Climate Change:
<http://www.ipcc.ch/>

Natural Resource Defence Council:
www.nrdc.org/buildinggreen/default.asp

University of Oregon Solar Chart Program:
<http://solardat.uoregon.edu/SunChartProgram.html>

Septic Systems

Karl Fiander



Septic systems come in many shapes and sizes. Taking care of your system will promote its longevity and protect the natural environment. Pumping out your system and not disposing of chemicals

and other products into the septic system are key to proper maintenance. Many old cottages have systems that were not inspected and do not meet current standards. The modern use of cottages has changed greatly and very old septic systems were not designed to handle modern cottage use. Bringing your own septic system up to present standards is advised not only for the good of the lake environment but also to address outcomes from possible mandatory inspections under the Clean Water Act.

Standard tank and leaching-bed septic systems have changed little since they were first developed; however, there are now many more options available to cottagers that provide tertiary treatment, new materials, and area efficiency. The primary use of septic systems is to treat domestic waste water from both toilets (black water) and sinks (grey water). Water should be treated so that the discharge water reaching the ground water or lake does not pose a threat to the lake environment

What Is a Septic System?

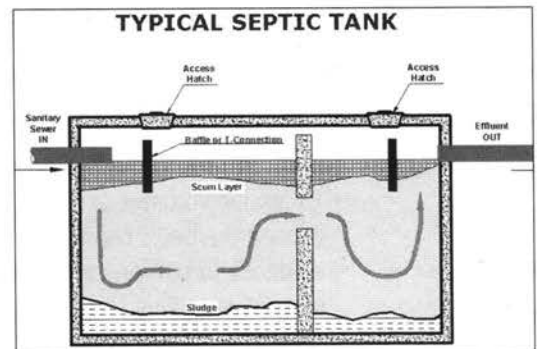
A septic system consists of a tank to hold effluent and a leaching bed to distribute the liquid effluent. The tank, which can be made of plastic, fibreglass or concrete, is used to separate the waste into three parts: scum at the top, solid wastes at the bottom, and a turbid liquid between them. Baffle plates are located at the inlet and outlet pipes and a baffle or separation plate divides the tank into two

compartments, with two-thirds in the first compartment and one-third in the second compartment. The inlet baffle extends above and below the liquid level and directs the flow downward and prevents breakup of the scum. The outlet baffle is similar and prevents any scum from leaving the tank and clogging the leaching bed. All septic tanks must have two compartments and a minimum capacity of 1600 litres. Systems installed in the 1950s and 1960s may have only one compartment and be undersized for current use.

The breaking down of waste materials in the tank is done anaerobically (in the absence of oxygen). Therefore, it is important that the tank be well sealed once installed and backfilled with soil. Generally there are two access hatches in the tank that

must remain accessible for inspection and occasional cleaning. You may check the inlet and outlet baffles yourself but under no circumstances should you ever put any parts of your body into the tank even when the tank has been pumped out, highly dangerous, odourless gases are present that can kill. All gases produced in the tank exit the system through a vent pipe that is located in the home's plumbing system and is usually vented through the roof. Once the sewage separates into scum (liquid and solids), the liquid (leachate) moves into the leaching bed through perforated pipe. Fluids then seep into a layer of gravel before moving into the surrounding soil where further treatment of the effluent is carried out by microbes.

Alternatives to the septic system include several



new tertiary treatment systems, the pit privy, composting or incinerating toilets, and a leaching pit (for disposal of grey water). They can be good substitutes if cost is prohibitive or soil conditions are poor for a standard or even an alternate septic system.

How to Take Care of Your Septic System

In order for your septic system to function properly, it needs regular maintenance. If you do not know the exact location of your septic tank and tile bed, find out where it is and make a rough sketch of your property showing the location of your cottage, septic tank, tile bed, trees, and the lake. Often the original approving agency (health unit or conservation authority) will have the original plans on file and be available for inspection (expect a fee for this service). It is also useful to include on your diagram the location of the access hatches to the septic tank and any additional equipment attached to or near the septic tank.

The leaching bed of a standard system is where most pathogens, phosphorus, and other nutrients are removed through chemical and biological action. The bed is subject to failure when one or more of the following conditions apply:

- The bed has been compacted by driving or parking vehicles and equipment on the surface.
- Excessive volumes of leachate are produced that exceed the bed's capacity. Usually there is evidence of soft or soggy areas that persist for several days. This "breakout" of leachate is potentially harmful and must be corrected immediately.
- Solids have entered the bed through a failure in the septic tank's exit baffle or filter, or the tank has experienced an excessive load. This usually results in flooding of the septic tank and backup into the house. Minor plugging of the bed with solids can be rectified but often it requires a major rebuild of the bed.
- An excessive "biomat" exists in the bed, which is a natural layer of bacteria, solids, and fungi. Restricted use of the bed for a period of time will reduce the biomat layer.
- Tree roots may enter the leaching bed tile, pipes, and the septic tank. Trees and shrubs should be trimmed back from the bed and tank area and a low-growing ground cover or grass used.

None of the commercial septic tank activators or maintainers have been proven effective at stimulating septic action. Anaerobic bacteria liquefy the solids in the septic tank and once leachate reaches the leaching bed, it is further reduced by aerobic bacteria in the bed and soil layers. This is where most biological treatment occurs and close attention is required for maintaining the integrity of the leaching bed.

It is advisable to have your septic tank pumped out every two years; however, this recommendation is for tanks that are used all year and not seasonally as with cottage use. Pumping frequency is dependent on the amount and type of use so it is best to ask the pumping contractor about the general condition of the tank. Contractors can comment on the structural integrity of the tank and the levels of scum and solids that dictate when the tank needs to be pumped. A licensed pumping contractor should be contracted to pump your tank. They will not only pump out the tank but also will inspect for leaks and blockages that can affect the performance of the system. Pumping gets rid of scum and indigestible solids that build up in the tank. Some plastic and fibreglass tanks may pop out of the ground when buoyed by high groundwater levels. These tanks should be pumped when the groundwater level is lower, usually in the fall. For those people that use their homes in the winter, pumping your tank in the spring or summer will give the system time to become repopulated with new bacteria before the cold of winter arrives. Infrequent use in the winter risks the slowing of the natural biological action. In these circumstances avoid high-volume use until the system has warmed and become active.

It was at one time a common practice for the grey water to go directly to a separate tile bed but this process is not permitted any longer; leaching beds work best when they are doused equally throughout the bed. This can be done with a pump that operates at intervals with prescribed volumes of leachate. The tank should be able to hold about two days volume of waste for settling and starting of the decomposition process, and for letting treated leachate trickle out slowly to the leaching bed or tertiary treatment system. The current size of tanks is based on the number of bedrooms and "fixture units" such as dishwashers, showers, and additional sinks.

Are Septic Systems Inadequate?

A properly designed and inspected septic tank or tertiary system will adequately treat waste water and protect the environment. Many cottages have systems that were not inspected and do not meet standards. The modern use of cottages has changed greatly and the very old systems installed years ago were not designed to handle present-day volumes. Older septic systems cannot handle organic chemicals and the volume generated by the conveniences of modern waterfront living (e.g., dishwashers).

What Can Be Done?

The first thing you can do is bring your own system up to standards. An approved standard system in proper soils will meet most requirements and does not need the extra care, expenditures, and maintenance that special systems require. If the system is in or near an environmentally sensitive

area or the lake is in a state of degradation and therefore requires special systems with nitrate and phosphate removal, there are new sewage treatment systems that can exceed the performance of standard septic systems

Very encouraging results have been obtained with peat systems, biofilters, and recirculating sand filters. The loading of oxygen-demanding organics and the suspended solids and bacterial levels have usually been reduced in tertiary systems. This means that these systems produce better quality effluent than expected from a standard septic tank system. These units are encouraged for waterfront properties where homes are large, lot sizes are small, or water quality protection is a high priority. Peat systems are examples of tertiary systems that have been designed for cottage use and are efficient, cost-effective, and can be located in tight spaces.

Septic systems 101

Denis Orendt, Executive Director Ontario Onsite Wastewater Association

Life at many cottages is starting to mirror that in the city with more appliances added to the cottage for comfort, but when it comes to flushing everything down the drain the cottage owner must be aware that being on a septic system is not like being in the city.

Under the Ontario Building Code as a cottage owner you are responsible for your system's performance and maintenance. If you take good care of your system, you will save yourself the time, money, and worries involved in replacing a failed system. Failed systems can be hazardous to the environment and your pocketbook. They can degrade water supplies and reduce your property's value. Here are some valuable tips to ensure the longevity of your system.

SEPTIC DOs

- Do familiarize yourself with the location of your system
- Do keep an "as built" system diagram in a safe place for reference
- Do divert surface water away from your leaching bed

- Do pump out your tank on a regular basis (3-5 years)
- Do repair leaky plumbing fixtures
- Do conserve water to reduce the amount of waste water that must be treated
- Do replace old toilets with low-flush models
- Do keep lint out of your septic system by cleaning the lint filter on your washing machine
- Do keep the tank access lid secure to the riser at all times
- Do keep accurate records of septic-system maintenance and service calls

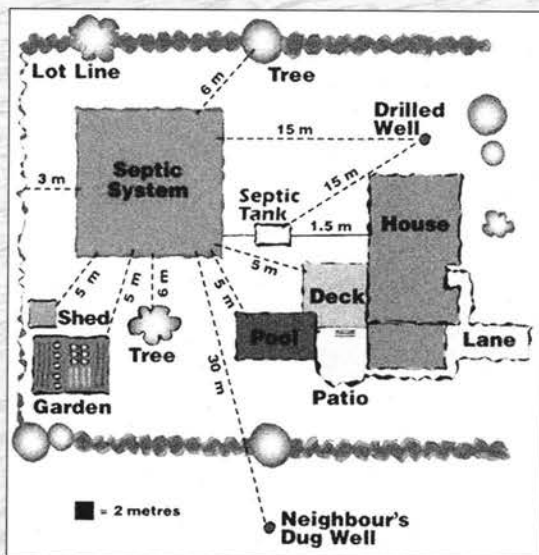
SEPTIC DON'Ts

- Don't flush hazardous chemicals, or paint into the system
- Don't flush cigarette butts, coffee grinds, cooking grease, sanitary products, or condoms into the system
- Don't use a garbage disposal or garburators
- Don't plant trees or shrubs too close to the system or leaching bed
- Don't use special additives that are touted to enhance the performance of your tank or system

- Don't dig without knowing the location of your septic system
- Don't drive over your tank or leaching bed
- Don't enter a septic tank – gases and lack of oxygen can be fatal
- Don't connect rain gutters, storm drains, or allow surface water to drain into a sewage system
- Don't leave interior faucets dripping or leaking during the winter protect waterlines during cold spells, and insulate your faucets and plumbing
- Don't connect water softeners to your system as the salt content can destroy the required bacteria and can overload the system when backwashing
- Don't park on the septic bed or use as a driveway

Separation distances

There are minimum separation distances surrounding your system and other home and yard



items that are required under the Ontario Building Code. Remembering these distances and planning your lot accordingly will lead to a healthier, longer-lasting system. Some municipalities have specific requirements for cottage and residences on a lake. Check with your local building

official for more information.

Recommendation

Have your system inspected by a licensed and qualified person. This can save you thousands of dollars should your system require a repair rather than a complete replacement.

Treatment technology for both water and sewage is being used more and more where there are water courses, lakes, rivers, streams, and creeks. Some people will not hesitate to spend money on the interior of their cottage.

Windows, doors, and dormers can all be added or changed but the real value in the property starts with the water quality and septic system.

Many cottagers are now installing UV systems for water treatment and also are looking at technology for their septic systems. Many of today's septic treatment systems can reduce nitrogen levels that can affect the quality of your shoreline. This is good for both the homeowner and the environment. These systems require yearly maintenance as required under the Ontario Building Code.

Under new legislation the Ministry of the Environment is planning a re-inspection program for septic systems across Ontario in order to protect our water resources. Regulations for inspection may fall under the Ontario Building Code. Many municipalities are currently undertaking a reinspection program prior to the government implementing this as law.

Recommendation

Planning on selling or purchasing a cottage? Not sure if your system is currently working? Check the Ontario Onsite Wastewater Association (OOWA) website (www.oowa.org) and go to the Ask the Expert section to find a qualified and certified septic professional in your area.

What's new?

- Having your system inspected and brought up to current Ontario Building Code standards increases the equity in your property.
- Current regulations for new systems include risers to grade for easy access and maintenance on the ends of the septic tank.
- New systems require effluent filters that prevent particles and larger material from entering the filter or leaching bed. Installing an effluent filter can prolong the life of the treatment bed.
- When having your system inspected you should consider having the filter installed by a qualified and certified septic professional.
- Proper care of your septic system is simple and easy.
- Remember to follow the simple "do"s and "don't"s. Have your system inspected and pumped if required.

- A well-maintained septic system can perform as expected for many years but a neglected or abused system can fail tomorrow.
- For more information contact the Ontario Onsite Wastewater Association. We would be pleased to do a septic seminar for your cottage association.

Recommendation

- When having a large family function at the cottage contact your local septic pumper or Port-a-Potty rental company and bring in some portable toilets. This will save you from overloading your septic system.
- Remember that the only thing to should go into your septic system is what you put in your mouth.

Aerobic systems are designed to replace the standard anaerobic septic tank with a system that agitates and actively circulates oxygen through the sewage. This forced system decomposes the organic waste quickly and effectively when the system is functioning normally.

Because cottage country generally has poor soil most leaching beds use imported soil and sand. In theory, if more bacterial digestion could take place in the tank then the tile bed could be made smaller. Regulations require a minimum leaching bed size for standard systems. The use of smaller leaching beds are approved for certain tertiary systems. The details for available systems can be supplied by licensed installers.

Phosphorous is a nutrient present in human waste and some detergents. When phosphorus enters a lake it may lead to excessive algal growth (eutrophication). Phosphorus is not effectively removed in standard septic systems but may be sequestered in the leaching bed material or the native soil. Some tertiary systems are more effective at phosphorus removal; however, adequate setback of the system from the lake or stream is usually the best preventive measure.

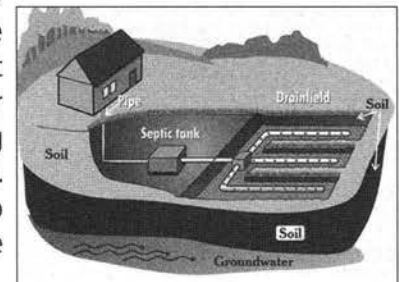
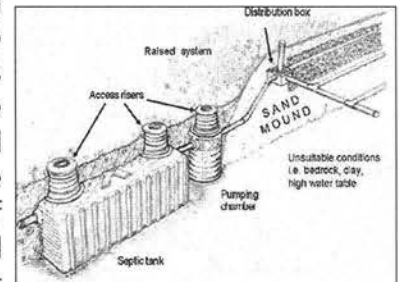
Over the years various media for the leaching bed have been tested because ideal soils do not exist in every area. Any imported soil used for the leaching bed must be of an approved type that produces a satisfactory "percolation rate." Licensed installers are trained in the testing and use of imported soil.

Some types of gravel are more successful at sequestering phosphorus. Tests indicate that up to 90 percent of the phosphorus may be removed by certain types of gravel. This process reaches a limit over time as the bed becomes "loaded" and it can only be rejuvenated by fresh material.

Sand, gravel, and various combinations of the two also have been tested in leaching beds. Unfortunately, sand tends to clog some perforated pipes causing effluent to pass over the perforations or to cause bed failure. Experimental systems are using a combination of sizes of gravel and sand in layers and nozzles to distribute the effluent through the layers. As with peat systems, these systems work best in raised beds and, therefore, may not be good systems for the average shoreline resident. One interesting aspect of some sand filters is that the waste exiting the filter is so clean that it can be recycled and used for flushing toilets, thereby reducing the need for water from the well. In addition, recent changes to provincial regulations allow the use of grey water for flushing.

Another system that has worked well for even municipal treatment and large companies is the constructed wetland. The tile bed is replaced by trenches made of heavy clay soil or covered in plastic to keep water from leaching out. The tiles are put in and covered with gravel, and native wetland vegetation is installed. Constructed wetlands are very effective at filtering waste and can be very attractive. There is a potential for freezing but these systems have been built in greenhouses in some very cold locations. Some approved wetlands are in use and trials for individual systems are ongoing.

One of the cheapest and most effective retrofit units uses a filter between the septic tank and the existing leaching bed. The leaching bed in standard systems is the place where organic



material in liquid suspension is treated. The bed fails when flooded or it receives solids in excessive amounts. The use of a filter at the point of exit from the septic tank prevents solids from entering the bed. Regulations require filters on new installations but because they are cheap and easily installed retrofitting them to older tanks is highly recommended.

Regardless of whether a standard septic system or a specialized system is installed, it must be remembered that the soil has a limit on how fast it can take liquids and how much leachate it can handle. A specialized, compact treatment system may have a small physical presence but it still requires a much larger hydraulic "footprint" to handle the effluent. This means that there may not be much more available land even though you put in a smaller unit.

Septic System Approvals and Inquiries

Communities in northern Ontario (north of Parry Sound) are serviced by existing health units. In southern Ontario, responsibilities have been delegated to the municipalities. In many areas, however, health units or Conservation Authorities will continue to offer service under agreement with local municipalities.

References

Kollaard, W. and I.P. Malcolm. 1996. Reducing phosphorus loading in rural wastewater. *Agri-food Research in Ontario* 19, 1.

Resources

Canada Mortgage and Housing Corporation:
www.cmhc-schl.gc.ca

CMHC has information for first time home-buyers pertaining to septic systems, wells, water filtration, etc., as well as maintenance of these systems.

Jowett, E.C. 1995. Replacing the tile bed with the Waterloo Biofilter. In *Alternative Systems, Nutrient Removal and Pathogenic Microbes*. Waterloo, ON: Waterloo Centre for Groundwater Research, University of Waterloo.

Moran, A. 1995. *Cottage septic reinspections: need for review and changes*. (Available from the FOCA office.)

National Small Flows Clearinghouse. 1995. *Pipeline* 6, 3.

Ontario Ministry of the Environment:
<http://www.ene.gov.on.ca>

Fact sheets about septage, septic systems, and the Clean Water Act.

Ontario Ministry of Environment and Energy. 1997. Nutrient abatement in domestic septic systems: research initiatives of the Ontario Ministry of Environment and Energy. A report to the Ontario Municipal Board by the Science and Technology Branch, Ontario Ministry of Environment and Energy.

Ontario Onsite Wastewater Association:
www.oowa.org

All information about septic systems and new technology as well as links to finding qualified professionals in your area.

The Septic Information Website: www.inspect-ny.com/septbook.htm

Waterloo Centre for Groundwater Research. 1994. Alternative septic systems for Ontario. Conference Proceedings for the Waterloo Centre for Groundwater Research, Waterloo, Ontario.

Light Pollution in Rural Areas

Robert Dick

(Royal Astronomical Society of Canada, Light Pollution Abatement Program)

Light pollution is excessive illumination that extends beyond where it is needed or wanted and it can be more than just a nuisance for neighbours. Light pollution is a relatively new form of environmental contamination that was first identified by astronomers in the 1970s and is now widely recognized for its impact on the environment and human health. It changes wildlife habitat and it can even impact our physical and emotional health. This article will raise your awareness of light pollution. It will also suggest simple ways to minimize its effect on our environment.

Outdoor lighting has been driven by cheap energy and a fear of the night. Energy is no longer cheap and much of this fear of the night is misplaced. We illuminate our grounds for security and to show off our property. With our property on display throughout the night vandals and thieves can freely do their evil deeds without being encumbered by a flashlight. With the property owner and neighbours asleep, no one will raise an alarm until the morning when it is too late. Light is only useful when there are people around to see it.

In catering to this fear, we are inadvertently contaminating the natural environment. If we are to be good stewards of the land and water we must understand that even light can be dangerous. But unlike air and water pollution, light pollution is easily reduced.

Nocturnal Lighting and Health

Our active daily lives result in physical damage to our skin, muscle, and other tissues that must be repaired. The scheduling of these repairs is governed by our internal body clock—the circadian rhythm that is kept in sync with our daylight

activity by detecting the day-night contrast in lighting.

Our bodies enforce this repair by releasing the hormone melatonin into our blood and putting us to sleep. It takes about three hours for most of this work to be completed, longer if we have more extensive damage. The best time for these repairs is in the early part of the night. My grandmother used to say that the hours of sleep before midnight were the most beneficial. She seems to have been right. If repairs are delayed by artificial lighting they may not be completed.

Our minds also require a bit of a cleanup. Think of your desk at work at the end of a busy day: papers and notes are scattered about. These have to be organized and filed so they can be easily found the next day. Without this reorganization, we would have a very confused work world. It is the same with our minds. Our daily memories have to be compressed and filed so they can be quickly recalled when needed. This requires sleep in a darkened room.

Wildlife

Scotobiology is the study of the ecological dependence on darkness. There are many nocturnal creatures that are most active during the night when they can forage for food with less fear of predators. A single yard light can impact over one square kilometre. To avoid the danger of the artificial lighting, wildlife may change their behaviour by foraging less or abandoning their familiar habitat. As they migrate into other areas, they put pressure on the indigenous wildlife as they compete for limited resources. Under the bright full moon, animals reduce their food intake but for the rest of the month during the relative darkness the

affected animals compensate by eating more. However, with artificial lighting, there is no dark time.

Songbirds rely on a good insect population but a single light will attract insects from over 100 metres away. This interrupts insects' normal



Impact of single light

behaviour of eating, mating, and migrating. As insects decrease in number, the insect-eating birds migrate to other regions in search of a better food supply. The apparent loss of songbirds in urban areas has been

attributed to these changes in their environment.

Vegetation is also affected by artificial light.

Some plants get their cues about the season from



1/2 kw private marker lighting

the length of the night. A short night means it is late spring and time to pollinate. Nights that are getting longer indicate it is time to store up nutrients and drop leaves in preparation for winter. Artificial lighting keeps the nights short and "summer-like," delaying pollination until it is too late for the insects and delaying the preparation for winter.

Examples of light pollution are not limited to cities and towns. They are found across the rural landscape. The main source is uncontained private lighting



Glare from shoreline

from "dusk-to-dawn" yard fixtures, driveways, and outdoor building lights. Many of these are left on even after the occupants have gone to bed. Not only do they make it difficult to see along a country

road but they contaminate the area for wildlife.

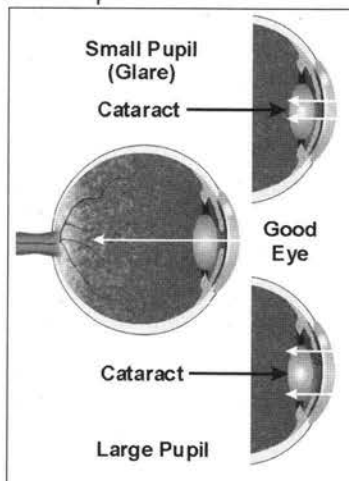
Shoreline illumination affects both human and aquatic life. It creates glare along the navigable channel. The bright lights prevent the eyes of boaters from adapting to the darkness and they fail to see channel markers and hazards. Without this obtrusive shoreline lighting, it is much easier to see the tree line and flotsam in the water. Light also reflects off the still water into your neighbour's windows across the lake. The direct light and the reflected light cause double the trouble and nuisance.

Constant illumination along built-up shorelines overwhelms the cues for the changing seasons that are needed by aquatic wildlife. This light makes the length of the autumn night seem short and summer-like. It can also drive zooplankton to deeper waters while encouraging the growth of algae on the surface, which affects the quality of the water. This separation of the consumer from the food supply may stress the vitality of the ecosystem.

Our Eyes

We use light to help us see after dark but it can have the opposite effect, especially if we are senior citizens!

After the age of 40, our eyes begin to deteriorate and incipient cataracts form in the centre of the



lens. With glare from unshielded lights, our iris (pupil) closes down to protect the eye. Light entering the eye must then pass through the incipient cataract. Light scattered by the cataract obscures the darker areas. Without

glare our iris widens and much more light passes through the clear part of the lens giving us a sharper view. So, we see better with less light! During the day, our iris is also small but there is plenty of light from daytime scenes and our brain does a good job of correcting for our hazy vision.

Community Initiatives

In 1999 the Torrance Barrens in Muskoka was designated a Dark Sky Reserve. The first area in the world to receive this designation, the Barrens is now a protected space free from all sources of artificial light. This effort was made possible with the help of strong partnerships with local and provincial groups. The Muskoka Heritage Foundation led the way, joined by the Ministry of Natural Resources, the Muskoka Lakes Association, and the Township of Muskoka Lakes. For more information visit

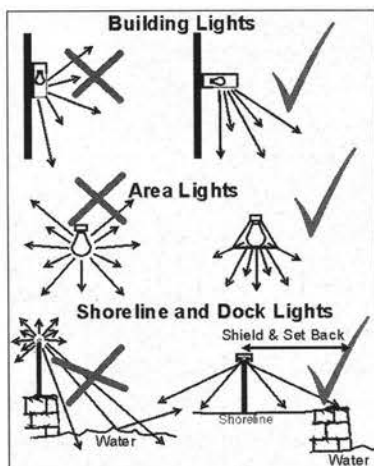
<www.muskokaheritage.org/natural>.

Through its Light Pollution Abatement Program the Royal Astronomical Society of Canada has developed guidelines for both Dark Sky Preserves (DSP) and Urban Star Parks (USP). There are now seven designated sites in Canada, with three being in Ontario.

For more information on the Light Pollution Abatement Program and to find out how you can nominate an area to be designated a DSP or USP visit <www.rasc.ca/lpa/guidelines.shtml>. Several municipalities in Ontario have identified the preservation of dark skies as an important part of planning in their communities and have adopted dark-sky policies in their official plans.

Simple Solutions

As good stewards of the land and water, we must minimize our impact on the environment. The solutions to light pollution are much easier than reducing air and water pollution. After dark, close your curtains to keep your indoor light inside. When we go to bed we should turn off lights or at least ensure that the lights are well shielded to minimize environmental contamination. Use the lowest wattage that suits your purpose. Making light shields can be a simple activity suitable for children.



Shield shoreline lights and keep them away from the water's edge and turn them off when you don't expect visitors and when you go to bed;

these and other examples are shown on the web at Starlight Theatre (www.starlight-theatre.ca). Use motion detectors instead of dusk-to-dawn fixtures. Soon you will be able to share the night sky with your neighbours.

Some Municipalities that have adopted Dark Sky policies:

- Town of Mississippi Mills,
- Township of the Archipelago, and
- Township of Carling.

References

Dark Sky Preserves and Urban Star Parks:
www.starlight-theatre.ca/LT-POLLUTION.HTM
Lighting policy documents and information.

International Dark-Sky Association:
www.darksky.org

A large quantity of written material on LP and the reduction of glare, light trespass and sky glow. Although its main focus is astronomy, it also covers some environmental topics

Longcore, T. and C. Rich. 2005. A survey of research into scotobiology highlighting the environmental impact of light. *Ecological Consequences of Artificial Night Lighting*. Washington, DC: Island Press.

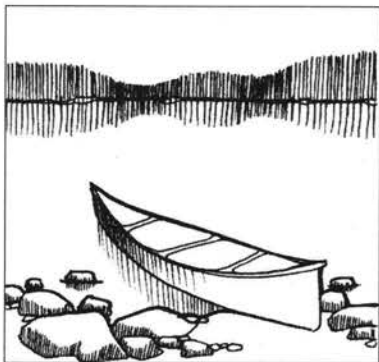
Muskoka Heritage Foundation:
www.muskokaheritage.org/ecology-night/
Summaries and contact information on ecology of the night (scotobiology with references to researchers in the field.

Royal Astronomical Society of Canada:
www.rasc.ca/lpa/index.shtml
Essays and published articles about LP with supporting imagery and a few projects to reduce LP for children and adults.

Noise Around the Lake

Andy Metelka
(Novel Dynamics Test Inc.)

Some of the most enjoyable aspects of cottage country are associated with sound, whether it be the haunting cry of the loon or the gentle lapping of waves onto the shore. Quiet mornings spent on the dock or a night searching for stars are treasured memories that stay with us during the cold winter months. However, as cottage-country population increases these moments might become rare as noise levels also increase.



Noise is defined as unwanted sound. If we enjoy cottage country for the sounds of nature, then surely the addition of our human sounds are pollution of the air waves! Fortunately, we can easily remedy this kind of

pollution with no lasting harmful effects to the environment. All it takes is a little understanding of sound and its properties.

The physics of sound is a complex issue that is too lengthy to describe within the scope of this article. However the most important aspect is how sound behaves at night and along the water during different conditions. In very general terms, sound waves are pulled in the direction of fastest travel velocity. Sound also travels faster in warm air. On a warm summer day at the lake sound waves from cottage activities travel in a more upward direction toward warm air and not as much sound pressure reaches our ears at the shore. At dusk the water surface cools producing a warm air layer between the water and the sky (thermal inversion). Those same sound waves follow the warm air again; sound pressure is concentrated along the surface of the lake and we can hear even the quiet conversation in a passing canoe. Normally sound pressure (as measured by a sound level metre)

dissipates at the rate of six decibels (dB) every time the distance doubles. This rate of loss decreases during temperature gradient conditions at night, especially when the temperature variant is high during dusk. Loons and other animals use this time period to communicate over great distances because of this property of sound. Other contributing effects such as reflective rocky shorelines, wind speed, and direction can affect noise transmissions as well. These vectors all combine at times, which compounds the problem. Some websites that describe this phenomenon in more detail are

<<www.mnresponsiblerec.org/previousite/resources/sound.htm> and
<www.kettering.edu/~drussell/Demos/refract/refract.html>.

Just like our friends in the animal kingdom, we can use sound to our advantage. Many people can sleep well with continuous noise such as waves crashing on the beach or rain on the roof whereas impulsive sound has an awakening effect. When multiple sound sources occur the dominant sound drowns out the quiet sound further away. Sleeping at night during a neighbour's party can be difficult. The simplest solution would be to turn on your fan during the neighbour's festivities and position it close to your ears. Don't let the fan noise bother you or it won't work. If the fan noise is 10 dB above the impulsive distributing noise it won't be heard; however, there is, however no substitute for common courtesy. If you are the noisy neighbour planning a loud event, it would be effective to communicate with your neighbours in advance. Mention that there may be excessive noise for a period in the evening so your neighbour can prepare.

Continuous noise from motorized vehicles, boats, ATVs, and construction is on the increase in cottage country and is difficult to regulate. The Canadian government has established noise bylaws that are constantly under review. The guidelines differ for day and night. Regulations for impulsive noise and continuous noise are different for urban areas than they are in rural communities. Airports, roads, factories, and other commercial establishments have strict noise guidelines enforced by the Ministry of the Environment. Rural area levels may not be as strictly defined; this includes cottage country. Noise complaints in rural areas tend to be subjective. Expensive advanced measurement instrumentation is used by certified acoustic consultants who have the expertise, experience, and understanding of noise ordinance bylaws to measure noise exceeding ministry guidelines. Some of these measurements include

- Community Noise Equivalent Level (CNEL, Lden),
- Composite Noise Rating (CNR),
- Day-Night Average Sound Level (DNL, Ldn),
- Hourly Average Sound Level (1HL, L1h),

- Perceived Noise Level (PNL),
- Single Event Noise Exposure Level (SENEL, LAX),
- Sound Exposure Level (SEL, LET),
- Sound Pressure Level (SPL, Lp),
- Energy Average (Leq),
- Sound Power Level (PWL, Lw), and
- Sound Transmission Class (STC).

Ministry guidelines can be reviewed at www.ene.gov.on.ca/envision/gp/3517e.htm.

The Ontario Ministry of Environment covers noise under the Environmental Protection Act. Relevant guidelines can be found at www.ene.gov.on.ca/en/publications/forms/index.php#Noise, www.ene.gov.on.ca/envision/gp/3372e.pdf, and www.ene.gov.on.ca/envision/gp/3405e.pdf.

The Ministry categorizes noise as a contaminant form of air pollution. In severe cases of noise complaints where acoustic consultants and lawyers are involved and the expense is high, we may wish to consider the alternatives. The more we understand about the noise we make, the better neighbours we can be.

Air Pollution

Clean Air Foundation

Vacationing and living on the water is not generally a place where one worries about air quality. Usually we associate our waterfront properties with fresh, clean air. The fact is that high smog readings can be found throughout many cottage regions (see www.on.lung.ca/Our-Programs/Air-Quality).

It is no secret that our actions have a direct impact on air quality. Nor is it a secret that poor air quality has negative effects on human and ecosystem health. Direct products of our consumption and behaviours contribute to various respiratory and cardiovascular system damages, acid rain, and global warming. It is incumbent upon

us all to take responsibility for our personal actions and contributions to the quality of the air that we breathe. Here are some tips while you are at the lake to help minimize your contribution to air pollution, and to improve air quality in and around your cottage.

Driving to the Lake

Vehicle emissions are a major source of air pollution. carbon monoxide, carbon dioxide, sulphur oxides, nitrogen oxides and VOCs (volatile organic compounds) are all pumped out of your exhaust pipe helping to create ground level ozone, smog,



Driving Tips!

1. Reduce the load, a lighter load will result in greater fuel efficiency. Try to do your grocery shopping close to the lake so that you are not hauling all of that weight over long distances.
2. Don't idle! Skip the drive through, instead go in and stretch your legs.
3. Keep you car clean, well tuned and maintain proper tire pressure.
4. Slow it down, speeds over 100km/h result in a reduction in fuel efficiency.
5. Keep your RPMs low, fast and frequent breaking and acceleration results in greater fuel consumption.
6. Choose a low sulphur fuel for your tank, it will last longer and pollute less.
7. **MAKE YOUR CAR CHOICE A FUEL EFFICIENT CHOICE!** If your car is older than a 1995 model year, then your vehicle is likely 19 times less efficient than a newer model. To responsibly retire your vehicle, donate it to Car Heaven and receive a free tow, charitable tax receipt and incentives towards cleaner transportation choices!

www.carheaven.ca

greenhouse gases, and acid rain. For more information see Environment Canada's website at <www.ec.gc.ca/cleanair-airpur>.

The trip to the lake can be a long one but there are a number of tips that can help maximize the efficiency of your drive and minimize your fuel consumption.

Another aspect to consider on your journey to and from the lake is the quality of air that you and your family are breathing in the car.

- Keep your car clean and dust free, and remove and dispose of food garbage as soon as possible.
- Use your vents! Keep your car well ventilated. Try to avoid overusing your car's air conditioner. Car A/Cs account for 25 percent of CFCs emitted into the atmosphere and can increase your car's fuel consumption by up to 12 percent while more than doubling nitrogen oxide emissions.
- Get rid of the air freshener! Car air fresheners are generally scented with chemicals that can be irritating or toxic.
- Don't smoke in the car! Better yet, don't smoke at all. Tobacco smoke contains 4,700 chemical compounds, some of which are known to cause cancer.
- Take frequent breaks: get out of the car, stretch your legs, breathe in some fresh air, stop and get some delicious pie at a roadside farmers market while you're at it!

Keep a
bike at
the cottage!



If there is a town nearby, consider keeping a bike at your property in order to bike in for supplies instead of driving, this will also leave open the option for some possibly great day trips!

On the Waterfront

Once you are at the lake there are many things that should be considered.

Your boat

Boating is a major contributor not only to air pollution but to water pollution as well, especially if you are using your trusty two-stroke outboard engine. A conventional two-stroke marine engine emits the same amount of hydrocarbon pollution into the air in one hour as driving a new car for more than 8,000 km! (www.ec.gc.ca/science/sandemay00/article1_e.html). Four-stroke outboards can be up to 80 percent more fuel efficient than conventional two-stroke engines. Four-stroke marine engines start and run better, are quieter, and produce less air and water pollution.

Here are some additional boating tips to help clear the air.

- Start the season with a tune-up and keep your engine tuned.
- Keep the boat load light and balanced; this results in better fuel efficiency.
- Don't overfill the tank; as gas heats up, it expands and can leak.
- Never store your gas canisters inside the cottage.
- Use the morning dew or summer rain as an opportunity to clean the deck instead of cleaning products that can contain ammonia or chlorine.
- Take out the canoe or kayak more. A fishing excursion can be very enjoyable engine-free!

Campfires and BBQs

BBQs are an integral part of waterfront life and everyone loves a good campfire. Whether you are cozying up and roasting marshmallows, or cooking up some dogs, please keep some things in mind.

- Keep the fire and the BBQ away from the cottage so that the smoke does not find its way in, burning wood or coals produces carbon monoxide which is toxic and can be fatal.
- Like your car, don't let your BBQ or fire idle; minimize your impact and if no one is cooking or enjoying the fire, put it out/turn it off!
- Burn only dry, seasoned wood, avoid burning any wood that is treated or painted, green or wet,

particle board or plywood; treatments and emissions can contain toxic chemicals including formaldehyde.

- Store your firewood outside, off the ground, and covered.
- Never burn garbage! Keep out all plastic, styrofoam, and cardboard. Burning garbage can release toxic chemicals into the air.
- Burn it Smart: www.burnitsmart.org.
- If you have an old woodstove it's time to upgrade; old stoves spew out 90 percent more emissions than newer woodstoves.

Outdoor tip

Keep the toxins out of the soil – Go WILD! Forget lawnmowers, fertilizers, pesticides and herbicides. Allow native plants to grow wild and beautiful!

Also, garbage should be packed out. If you have to pack out your garbage you will be far more likely to be mindful of the volume of garbage that you are producing. Keep in mind the 4 Rs: Refuse, Reduce, Reuse, and Recycle! A closed composter is a good way to deal with your organics, while keeping your cottage vermin free.

For more energy savings tips see www.energy.gov.on.ca.



Switch the 'Stat encourages the uptake of programmable thermostats, while ensuring the safe disposal of the mercury switched contained in older thermostats.

www.switchthestat.ca



Keep Cool offers incentives for the retirement of older, inefficient window air conditioners, and encourages less energy intensive cooling options. The program ensures that the units are recycled responsibly.

www.keepcool.ca

The Air Inside Your Home

If you have a family member with allergies or asthma, you know the importance of air quality inside the cottage. Houses can be a haven for toxins, moulds, chemicals, and dust.

Chemicals in the home

There are many sources of chemical emissions that can be found throughout your cottage and most of them take the form of cleaning and personal-care products. The chemicals from these products can be toxic and almost all of them can be replaced with less toxic alternatives. Most cleanup jobs can be done with water, vinegar, baking soda, microfibre cloths, and by getting to the mess early. For a list of less toxic alternatives see www.lesstoxicguide.ca.

VOCs: Volatile organic compounds are off-gases that can lead to a number of symptoms from eye, nose, throat and skin irritation to serious damage to the respiratory system, liver, kidneys, and central

nervous system. VOCs are common in building materials such as plywood, particleboard and glues, paint, new carpeting and draperies, cleaning agents, tobacco, and combustion of gases. When renovating your cottage, look for low-VOC and low-emissions alternatives and allow products to air out for several days before installing inside (http://www.ene.gov.on.ca/envision/techdocs/4521e_6.pdf).

Carbon monoxide: CO fumes are highly toxic; high levels can lead to dizziness, nausea, disorientation, and can be fatal. There are a number of sources of carbon monoxide in a cottage including fireplaces, woodstoves, gas appliances, space heaters, camp stoves, grills, and power tools. It is a good idea to minimize the use of these items indoors and to have a carbon monoxide detector in the cottage (http://www.cmhc-schl.gc.ca/en/co/mahoyohoye/inaiqu/inaiqu_002.cfm).

Radon: Radon is a radioactive gas known to cause

lung cancer. It is a naturally occurring substance and can enter your cottage through a weak foundation. Testing is the only way that you can find out if your cottage has a dangerously high level of radon. To find out more about radon and how to test for it see Health Canada's website at <www.hc-sc.gc.ca/hl-vs/iyh-vsv/enviro/radon-eng.php>.

Mould: Mould is toxic, a known allergen, and can be a serious irritant to asthmatics. Mould is particularly tricky to combat in a building unless the building is maintained year round. To combat mould it is critical to keep the moisture in the building low and to keep it clean.

- Make sure that you repair all leaks in pipes, roof, walls, and flooring as soon as possible.
- Make sure that a seasonal use building is well sealed and there is no opportunity for moist air or animals to enter while the building is closed.
- Maintain adequate ventilation, and make sure that you do not leave wet towels and clothes lying around the house. Have a clothesline outside to take care of this!
- Keep organic waste in an outdoor composting unit.

- Make sure that you completely air out all equipment before storing it at the end of the season.
- Air out and store clean blankets and pillows in airtight, sealed bags over the winter to avoid a buildup of moisture.
- Books tend to be a collector of mildew and mould. Keep books and board games in a dry area and dispose of any items that have a musty smell.
- www.ec.gc.ca/CEPARRegistry/notices/NoticeText.cfm?intNotice=400&intDocument=2692

Keep It Clean!

Keeping the home clean is critical to minimize the factors that can negatively affect the air quality inside. Dust, mould, animal droppings and dander, and food waste are all major contributors to poor air quality. The best way to keep the air inside of your home breathable is to keep your home clean, ventilated, and well maintained.

To find out more about what you can do to save energy and reduce air emissions at the cottage or at home visit <www.cleanairfoundation.org>.

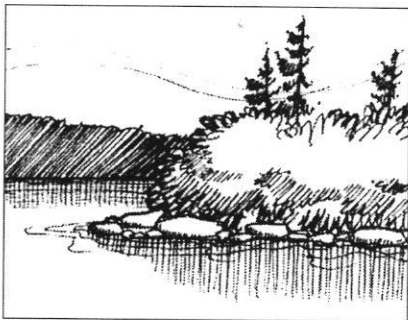
PLANNING AND PROTECTING FOR THE FUTURE

Land-Use Planning in Ontario

Heather Watson MCIP RPP
(EcoVue Consulting Services Inc.)

At one time in Ontario the supply of land was seemingly limitless. In twenty-first century Ontario land has become a commodity and a finite resource upon which there are many competing demands. As a result, we struggle to balance development pressures with the long-term need to protect prime agricultural lands, a supply of fresh water, mature woodlands, and natural open space.

The same struggles are front and centre in Ontario's shoreline areas. There is very little undeveloped shoreline left in Ontario and waterfront properties command a high price in the real estate marketplace.



Overdevelopment means the loss of the very values that make shoreline areas special—a sense of open space, dark starlit skies, the cry of the loon as it echoes across the evening stillness of the lake, and clear sparkling waters. Land-use

planning is the legislative process by which we attempt to balance competing demands for these resources.

In all planning decisions there must be an understanding of the greater good of the community and the goal of improved quality of life in the world. We must also understand the relationships between the land, resources, and people and be aware of the impact of changes in the balance between the natural world and people. In the end, we are not the owners of our world and

its precious resources; we are merely borrowing from future generations.

The Land-Use Planning Process in Ontario

Planning legislation is intended to guide decision making as we determine the future form of our communities and come to better understand our relationship with the natural environment. The legislation establishes a public process within which land-use and development decisions are made in Ontario. Public participation is an essential component of the planning process. For citizens who are concerned with the protection of the environment, an understanding of the planning process is essential.

This chapter offers a basic primer of planning terms, policies, and regulations that are fundamental to the approvals process in Ontario. Opportunities for effective public participation at each stage in the planning approvals process are identified and discussed.

Land-use planning in Ontario is governed primarily by the Planning Act and its implementation regulations, found in the Provincial Policy Statement. Municipal planning documents implement provincial policies and set out goals and objectives for long-term land use and development in our municipalities. At every stage in the planning process there are provisions for public involvement. What is more, the public has the responsibility for ensuring that the proper decisions are made. It is up to each and every one of us to make sure that the land-use decisions that are made are in the best interests of our communities and our futures.

Useful definitions

Planning Act: Provincial legislation that is the basis for planning in the province. The Act gives municipalities the authority to develop official plans, zoning regulations, and other planning tools to regulate land use and development.

Provincial Policy Statement 2005: Issued under the Planning Act, the Statement gives direction to planning approval authorities on matters of provincial interest.

Official Plan: A policy document adopted by a municipality, under Section 17 of the Planning Act, which establishes goals, objectives, and policies to manage and direct physical change and the effects on the social, economic, and natural environment of the municipality or part of it, or an area that is without municipal organization.

Zoning Bylaw: A bylaw passed by the council of a municipality, under Section 34 of the Planning Act, which restricts the use of land within the municipality and regulates the erection, location, or use of buildings or structures for purposes as may be set out in the bylaw. The zoning bylaw also prohibits the erection of buildings or structures on land that is subject to flooding or on land with steep slopes, or that is rocky, low-lying, marshy, unstable, hazardous, subject to erosion or to natural or artificial perils, as well as on contaminated lands, sensitive, or vulnerable areas.

Committee of Adjustment: A committee of council, authorized under Section 45 of the Planning Act, which has the authority to approve minor variances from the provisions of the

municipality's zoning bylaw. Variances of land, building, structure, or use are granted by the committee if in its opinion the variance is desirable for the development or use of the land, building, or structure.

Minor Variance: A decision by the Committee of Adjustment of a municipality, under Section 45 of the Planning Act, to vary the provisions and regulations of a zoning bylaw (e.g., required lot frontage, lot area or minimum side yard, to permit the use of land or erection of a building or structure) if the general intent and purpose of the bylaw and of the official plan is maintained.

Consent: A municipality gives its consent to sever land, to provide for an addition of land, for an adjustment to a lot line, or for a right-of-way or an easement. Consent is often referred to as a severance.

Land-Use Schedules: Maps attached to an official plan and zoning by-law that show the uses of land as defined by the municipality. The information shown on these maps forms part of the official plan or zoning bylaw.

Development: The creation of a new lot, a change in land use, or the construction of buildings and structures, requiring approval under the Planning Act.

Site alteration: Activities, such as grading, excavation, and the placement of fill that would change the landform and natural vegetative characteristics of a site.

Provincial Policy Statement (PPS)

The PPS specifically identifies natural heritage features areas where site alteration and development may not occur. In some cases development may be permitted if it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

In some cases site alteration and development is not permitted on adjacent lands unless the

ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

- Section 2.2 (Water) requires that planning authorities protect, improve, or restore the quality and quantity of water. Site alteration is restricted in or near sensitive surface water features and sensitive ground water features. The intent of the

PPS is to protect, improve, or restore these features and their related hydrologic functions.

- Section 2.6 (Cultural Heritage and Archaeology) states that significant built heritage resources and significant cultural heritage landscapes be conserved. Development and site alteration is only permitted on lands containing archaeological resources or areas of archaeological potential if the significant archaeological resources have been conserved by removal and documentation or by preservation on site.
- Section 3.1 (Natural Hazards) is intended to reduce the potential for public cost or risk to Ontario's residents from natural or human-made hazards. Development is directed away from areas of natural or human-made hazards where there is an unacceptable risk to public health or safety, or property damage. Natural hazards include flooding hazards, erosion hazards, and dynamic beach hazard limits. Hazardous sites include property or lands that could be unsafe for development and site alteration due to naturally occurring hazards. These may include unstable soils (sensitive marine clays [leda], organic soils) or unstable bedrock (karst topography).

Municipal Official Plans

An official plan (OP) is a formal document developed by a municipality to guide future growth and change for a specified period of time. Through the OP the municipality sets out a general policy framework to direct its land-use decisions. Among other things, an OP typically includes principles and policies regarding land severance and subdivision, environmental protection, heritage preservation, and the management of environmentally sensitive areas.

Both upper- and lower-tier municipalities can develop official plans to guide land use and development within their jurisdiction. The OP of a lower-tier municipality must conform with the OP of the upper-tier municipality. Although the Planning Act places responsibility for approval of Official Plans with the Minister of Municipal Affairs and Housing, the Province has delegated this responsibility to upper-tier municipalities such as the District of Muskoka and the County of Haliburton, and to single-tier municipalities such as

the City of Peterborough and the City of Barrie. Official plans must be updated every five years and it is important that the official plan conforms with any changes in policy at the provincial level during these updates. In addition to these reviews, official plan amendments may be proposed at any time to permit projects that do not conform with the existing plan or to have protection issues addressed.

Members of a community have the opportunity during the development of an official plan and during the five-year review to participate and provide input. The public is invited to an open house to learn about the proposed changes to the OP and to voice opinions about these changes. A statutory public meeting is the formal opportunity for members of the public to provide comments and to register any formal opposition to changes. If you do not attend the public meeting or provide written comments, you will not be able to object to the decisions made by the municipality. More information on the public process is provided in the section Citizen Participation.

Implementing Zoning Bylaws

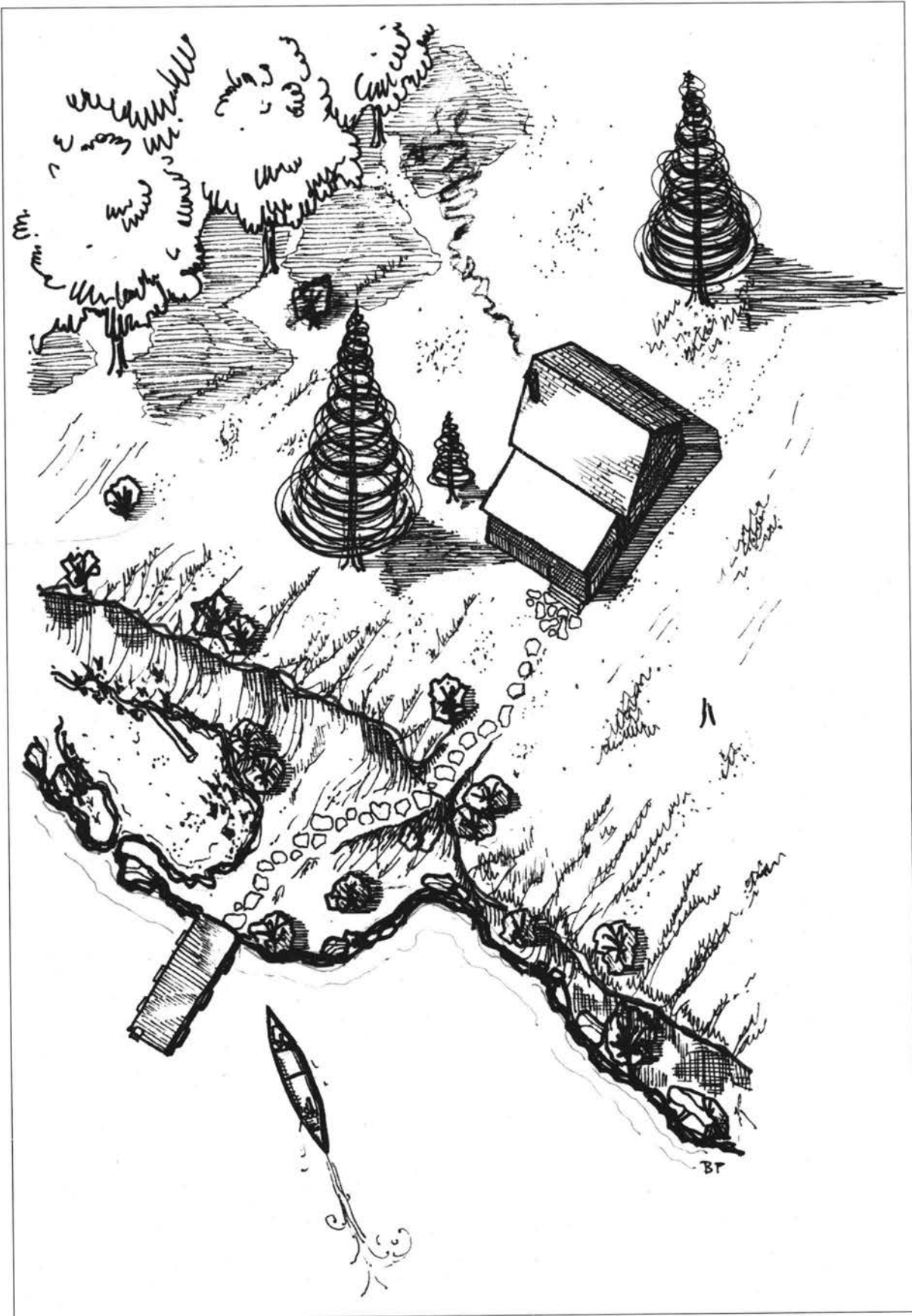
A zoning bylaw is adopted by a municipality to implement the policies contained in its official plan. The bylaw places restrictions on the use of land, buildings, and structures in the municipality.

The Planning Act requires that all zoning bylaws conform with the official plan of the municipality. A zoning bylaw contains very specific provisions and legally enforceable regulations. Detailed information contained in zoning bylaws includes lot size, types of permitted uses and dwellings, and location of structures (setbacks). Any new development must conform with a municipality's zoning bylaw before a building permit is issued.

Zoning bylaws follow a similar approval format to that of the official plan or amendment. The Planning Act requires that at least one public meeting be held. Citizens concerned with the environment can participate through discussions with planners and politicians and by attending public meetings.

The 30 Metre Setback

Recently, the Ministry of Municipal Affairs and Housing has begun to include mandatory setback requirements for shoreline development in official



plans and to require that these setbacks be included for all shoreline areas outside of settlement areas.

The province recognizes that the character of shoreland areas is linked to the natural and built form associated with lakes and rivers. For the most part, the natural form includes vegetated shorelines with thin soils over bedrock. The built form includes predominantly residential development interspersed with some commercial developments including resorts and marinas. Shoreland areas are generally associated with leisure, recreation, water supply, support for fisheries, and wildlife habitat. As such, development occurring in the Shoreland Areas should enhance and protect, where possible, those qualities that contribute to the area's character.

In some cases local plans and zoning bylaws will require that all new development and sewage disposal systems be set back at least 30 metres from the ordinary high water marks of all water bodies. Excepted from this requirement are marina facilities, docks and other water access facilities, pump houses, and minor accessory buildings and structures as defined by zoning bylaws.

Citizen Participation

It is important for concerned citizens to become actively involved in the land-use planning process in their community and by doing so they will protect and enhance the environment in their area. Involvement in the planning process does not

necessarily need to be confrontational. By being involved in the process of developing an official plan protection can be obtained for significant environmental features in your community. Up-front involvement through consultation and informal discussions with municipal planners and politicians is invaluable. Participation in formal public meetings gives the local community (including cottagers) the ability to voice their meaning of community. There is also the right to appeal under certain conditions. This involvement allows a community to defend its lake from inappropriate development and obtain protection for environmentally sensitive or significant areas. It is important to remember that even if the struggle to prevent development is lost, a partial success is still possible by modification of the development proposal with good environmental planning. To do this a cottage community needs to be organized and well informed of what is being proposed in their community and be willing to participate in the planning process from the early stages of a proposal. You must make a submission (verbal or written) if you intend to appeal a decision.

Citizen participation is a key component of the planning process in Ontario. The Planning Act describes who will be notified regarding a proposed change in a land-use policy or regulation affecting a parcel of land. The Planning Act also prescribes the length of time the public will be given to respond to a proposed change. The municipality must provide information about the effects the change will have and where further information is available and the date, time, and location of the meeting at which the request will be considered.

Within thirty days of an application being filed under the Planning Act the municipality must review the application and advise the applicant whether the application is complete. If the application is deemed complete, within 15 days the municipality must advise the public that a complete application has been filed. The municipality will schedule a public meeting to hear comments regarding the proposed change, having given 20 days notice of the date, location, time, and purpose of the public meeting.

Official Plan: A municipality is required to hold a public meeting at least once every five years to review the plan. Proposed amendments require at least one public meeting that must be advertised

The 30 metre setback...

is intended to:

- promote the development and management of existing and future open-space buffers in a natural state so that they may serve as vegetated protection zones;
- control erosion and preventing nutrient overloading in waterbodies;
- preserve and enhance wildlife habitat areas;
- improve water quality on a watershed basis;
- recognize and preserve to the greatest extent possible the character of water bodies and lands adjacent to the shoreline; and
- ensure that the built form along the shoreline is not overly concentrated or dominating to the detriment of the natural form.

20 days in advance. For a new official plan or a five-year official plan review, an open house is required to be held at least seven days before a statutory public meeting is held. Notice of the public meeting must be given 20 days in advance to everyone affected by the new official plan, usually by means of a notice in a local newspaper. Concerned citizens may make presentations at this meeting or written statements to the municipality expressing their concerns.

Official Plan Amendment: A statutory public meeting is held. Notice of the public meeting must be given 20 days in advance to everyone within 120 metres of the subject property. Notice is most often given by first-class mail and a notice is posted on the subject lands.

Zoning By-law Amendment: A statutory public meeting is required. Notice of the public meeting must be given 20 days in advance to everyone within 120 metres of the subject property. Notice is often given by first-class mail and a notice is posted on the subject lands. You must make a submission (verbal or written) if you intend to appeal a decision.

Minor Variance: Applications for minor variance must be heard within 30 days of the filing of the application. A notice of the hearing is sent to landowners within 60 metres of the affected lands, in advance of the Hearing.

Up-front involvement and consultation is an important component of the planning process. To stay informed of planning activities at the cottage be sure to order your local newspaper year round and monitor for activities. Municipalities are beginning to take advantage of the Internet as a means of providing information to residents; watch your municipality's website for up-to-date news on your community.

Ontario Municipal Board

In the case of a conflict between a decision made by a municipality and the desired outcome for either the applicant or those affected by the proposed change, the Ontario Municipal Board (OMB) is the ultimate authority. The OMB hears appeals on a wide range of issues ranging from the failure of a municipality to make a decision within the prescribed timeframe, to the types of conditions attached to a decision, to the decision itself.

The OMB provides opportunities for mediation in order to resolve an impasse as well as pre-hearings to reduce the scope of an appeal before the Board. OMB hearings can be time-consuming and very costly for everyone involved. In an attempt to streamline the appeals process, the province now restricts people from launching an appeal at the eleventh hour if they have not participated in the planning approval process prior to the appeal. If you have a concern, be sure to make either a verbal or written submission to the council of your municipality prior to or during the public meeting at which the application will be considered to ensure that your voice will be heard.

Resources

Ministry of Municipal Affairs and Housing:
www.mmah.gov.on.ca

The site provides information about many aspects of the planning process, including the PPS, the OMB, municipal planning and development tools, and approval authority.

Ontario Professional Planners Institute:
www.ontarioplanners.on.ca
Information about planning, healthy communities, and community planning.

The Planning Act, Revised Statutes of Ontario 1990:
www.elaws.gov.on.ca/html/statutes/english/elaws_statutes_90p13_e.htm

www.greenontario.org/osgn

www.omb.gov.on.ca

www.conservation-ontario.on.ca

www.yourlocalgovernment.com/

Watershed Planning

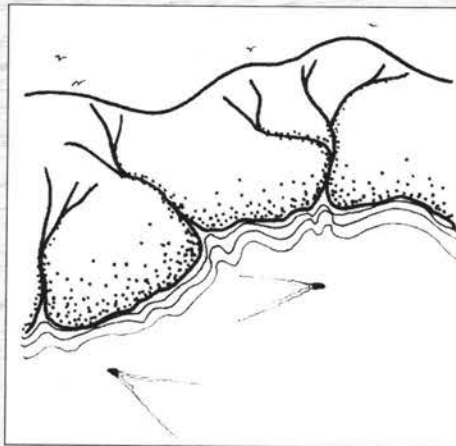
Heather Sadler MCIP RPP

Watershed planning takes land-use planning beyond municipal boundaries to include the total area drained by a watercourse and its tributaries. This area is referred to as a watershed. Features of a watershed include physical characteristics such as streams, lakes and ponds, valleys and hillsides, woodlands and fields, wetlands and wildlife

communities, as well as socio-economic features such as roads and electrical transmission corridors, villages, towns and cities, pits and quarries, farms and factories. The common factor to both the physical and socio-economic features of a watershed is water.

What is a watershed?

A watershed (also called a drainage basin or a catchment) is defined as an area of land that intercepts and drains precipitation through a particular river system or group of river systems. Drop by drop, water is channelled into soils, groundwater, creeks, and streams making its way to larger rivers and eventually the ocean. In other words, it is a region of interconnected rivers and streams that function as a unified system for water



transport.

The concept of a watershed is very important because it pertains to everyone. No matter where people live, they live in a watershed and what we do on the land affects water quality for all communities living downstream. Water is a universal solvent affected by all that it comes in contact with—the land it traverses and the soils through which it travels.

Water for Life

At our most basic level human beings depend on water for life. Eighty-three percent of the human circulatory system is water; drinking, respiration, perspiration, and elimination of wastes are all part of this cycle. On a broader scale, human society depends on water for most economic activities including agriculture and mining, food processing, manufacturing, and the generation of electricity from thermal power plants. We value our supply of fresh water as a recreational resource for boating, swimming, and fishing. Only a small percentage of

the earth's water is fresh water and only a small percentage of that water is available to us to support human society.

Failure to manage this precious resource wisely for the future will have drastic repercussions. Thus, it is very important that we understand the key role of water within our watershed and within our neighbourhood. The hydrologic cycle (water cycle) provides a way of visualizing these interrelationships. It also allows us to understand how human intervention can affect the cycle.

Impacts of Human Activity on the Water Cycle

Land development alters the water cycle and impacts watershed health. Development replaces pervious natural land cover with hard impervious surfaces, thereby altering natural drainage processes. Prior to development, the landscape is capable of absorbing water from rainfall and snow melt, allowing it to infiltrate into soils, recharge groundwater systems, and provide base flow to rivers and streams while the rest drains slowly over the surface. Vegetation, soils, and organic matter cleanse the water and manage its pace as it flows over and through the ground. The water takes many paths, some fast and some slow, as it runs into rivers, streams, and other water systems in the watershed.

When land is developed impervious surfaces such as pavement and buildings replace absorbent land, preventing water from infiltrating into the

ground. This reduced infiltration causes corresponding reductions in groundwater recharge and base flow to rivers and streams. Reduced infiltration also increases the volume and velocity of surface runoff and thus increases the threat of flooding. Increased and faster runoff impacts stream health and water quality causing erosion, sedimentation, channel incision, stream-bank instability, and habitat degradation. The impacts of these changes to the water cycle vary in intensity: in agricultural irrigation a large percentage of the water returns to the atmosphere through evapotranspiration; water used for other applications returns to its source but contains waste products (or has to be treated to remove them); water used for thermal power plants contains waste heat on its return; water used to drive turbines for hydroelectricity is temporarily removed from its course.

A provincial perspective on watershed planning

"... Municipalities have the legislative authority and political responsibility to undertake comprehensive land-use planning which considers environmental issues. A consensus is emerging that currently, land-use planning does not always satisfactorily protect the environment, particularly from the negative cumulative environmental effects of changing land uses."

"... [A]dequate information is not always available for land use decision making. When ecosystem considerations are integrated into the planning process, it is more likely that land use decisions will not jeopardize ecosystem and human health. An ecosystem approach can result in economic savings by avoiding the need for

costly and difficult remedial actions.

An ecosystem approach to land use planning requires that boundaries for land use planning be based on biophysical boundaries as the context for examining the relationships between the natural environment and human activities."

"The primary boundary for an ecosystem approach to land use planning should be the watershed.... [T]he hydrologic cycle ... [is] the pathway that integrates physical, chemical and biological processes of the ecosystem."

Water Management on a Watershed Basis: Implementing an Ecosystem Approach. June 1993. Queen's Printer for Ontario.

The Watershed Perspective

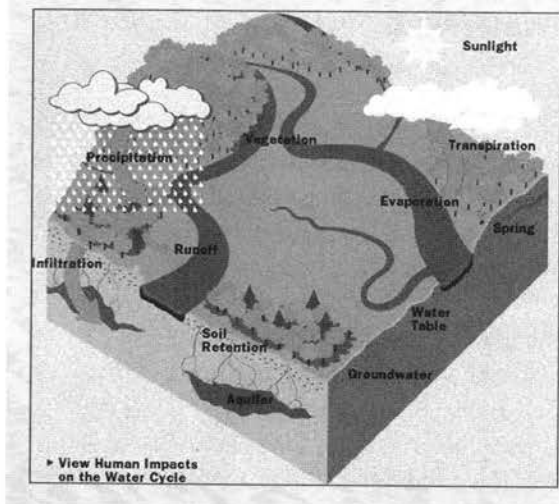
The watershed perspective introduces an element of environmental responsibility that may be neglected in traditional municipal planning functions and processes. By looking beyond their immediate area or jurisdiction, planners and decision makers can begin to understand the natural, physical impacts of land-use decisions and

the broader context of cause and effect. As a result, planning decisions can begin to reflect the reality of an area; this understanding can lead to better decisions that are made in the context of functional limits.

Watershed planning employs an ecosystem approach to understanding environmental interrelationships and to managing change within

The hydrologic cycle

Driven by the sun, the hydrologic or water cycle converts solar energy into energy that performs the main transport functions in ecosystems. Water cycles throughout the oceans, the atmosphere, the soil, bodies of fresh surface water, and living organisms. The main processes, illustrated in the figure below, are evaporation, precipitation and condensation, infiltration to soil and groundwater, flow to vegetation or to streams and other water bodies, and then either transpiration from plants into the air or runoff via rivers to the oceans. These processes purify the earth's supply of water, reshape the earth itself by erosion, drive other biogeochemical cycles, and redistribute the elements necessary for life (e.g., nutrients and carbon). The hydrologic cycle is a key part of the global climate system and provides the condition and basis for all life.



the watershed. This approach to land-use planning requires that boundaries for land-use planning be based on biophysical boundaries as the context for examining the relationships between the natural environment and human activities. While in the end we acknowledge that "everything is connected to everything else," such an all-inclusive view can prove unwieldy and unmanageable for those attempting to make or influence informed planning decisions. The boundaries of a watershed provide natural limits for understanding and managing interconnections between human activities and the natural environment.

A watershed plan recommends how water resources are to be protected and improved as land uses change within a watershed. A sub-watershed plan provides more detailed information about an area drained by a specific tributary within the watershed. The watershed plan should be based on a body of field research and other technical information and should include information about the form and function of natural systems within the watershed. The plan should also investigate and explain the relationships between the organisms, including human beings, within the watershed that use water and the natural processes that sustain the supply and quality of that water.

Watershed planning and land-use planning consider the same environmental issues but from different viewpoints and levels of detail. The integration of watershed and land-use planning together can be achieved through a watershed-management plan.

Ecosystems

An ecosystem is defined as a localized group of interdependent organisms together with the environment that they inhabit and on which they depend.

Ecosystems vary in size and composition and display functional relationships within and between systems. The term may be applied to a unit as large as the entire ecosphere or to smaller divisions such as small lakes.

Watershed-Management Plans

A watershed-management plan is a document developed cooperatively by government agencies and other stakeholders to manage the water, land/water interactions, aquatic life, and aquatic resources within a particular watershed. It assumes a broad ecosystem approach to natural resource features that are water-related, provides a comprehensive understanding of ecological form and function within the watershed, provides watershed-wide policy directions, delineates sub-watershed-planning areas and identifies priorities for further detailed studying.

By developing a watershed-management plan a municipality is able to deal with issues early on when they are much easier and less costly to correct. It means seeing what's happening in the

entire river basin. It means getting taxpayers, councillors, developers, and other stakeholders together as a watershed community to identify development constraints and opportunities.

The information included in the watershed-management plan can provide valuable background for policies and provisions included in municipal official plans and zoning bylaws. The input of environmental considerations, goals, and management recommendations into the land-use planning process at an early stage contributes to informed decision making. When ecosystem considerations are integrated into the planning process, it is more likely that land-use decisions will not jeopardize ecosystem and human health.

The Watershed Report Card

Communities can access a set of tools known as the Watershed Report Card to improve connections between human activity and natural systems on a watershed basis. The report card can be done on a lake basis or for the entire watershed. The report is written for citizens and it allows local residents and interest groups to assess the health of their watershed.

Many Conservation Authorities in Ontario prepare Watershed Report Cards from time to time. These Report Cards summarize the conditions of four elements within watersheds (surface water, groundwater, vegetation, watershed health) using a protocol developed for Conservation Authorities across the province. The intent is to allow for comparisons of watershed health between populated areas of Ontario. Some non-governmental organizations, such as the Muskoka Watershed Council, have also prepared Watershed Report Cards for their area. Stewardship Ontario also promotes the preparation of Watershed Report Cards as a means of research, writing, and publication of a scientifically defensible manual that community groups can easily use to improve environmental health.


The objective of a Watersheds Report Card is to evaluate changes in ecosystem condition and the impact of human actions against a standard of a healthy functioning ecosystem. A review of existing data on the health of water, air, and landforms within the watershed forms the basis for a Watersheds Report Card. The Report Cards typically summarize the strengths, weaknesses,

The Muskoka Watersheds **REPORT CARD**

SUMMER 2007


DRINKING WATER A-

OUR DRINKING WATER QUALITY IS EXCELLENT, BUT PLANS TO PROTECT DRINKING WATER SOURCES FROM CONTAMINATION ARE NEEDED.




AQUATIC HABITATS B

DEVELOPMENT HAS DAMAGED FISH AND WILDLIFE HABITATS. GEORGIAN BAY IS EXPERIENCING SIGNIFICANT CHANGES DUE TO INVASIVE SPECIES.




ECOSYSTEM PROTECTION A-

50 PER CENT OF THE WATERSHED IS PROTECTED FROM DEVELOPMENT, BUT THERE IS LITTLE PROTECTED LAND IN THE CENTRAL PART OF THE WATERSHEDS.



STEWARDSHIP ACTIVITIES A-

MUNICIPALITIES HAVE INTRODUCED MORE STRINGENT DEVELOPMENT CONTROLS, AND MANY LAKE ASSOCIATIONS ARE UNDERTAKING MONITORING AND STEWARDSHIP PROGRAMS.




HOW CAN WE IMPROVE OUR WATERSHED GRADES?

THE HEALTH OF MUSKOKA'S ENVIRONMENT IS FACING UNPRECEDENTED CHALLENGES, BUT WE CAN TAKE THE FOLLOWING STEPS TO MAKE THINGS BETTER:

- Protect shoreline vegetation
- Reduce hardened surfaces
- Protect significant wetlands
- Reduce habitat fragmentation
- Maintain large natural areas
- Remediate degraded sites
- Contain urban sprawl
- Reduce carbon emissions


DEVELOPMENT IMPACTS C

URBAN AREAS NEED PLACES WHERE STORMWATER CAN SOAK INTO THE GROUND. SHORELINE VEGETATION NEEDS TO BE MAINTAINED.




WETLAND PROTECTION C

43 PER CENT OF PROVINCIAL SIGNIFICANT WETLANDS ARE PROTECTED ON CROWN LAND, BUT THERE IS NO PROGRAM TO EVALUATE ANY MORE LARGE WETLANDS.




RECREATIONAL WATER A-

GENERALLY, OUR LAKES ARE IN GOOD TO EXCELLENT CONDITION. HOWEVER, DEVELOPMENT, ACID RAIN AND CHANGING CLIMATE PATTERNS ARE HAVING SIGNIFICANT IMPACTS.




AIR QUALITY D

THERE ARE 10 TO 30 DAYS OF POOR AIR QUALITY A YEAR. ACID RAIN HAS NOT BEEN REDUCED ENOUGH TO SEE A FULL RECOVERY OF NATURAL ECOSYSTEMS.



The Muskoka Watersheds Report Card is produced by The Muskoka Watershed Council, an organization founded by the District of Muskoka and the Muskoka Heritage Foundation. The Muskoka Watershed Council's goals are: to preserve and enhance the air, water and terrestrial ecosystems of the watersheds in Muskoka for the environmental, health, economic, spiritual and intrinsic values they provide. For the full research report by the Watershed Council visit www.muskokaheritage.org/watershed



Muskoka
WATERSHED COUNCIL

opportunities, and threats to the watershed and highlight areas and programs that can address some of the identified threats, build on the strengths and take advantage of the opportunities to ensure the long-term health of the area.

Watershed Planning in Cottage Country

Has a watershed-management plan been prepared for your community? If so, has it been implemented through policies in your local official plan? In most areas, the answer to this question will be a disappointing "no"! Although provincial policy endorses the concept of planning through the Provincial Policy Statement and has long recognized the value of this approach, watershed-

based planning remains the exception rather than the rule in most communities. In some parts of Ontario, Conservation Authorities, which are defined by a watershed (such as the Grand River Watershed, the Otonabee River Watershed, and the Rideau River Watershed), have prepared watershed plans and sub-watershed plans for watercourses within their jurisdiction. (Conservation Authorities do not exist in many parts of cottage country, including the Counties of Haliburton and Renfrew, northern Hastings County, and the northern half of the City of Kawartha Lakes, as well as the District of Muskoka.) For the most part, these plans are gathering dust on shelves in planning offices and storage rooms across the Province. Integration of these plans into municipal policy is not easy. As was discussed at the beginning of this chapter, watershed-based planning does not stop at municipal boundaries. Rather, watershed planning requires cooperation between municipalities and coordination of planning policies and programs across municipal boundaries. There remains an obvious disconnect between watershed planning, watershed-management plans, and the municipal planning process. There is much work to be done before the fundamental connections between watershed planning and municipal planning are fully recognized in Ontario and integrated into environmentally sustainable policy foundations for our communities.

Lake, River, Island, and Beach Plans

Watershed planning can sound very "large scale" if you live on a small lake or river. Even if there is watershed planning occurring in your area, you

may want to think about getting involved in some planning in your community. The characteristics and features of individual "lakesheds" or "riversheds" are very important to the overall management of a watershed and tend to be overlooked when the focus is at a broader scale. Start by identifying the natural (wetlands, water quality), physical (soils, geology, water levels), and social (aesthetics, noise, roads) factors that influence the quality of life in your community. Once a community identifies the things that are important to them, it can start to target the areas where conservation and stewardship initiatives would be beneficial.

Starting a lake plan or a stewardship program can range from being very easy to implement to being a costly and long-term strategic process. There are many ideas and examples that lake associations across Ontario have implemented in their communities from shoreline restoration projects to lake plans to workshops and events. For more information on lake planning and stewardship initiatives visit <www.foca.on.ca> and request a copy of the "Lake Planning Handbook for Community Groups."

Resources

Conservation Ontario: www.conservation-ontario.on.ca

The Atlas of Canada: www.atlas.nrcan.gc.ca

Great Lakes Information Network: www.great-lakes.net

Land Trusts: A Powerful Conservation Tool

Sandy Gillis

What, me worry?

If you believe that your lake will always be as beautiful as it is today, if you are confident that your local and provincial governments are vigilant about protecting your little piece of watery heaven, if you feel that a hotel, condominium, or golf course on the opposite shore would look better than rocks and trees, then you may skip this chapter.

You're still reading, aren't you? If a good number of us were not worried about the future of our lakes, there would be no need for lake associations and no need for FOCA. Many of us are tired of what I will call "crisis activism"; i.e., flying into action and rallying the troops when some new development threat comes along.

There is an alternative to a knee-jerk, reactive approach to environmental planning. Land trusts provide a wonderful conservation solution that is both proactive and permanent.

What Is a Land Trust?

A "trust" is a property held by one person or entity for the benefit of another individual or community, as in the case of a trust fund. In the case of a land trust, as the name implies, it is land that is entrusted to an organization to be cared for according to predetermined environmental standards, in the interest of the community. Land trusts may be national, as in the case of the Nature Conservancy of Canada, regional (The Kawartha Heritage Conservancy) or local (Ahmic Lake Land Trust), and may serve various purposes such as the protection of natural habitats, scenic landscapes, agricultural land, or even heritage buildings. I will use the term to refer to local, non-governmental organizations dedicated to the protection of lakes and rivers by owning and/or managing specific parcels of land according to predetermined environmental standards. Land trusts are

incorporated and are registered charities. Most land trusts are formed by interested volunteers but many grow to have paid staff positions.

The formation of small, privately run land trusts is gathering momentum as an approach to environmental protection. In the United States in 1950, there were only 53 land trusts in existence. By 2005 there were 1,667. In Ontario, the 1997 inaugural meeting of the Ontario Nature Trust Alliance (now known as the Ontario Land Trust Alliance or OLTA) welcomed 11 founding member organizations, and it now has more than 40. That's nearly 400 percent growth in 11 years!

Why Should You Join the Land Trust Movement?

Official plans and lake plans provide development guidelines but no guarantees. Anyone can ask for a variance or an amendment to the official plan. OPs are constantly challenged by developers and cottage associations have been faced with expensive appeals to the Ontario Municipal Board. Moreover, each new election brings a new municipal council with, perhaps, a different agenda from the last. Land trusts provide conservation tools that are lasting and immune to the vagaries of politics. Lands owned and held in trust by these organizations are out of the reach of developers. Should the land trust dissolve for any reason, the disposition of its lands would, by virtue of the laws that govern all charities, be consistent with its conservation goals. For example, the lands might be donated to another land trust.

If you're lucky, you already have an established land trust in your community and you need only to volunteer, join, or contribute. Check the OLTA website (www.ontariolandtrustalliance.org), which provides a complete list of members as well as a map showing the area of operation of each land trust.

If there is no land trust in your area, you may still wonder whether it is necessary to form one. Why not just gather a group together informally to purchase a piece of land that needs protection? Why bother with the legalities of incorporation? A formal land trust organization is advantageous for a number of reasons. As a registered charity with stated conservation goals, it inspires confidence among potential donors that their money will not be used to serve individual, corporate, or political interests. Land trusts must adhere to the Canada Revenue Agency's rules for charities. They are also guided by the Standards and Practices provided by OLTA and the Canadian Land Trust Alliance (CLTA). This provides donors with assurances that they are donating to a reputable organization. The ability to issue a charitable donation receipt is an invaluable aid to fundraising, which is, of course, a prerequisite to land procurement. As a respected, locally run organization your land trust will be in a much better position to gain the trust of local landowners who might be distrustful of

government agencies (Hilts and Reid 1993). Hilts and Reid portray successful land trusts as ones that "view landowners as their allies and their clientele, and seek to build on the goodwill of private landowners to achieve their objectives. Successful land trusts become an integral part of their communities and are open and responsive to local input. They seek a sense of community ownership, of being 'our land trust', in the same way that the local hospital is viewed as 'ours'."

But I Hate Fundraising!

If you find fundraising hair-raising, be assured that a little creative thinking can go a long way towards minimizing expense. For example, landowners who

do not have heirs to whom they wish to leave their property may want to take advantage of the tax benefits of donating their property while maintaining the right of lifetime tenancy. A cottager who owns acres of beautiful forest around his cottage and wishes to donate some of it in order to assure that the area remains untouched for future generations will also enjoy the benefit of saving money on property taxes. The Income Tax Act provides a category of charitable donation known as ecological gifts and most land trusts are eligible

recipients of such gifts. Your donors should seek advice from their own tax advisors as to how to maximize the benefits of their gifts but your board should familiarize itself with the potential tax advantages. There is a great deal of literature available from the OLTA and existing land trusts on the tax benefits of donations for conservation purposes.

Conservation easements provide another alternative to outright purchase or donation of land. A conservation easement is a voluntary legal agreement between the owner of a property and

at least one other party (in this case it would be your land trust) who "holds" the easement. The agreement places specific restrictions on the use and development of the property. These restrictions serve to preserve the property's heritage features. In the case of a lake-based land trust, this would most likely refer to natural heritage features such as wildlife habitat, forests, wetlands, and undisturbed shoreline but features can also include built heritage (e.g., a historical building), recreational heritage (e.g., the Bruce Trail), or cultural heritage (e.g., a particularly beautiful rock formation that is valued by the community or an archeological site). Conservation easements are as varied as the properties themselves and are tailored



to the goals of the owner. It may apply to all or a small portion of the property; for example, it might provide for a buffer zone between the lake and the cottage and restrict any changes to the topography and flora of the land in that area. Since conservation easements remain on title in perpetuity, they are also a way for landowners who wish to preserve their own property to do so without giving up the pleasures and benefits of ownership. Moreover, the market-value assessment approach to taxation means that many donors of conservation easements, which restrict uses of the property, see their property taxes decrease.

There are also a number of grants available to help land trusts with the costs associated with land or conservation easement acquisition. Land trusts that are members of the OLTA and the CLTA are kept abreast of these opportunities as they arise.

I Also Hate Paying Taxes!

It's all well and good to receive donations of land but doesn't the land trust incur a liability in the form of property taxes? There are a number of ways that land trusts can reduce or eliminate high property-tax obligations. The Conservation Lands Tax Incentive Program (CLTIP) relieves the land trust of the tax burden on eligible properties. This program is administered by the Ministry of Natural Resources and further information may be found on the Ministry website. The Managed Forest Tax Incentive Program (MFTIP) provides a 75 percent tax reduction on forested properties of 10 acres or more with the submission of an approved management plan. Conservation is an approved management goal and requires only periodic inspection of the property.

OK, I'm Interested. Where Do I Begin?

Like many great achievements, your land trust will begin with a meeting. Presumably, as an environmentally aware property owner interested in conservation, you number among your friends and acquaintances at least a few like-minded individuals who you should now invite over for a chat. If there is enthusiasm for the land trust idea, this group will constitute your founding committee. You should now begin to discuss priorities and goals, and to come up with a mission statement and a name that will convey to the community what you are all about. You will probably require a

small initial outlay from the founding members in order to cover the fees associated with incorporation and registration as a charity. Donations of professional services can be as valuable as cash; take a good look at the membership of your cottage association for anyone who can help out, such as lawyers (especially lawyers!), naturalists, artists (publicity and promotion), printers, accountants—you get the idea. Anyone with good leadership skills, speaking skills, or simply lots of enthusiasm will also make a good member of your founding board or part of your volunteer base.

Your first outlay might be \$10 to purchase the book *Creative Conservation: A Guide for Ontario Land Trusts* by Stewart Hilts and Ron Reid, available on the Ontario Nature website (www.ontarionature.org). This book provides an excellent overview of almost every facet of land trust activity. A little more costly but well worth the investment would be a trip by your founding committee to the yearly OLTA "Gathering," where workshops are offered for all levels of land trusts, including beginners. This conference is inspiring, informative, and provides an invaluable opportunity to meet and pick the brains of members of successful land trusts. Without spending a penny, you can also visit the OLTA website (see above), which provides a list of its members and, in many cases, links to members' websites. Here you can look for members whose goals are similar to your own. Get on the phone and start talking, and before you know it you'll be on your way.

Case Study: One Lake and Its Land Trust

The Lake Clear Conservancy began with a challenge to the official plan. In the case of Lake Clear, a landlocked lake in the upper Ottawa Valley, the official plan specified that there was to be no development on the islands, to which no services are provided. The islands could be bought cheaply since development was not permitted. When the new owner of the lake's largest island asked for an OP amendment to allow him to develop it, the cottage association voted overwhelmingly to oppose his application. What ensued was a financially and emotionally draining battle (including an OMB hearing and large legal bills) that was only partially successful. A handful of association members said, "Never again!" From

now on, they vowed, they would be proactive and deal with potential problems before they arose. The result was the birth of the Lake Clear Conservancy (LCC).

Part of the advantage of forming a land trust is that there is a legal entity ready to act when opportunities arise. The first official act of the LCC was to acquire three of the islands in the lake by paying the back taxes owed on them. Funds were raised through membership fees and donations. More recently, the LCC was ready to intervene in a dispute between the township and the owner of an illegal building on a tiny island. Rather than incur more legal bills, the owner of the island opted to give it to the land trust in return for a tax receipt for the appraised value of the property. A group of LCC volunteers donated their time to take the building down and restore the island to its natural state.

Many of the islands in the lake are crown lands, and although safe from development, there were other problems associated with them in the form of irresponsible campers who left piles of garbage, cut trees, and on at least two occasions, started fires. The MNR staff is spread too thin to keep an eye on all crown lands. Once again, by virtue of its status as a recognized, incorporated land trust, the LCC was able to act by forming a partnership with the MNR and the township. By virtue of this three-way agreement the LCC was given authority to steward the islands. A system of free camping permits was initiated, thereby giving the LCC a record of who was camping where and when, and making campers accountable if anything was left behind. Two local merchants agreed to provide the permit application sites and the township agreed to pass a bylaw to support the permit system. A report prepared for the township on the outcome of the

Island Camping Program stated the following: "A year end inspection of the islands revealed no damage to vegetation and very little litter."

Today, the LCC is engaged in developing a program to acquire shoreline conservation easements. In co-operation with the cottage association and by means of its newsletters the LCC promotes good lake stewardship by landowners. It also runs a yearly charity golf tournament that has become a social highlight of the summer season to those who participate year after year. But the real beauty of the land trust concept is this: if the LCC did nothing more, those four islands would still be conserved in perpetuity, regardless of changes in elected officials or in the official plan. Conservation that is permanent is something we can all feel good about.

Resources

Canadian Land Trust Alliance: www.clta.ca

Ecological Gifts Program via Canadian Wildlife Services: www.cws-scf.ec.gc.ca

Lake Clear Conservancy: www.lakeclear.org

Ontario Land Trust Alliance:
www.ontariolandtrustalliance.org

For information on MFTIP and CLTIP:

Ministry of Natural Resources: www.mnr.gov.on.ca

Municipal Property Assessment Corporation:
www.mpac.ca

Ontario Forestry Association: www.oforest.on.ca

Ontario Woodlot Association: www.ont-woodlot-assoc.org

Protecting the Environment

G. Hunnius, J. DeMarco and C. Nielsen

(updated by A.M. Lintner)

Although recently we have seen an overall increase in government attention to environmental stewardship, individuals and organizations have continued to take an active role in ensuring that safeguards for the environment are put in place and implemented. This chapter summarizes some of the applicable laws to water quality and environmental protection. Additionally, lists of responsible government agencies are provided. Other resources are also noted including governmental and non-governmental organizations that play a role in ensuring that environmental legislation is upheld. This chapter is not meant to replace the need to consult legislation and contact responsible authorities and legal experts, but rather is a basic introduction to some of the laws and regulations available to help ensure proper environmental stewardship.

In April 1997, Eva Ligeti, then Environmental Commissioner of Ontario, presented her 1996 Annual Report to the Speaker of the Legislative Assembly for submission to the Legislative Assembly of Ontario. Some of the points she made are disturbing. The following quotes from her report reflect changes in environmental protection we have all relied on previously.

Throughout 1996, the ministries demonstrated an alarming lack of environmental vision. They failed to put their stated environmental values into action. Instead, their activities were characterized by omnibus-style legislation, cuts to environmental programs and the shift of environmental responsibilities to municipalities and the private sector.

Perhaps the most significant decisions made in 1996 were those that reduced the ministries' responsibility to protect the environment.

Since then, each Annual Report of the Environmental Commissioner of Ontario has tracked both progress and setbacks with respect to the ministries' environmental responsibilities. Most recently, the Environmental Commissioner of Ontario has launched a new website that tracks progress on all of the Commissioner's recommendations made in the past ten years (see

www.ecoissues.ca for a list of ECO Recommendations). Little or no progress has been made on several of the recommendations that relate to water protection.

At the same time, there has also been astonishing progress with respect to new or improved legislative protection of water in Ontario. As indicated in the Environmental Commissioner's 2007 Special Report to the Legislative Assembly entitled "Doing Less with Less – How shortfalls in budget, staffing and in-house expertise are hampering the effectiveness of MOE and MNR" (search this title at www.eco.on.ca) what is lacking is the financial commitment to ensure environmental protection and enhancement is implemented and enforced.

As legal protection for the environment has improved in Ontario, the federal government has been consistently deregulating and can be expected to continue to do so for the time being. FOCA and over 500 member organizations will have to continue to take on additional responsibilities for the protection of the natural environment. This chapter gives you some basic data and suggestions on how to go about doing this.



Fish Habitat: Environmental Protection That Bites!

The general health of a lake and the state of shoreline development plays a significant role in the well-being of the aquatic ecosystem, which includes fish and plant life. Preventing destructive development along shoreline riparian areas and in the littoral zone are important aspects of lake stewardship. When it comes to the protection of aquatic ecosystems, the federal Fisheries Act is one of the main tools for ensuring the protection of fish and other aquatic organisms and their habitat.

The Fisheries Act is a very strong piece of legislation with respect to the protection of aquatic ecosystems. Those who are convicted under the federal Fisheries Act may face stiff penalties including fines up to one million dollars and up to three years in prison. This Act takes precedence over provincial legislation, unless specifically noted otherwise, and is often enforced by provincial authorities. Two of the most important sections of the act are detailed below.

No person shall carry on any work or undertaking that results in the harmful alteration, disruption, or destruction of fish habitat. Fish habitat means spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly to carry out their life processes. (See legislation for complete wording)

This section is very broad in scope and is intended to prevent physical degradation of habitat that is used by fish at any stage of their life cycle. It includes, for example, a swamp or marsh where fish spawn and are present for only a very short period of time. This section of the Act covers such projects as building docks and boathouses, dumping sand to create swimming beaches, and creating sea walls to protect shorelines. These projects should only be performed with prior approval of Fisheries and Oceans Canada and provincial and municipal authorities using designs that enhance fish habitat and should not be performed at all in sensitive areas such as fish spawning areas.

No person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where such deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any

such water. Deleterious substance means any substance that if added to any water, would degrade or alter or form part of a process of degradation or alteration of the quality of that water so that it is rendered or is likely to be rendered deleterious to fish or fish habitat or to the use by man of fish that frequent that water. This includes water which contains substances at concentrations that may be deleterious to fish. (See legislation for complete wording)

Section 36 is intended to prevent the degradation of fish habitat due to the addition of chemicals or substances, including such things as hot water or plant process water, to bodies of water containing fish.

The main objectives of the federal Fisheries Act are to conserve existing habitat, restore damaged habitat, and create new habitat. Development will be guided on the principle that there will be "no net loss" of fish habitat. That is, if habitat must be damaged to allow for a particular project, fish habitat of equal or greater size and quality must be created.

The Ontario Water Resources Act was amended in 2007 to provide a higher standard of protection for Ontario's water (similar to that under section 36(3) of the Federal Fisheries Act) and to allow for environmental penalties to be applied immediately for pollution spills that originate with large, regulated industrial or municipal industries.

Many Ontario lakes are facing a variety of existing and emerging environmental threats, including impacts of urban growth, industry, and climate change. In response, some collaboration has appeared with goals for improved lake-wide management. For example, a variety of provincial agencies, municipalities, and a local Conservation Authority established the Lake Simcoe Environmental Strategy, which spurred on legislative protection in the Lake Simcoe Protection Act (given Royal Assent in December 2008).

A Summary of Environmental Litigation Options

This section is intended to introduce the basics of environmental litigation to those with little or no legal background. Further detail can be found in the books *Environment on Trial* and *The Environmental Bill of Rights: A Practical Guide*. People interested in pursuing litigation options are

advised to contact a lawyer or seek assistance from Ecojustice Canada (formerly Sierra Legal Defence Fund) or the Canadian Environmental Law Association.

Litigation is by no means a panacea for environmental disputes. The legal system is often slow, expensive, and conservative. Legal actions rarely completely resolve an environmental issue but can be an important tool for helping to address environmental problems. More importantly, a basic understanding of the legal system and litigation options can assist people in their dealings with government or corporate officials. However, when education and reasoned arguments fail to resolve an environmental dispute, one should consider the "court of last resort."

Prospective environmental litigants are faced with four general routes of accessing the court system: civil actions, prosecutions, judicial reviews, and Environmental Bill of Rights actions. Table 1 summarizes these types of actions. The final

column, "Costs," refers not to the costs of carrying out litigation but to the risk that a losing litigant may be forced to pay the costs of the other side. A fifth quasi-litigation option, namely appealing to tribunals such as the Ontario Municipal Board or the Environmental Review Tribunal, is also sometimes available.

Civil actions

Civil actions involve a dispute between a plaintiff and a defendant (e.g., Smith v. Jones). They draw heavily on the common law, the law developed by judges over the centuries, and are further categorized by the nature of the situation giving rise to the dispute. Examples of these categories are trespass, nuisance, and negligence. Normally those who bring civil actions must assert a property, personal, or economic right that is being violated. Proof in a civil suit is on the "balance of probabilities" standard.

Table 1. Principal types of public interest environmental lawsuits

Type of Action	Source of Law	Standing/Limits	Defendant	Remedies	Costs
Civil Action	Common Law - trespass, nuisance - riparian rights, negligence	Property Owner economic or personal injury	Polluter	Injunction and/or damages	Usually, but can waive
Private Prosecution	Statutory Offence (federal/provincial)	Any person, but Attorney-General can stay	Polluter	Fines, stop order, clean-up order	Not normally
Judicial Review	Statutory Powers (federal/provincial) (procedural or substantive)	Property, economic, personal or public interest standing	Government Officials	Require decision maker to do its duty	Sometimes (rare in federal)
Environmental Bill of Rights	Statute - citizen suits re: offences - request investigation - need unreasonable response or imminent harm	Anyone	Polluter or Government	Restoration order Injunction order	Available, but can waive

Private prosecution

Prosecutions are normally carried out by the Crown (government) but can also be initiated by private citizens. Prosecutions allege violations of a specific environmental standard set out in an act, regulation, permit, or approval. Table 2 summarizes many of the main provincial laws affecting the environment while Table 3 covers federal environmental laws. If the government refuses to carry out a prosecution following a citizen complaint, private prosecution should be examined as an option. Proof in a prosecution is on the higher criminal standard known as "beyond a reasonable doubt." The Crown has certain powers to take over a private prosecution and proceed or stay (suspend) the case.

Judicial review

Judicial review is a type of civil action that asks the courts to rule on whether government officials have acted outside the powers given to them by legislation. These "statutory powers" are often exercised by ministers, government officials, tribunals, and government agencies. Generally, the desired outcome is a court judgement that forces a decision maker to carry out a duty in a lawful manner. Note that under federal legislation, one must commence judicial reviews within 30 days after one is aware of a decision that violates federal law. Under Ontario legislation, there are also time limitations, which depend on the type of decision.

Environmental Bill of Rights

In Ontario, the Environmental Bill of Rights (EBR) adds a fourth option, or more correctly, a fourth set of options. It provides an avenue for civil actions against persons who violate environmental laws (as opposed to criminal prosecutions that are more onerous). The EBR also expands the civil law of public nuisance (harm to community interests). It grants people the right to request investigations and policy reviews and to access environmental information through an electronic registry. It also expands the ability of citizens to appeal environmental approval decisions to the Environmental Review Tribunal. Contact the office of the Environmental Commissioner of Ontario for more information.

Ombudsman Ontario

The Ombudsman's office provides a non-litigation alternative. The Ombudsman's office should only be contacted after all other options, short of litigation, have been exhausted. If you believe a department of the provincial government acted in a way that was "unfair, illegal, unreasonable, unjust, mistaken or just plain wrong," call Ombudsman Ontario. Complaint forms can be found and submitted online at www.ombudsman.on.ca. Certain problems, however, cannot be investigated by Ombudsman Ontario, including those about doctors and lawyers, local school boards, private individuals or companies, decisions of judges, courts or the Cabinet, and bylaw enforcement or garbage collection, which come under municipal jurisdiction.

Before approaching an Ombudsman office, try to speak directly to the group or individual involved. If that does not help, write or talk to the head of the organization. Failing that, contact your Member of Provincial Parliament. In all situations, remember to get the names of the people with whom you deal, keep track of the dates you talked to people, and keep all papers and letters about your complaint. If you are unsuccessful in your attempts at the suggestions given above, bring your complaint to the Ombudsman office nearest you.

In addition to legal advice, the Ombudsman office and the Environmental Commissioner of Ontario will provide speakers for information sessions and meetings. Be sure to contact them well in advance to make appropriate arrangements.

Dramatic changes in legislation and regulations and the transfer of responsibilities to municipalities and the private sector are putting increased pressure on associations to become more active in the protection of the natural environment. Table 6 contains details that will hopefully assist cottagers in gaining an accurate picture of the constantly changing landscape of environmental legislation and regulations. The original information was compiled with the assistance of the MNR office in Bancroft, the MOE, the federal government, the Baptiste Lake Association, and the Paudash Lake Conservation Association. It only deals with selected provincial requirements. You must consult directly with all relevant agencies before proceeding with activities that may harm the environment. For example, while provincial permits may no longer be necessary in certain instances, federal and municipal requirements may still apply.

Relevant Federal and Provincial Legislation and Provincial Permitting Schedules

Table 2. Selected provincial laws

Law	Description
Clean Water Act	<ul style="list-style-type: none"> once fully implemented will prohibit specific land uses/activities that threaten drinking water sources
Crown Forest Sustainability Act	<ul style="list-style-type: none"> weak legislation but contains prohibition against logging except in accordance with approved plans that must provide for "sustainability of the Crown forest"
Endangered Species Act	<ul style="list-style-type: none"> prohibition against killing an endangered species or damaging its habitat
Environmental Assessment Act	<ul style="list-style-type: none"> EA Act requires environmental assessment for "undertakings" (projects) carried out by most provincial and municipal government officials and agencies prohibition against proceeding with undertakings without environmental assessment or contrary to terms and conditions imposed by the Environmental Assessment Board or Minister
Environmental Bill of Rights	<ul style="list-style-type: none"> appeal rights for pollution permits, etc. but must show "unreasonable action" by government civil suit to prevent contravention of environmental legislation or to restore harm caused by such contravention (need to request investigation and receive "unreasonable response" before going to court, unless environmental harm is imminent) right to request investigations and policy reviews
Environmental Protection Act	<ul style="list-style-type: none"> prohibition against discharging a contaminant that causes (or is likely to cause) an "adverse effect" prohibition against discharging pollution in excess of regulatory limits or contrary to conditions in permits prohibition against waste disposal (on land or in water) unless specifically permitted, as well as prohibition against littering
Greenbelt Act	<ul style="list-style-type: none"> prohibition against some types of development within the Greenbelt (which completes a protected area around the Greater Toronto Area, including the Niagara Escarpment and the Oak Ridges Moraine), unless specifically permitted
Lake Simcoe Protection Act	<ul style="list-style-type: none"> once fully implemented will prohibit certain activities and land uses that threaten the ecological health of Lake Simcoe's watershed
Niagara Escarpment Planning and Development Act	<ul style="list-style-type: none"> prohibition against some types of development on the Niagara Escarpment unless specifically permitted
Nutrient Management Act	<ul style="list-style-type: none"> requires approval and certain standards be met for nutrient use on large agricultural operations
Oak Ridges Moraine Conservation Act	<ul style="list-style-type: none"> prohibition against some types of development on the Oak Ridge Moraine unless specifically permitted
Ontario Water Resources Act	<ul style="list-style-type: none"> prohibition against discharging material that may impair quality of water
Pesticides Act	<ul style="list-style-type: none"> prohibition against improper use of pesticides harming environment, health, etc.
Public Lands Act	<ul style="list-style-type: none"> restricts use of public lands
Safe Drinking Water Act	<ul style="list-style-type: none"> prohibition against putting anything in a drinking water system that could result in a drinking water health hazard prohibition against putting anything in a drinking water system that exceeds a "prescribed" standard or interferes with the operation of the system

Table 3. Selected federal laws

Law	Description
Canadian Environmental Assessment Act	<ul style="list-style-type: none"> • requires environmental assessment of most projects that involve a federal approval, federal funding, or federal lands • prohibits permits and licences being issued for such projects until environmental assessment is approved
Canadian Environmental Protection Act	<ul style="list-style-type: none"> • prohibition against discharging toxic substances in excess of regulatory limits • allows citizen to request government investigation
Fisheries Act	<ul style="list-style-type: none"> • prohibition against discharging substances deleterious to fish in water frequented by fish • prohibition against carrying out undertaking that harms or destroys fish habitat
Migratory Birds Convention Act	<ul style="list-style-type: none"> • prohibition against killing migratory birds or interfering with their nests without permit • prohibition against depositing harmful substance in lands or waters frequented by migratory birds
Navigable Waters Protection Act	<ul style="list-style-type: none"> • need federal permit for any work that will interfere with navigation of a lake or river (trivial interference exempted)

Table 5. Major federal legislation relating to water quality

Provincial Legislation	Administering Agency	Description of Legislation	Implementing Agencies
Fisheries Act	Fisheries and Oceans Canada (DFO)	<ul style="list-style-type: none"> • protects fish habitat by prohibiting habitat disturbance and deposition of deleterious substances in water frequented by fish 	DFO MNR
Canada Shipping Act	Transportation Canada	<ul style="list-style-type: none"> • controls pollution from ships by imposing penalties for dumping of pollutants or failing to report a spill 	Transportation Canada
Canada Water Act	Environment Canada	<ul style="list-style-type: none"> • authorizes agreements with provinces for designation of water quality management areas and other special projects 	Environment Canada
Canadian Environmental Protection Act	Environment Canada	<ul style="list-style-type: none"> • controls the manufacture, transportation, use and disposal of toxic substances not adequately regulated by other legislation 	Environment Canada
Pest Control Products Act	Agriculture Canada	<ul style="list-style-type: none"> • regulates products used for the control of pests via registration according to prescribed standards 	Agriculture Canada

Table 4. Major provincial legislation relating to water quality

Provincial Legislation	Administering Agency	Description of Legislation	Implementing Agencies
Clean Water Act	Min. of the Environment (MOE)	<ul style="list-style-type: none"> • provides for the protection of current and future drinking water sources • establishes a planning process for identifying threats to drinking water and for establishing drinking water protection policies • when fully implemented will prohibit land uses that threaten drinking water quality 	MOE, Conservation Authorities, Municipalities
Ontario Water Resources Act	MOE	<ul style="list-style-type: none"> • allows for regulation of water withdrawals • allows surveillance and monitoring of all surface and groundwater in Ontario • regulates sewage disposal and controls water pollution • allows MOE to construct and operate waste water facilities or require this to be done by an industry or municipality • allows for immediate "environmental penalties" for pollution spills 	MOE, Municipalities
Environmental Protection Act	MOE	<ul style="list-style-type: none"> • forbids the discharge of any contaminant to the natural environment in amounts exceeding regulations • prohibits the discharge of any substance into the natural environment that is likely to cause adverse effect • requires that spills of pollutants be reported and cleaned up promptly and establishes a liability on the party at fault • regulates certain types of sewage disposal • allows for immediate "environmental penalties" for pollution spills 	MOE
Environmental Assessment Act	MOE	<ul style="list-style-type: none"> • requires the assessment of any major public (and some private if the government so designates) undertaking so that it may be altered or cancelled if found to be environmentally unacceptable 	MOE
Pesticides Act	MOE	<ul style="list-style-type: none"> • controls the use of chemicals for the destruction of plant and animal pests • investigates possible harmful effects of pesticides on the environment 	MOE
Conservation Authorities Act	Min. of Natural Resources (MNR)	<ul style="list-style-type: none"> • establishes Conservation Authorities (CAs) and provides them with a mandate to operate dams for water quality enhancement, to undertake water quality surveys, and to comment on planning documents 	CAs
Lakes and Rivers Improvement Act	MNR	<ul style="list-style-type: none"> • provides approval process for dams • regulates certain forestry activities affecting water bodies 	MNR
Lake Simcoe Protection Act		<ul style="list-style-type: none"> • provides for the protection and restoration of the ecological health of the Lake Simcoe watershed • establishes a planning process, building on the foundation of the Clean Water Act and other provincial conservation plans, for identifying threats to ecological health and for establishing ecological health protection policies • when fully implemented will prohibit certain activities or land uses that threaten the ecological health of Lake Simcoe's watershed 	
Planning Act	Min. of Municipal Affairs & Housing (MMAH)	<ul style="list-style-type: none"> • guides municipal planning activities (i.e., requires local governments to assess the impact of a proposed new subdivision on existing water supplies) 	MMAH Municipalities

Table 6.
Provincial permitting schedules of the Ministry of Natural Resources and the Ministry of the Environment.

Activity	Permits Still Required
Dredging	<ul style="list-style-type: none"> • boat channels, swimming areas • buried commercial and industrial submarine cable • removal/displacement of rocks and boulders to fill cribs or create a beach
Drainage, Stream Diversions, Water Crossing	<ul style="list-style-type: none"> • stream diversions enclosures, channelization, pond creation/bypass, dams and locks • culverts and bridges on crown land • crown and private water crossings draining an area >5 km² • all water crossings enclosing more than 20 m of stream length
Building and Structures	<ul style="list-style-type: none"> • all new building • structures that impede the flow of water (i.e., breakwalls and groynes) • crib structures (i.e., docks and boathouses) with cribs or solid supports over 15 m² in total surface area including existing structures • erosion control structures below the high water mark
Fires	<ul style="list-style-type: none"> • industrial slash • prescribed burns • all other fires except those noted in adjacent box
Clearing	<ul style="list-style-type: none"> • new or upgraded roads • new recreation trails
Filling (Crown) Shore Lands	<ul style="list-style-type: none"> • beach creation, breakwalls, causeways • property extensions on crown land and private flooded land • shore stabilization in shore land areas
Fish Habitat and Controlling Aquatic Plants	<ul style="list-style-type: none"> • removal of any amount of aquatic vegetation from a lake or stream in the area north of Hwy. 7 from Lake Huron to Sharbot Lake; or the area north of Hwy. 401 from Kingston to the Quebec border • removal of >100 square metres of aquatic vegetation south of the 7-38-410 highway corridor
Use of Herbicides to Control Aquatic Plants	<ul style="list-style-type: none"> • anyone proposing to apply a herbicide for the control of aquatic plants must obtain a permit from the Ministry of the Environment

Other items to note

- Waterfront owners should carefully consider the timing of their work in the waters of our streams and lakes to minimize disturbance to fish spawning, nesting, and rearing activities. The best timing for work in and around water to ensure protection of fish can be obtained from the MNR.
- The federal Fisheries Act provides for the protection of fish habitat. Under this Act, no one may carry out work that harmfully alters, disrupts, or destroys fish habitat and no one is permitted to deposit a harmful substance in water containing fish without approval. Violations can mean fines of up to \$1 million, risk of imprisonment, and a

Permits No Longer Required

- log salvage
- submarine cable laid on lake or river bottom
- residential water intakes, heat loops and cables

- private land water crossings <20 m of stream length and draining an area <5 km²

- improvements/renovations to existing buildings
- removal of old docks and boathouses
- structures that permit free flow of water (i.e., floating or pole support docks, rafts, cantilever structures)
- crib structures (i.e., docks and boathouses) with cribs or solid supports under 15 m² in total surface area including existing structures

- tended small woody debris fires at specified times of day
- fires for cooking or warmth
- incinerator fires
- fireworks

- upgrade of recreational trail

- None

- removal of up to 100 m² of aquatic vegetation annually from any lake or stream located south of the line formed by Hwy. 7 from Lake Huron (at Sarnia) to Sharbot Lake at Hwy. 38, and the area south of Hwy. 401 from Kingston to the Quebec border

- no permit required from the Ministry of Natural Resources

requirement to cover the costs of returning the site to its natural state.

- The Ministry of Natural Resources is no longer a commenting agency for the sale of municipal shoreline road allowances. The sale of such allowances is the responsibility of local municipalities.

Table 6 provides a sampling of activities for which work permit requirements have changed. It is not intended to be an all-inclusive list. Proponents will be responsible for awareness of permit requirements and compliance with applicable legislation. Fact sheets are available for this purpose

Conclusion

In this era of government cutbacks, individuals and organizations must take a more active role in ensuring that safeguards for the environment are put in place and implemented. All Ontarians should take a precautionary approach when it comes to development and err on the side of environmental protection. This chapter provides a basic summary of some of the applicable laws to water quality but is not intended to replace the need to consult the actual legislation and regulations. Additionally, all responsible government agencies should be contacted before any development project is undertaken. If you are aware of activities or developments that may be violating environmental standards, contact the appropriate authorities listed in the tables. If you experience difficulties getting assistance from government, consider contacting the Environmental Commissioner or an environmental law expert.

References

- Agriculture and Agri-Food Canada and Ontario Ministry of Agriculture, Food and Rural Affairs. 1996. Best management practices. Fish and wildlife habitat management.
- Environmental Commissioner of Ontario. 1996. Annual report 1996: Keep the doors open to better environmental decision making. Toronto: Environmental Commissioner of Ontario.
- Ontario Ministry of Natural Resources. 1995. Fisheries guidelines for shoreline alterations and in-water works for inland waterbodies in the Kawartha lakes management area. Toronto: Ontario Ministry of Natural Resources.
- Ontario Ministry of Natural Resources. 1994. Fish habitat protection guidelines for developing areas. Toronto: Ontario Ministry of Natural Resources.

Resources

Publications

- Ecojustice Canada. 2008. Legal toolkit, Ontario edition.
Available online at
<www.ecojustice.ca/publications/reports/ecojustice-legal-toolkit-ontario-edition>.
- Estrin, D. and J. Swaigen, eds. 1993. *Environment on trial: A guide to Ontario environmental law and policy*. 3rd ed. Toronto: Emond Montgomery Publications.
- Muldoon, P. and R. Lindgren. 1995. *The Environmental Bill of Rights: A practical guide*. Toronto: Emond Montgomery Publications. (This title is no longer in print. Access may be obtained through the Environmental Commissioner of Ontario's Resource Centre or some public libraries.)
- Muldoon, P., A. Lucas, R. Gibson, and P. Pickfield. 2009. *An introduction to environmental law and policy in Canada*. Toronto: Emond Montgomery Publications.

Organizations

The following organizations may be able to provide professional advice or additional resources in their respective areas of expertise.

The Canadian Environmental Law Association (CELA): www.cela.ca
130 Spadina Avenue, Suite 301
Toronto ON M5V 2L4
Phone: (416) 960-2284

Ecojustice Canada (formerly Sierra Legal Defence Fund): www.ecojustice.ca

Environmental Commissioner of Ontario:
www.eco.on.ca
Toll Free: 1-800-701-6454

Environmental Defence:
www.environmentaldefence.ca
Toll Free: 1-877-399-2333

Ombudsman Ontario: www.ombudsman.on.ca
Phone: 1-800-263-1830

Other websites of interest

Canadian Laws: www.canlii.org
(no charge, searchable database of court decisions
and unofficial site for legislation)

Environment Canada: www.ec.gc.ca

Federal Environmental Assessment Registry:
www.ceaa.gc.ca/050/index-eng.cfm

Federal Laws (official site): laws.justice.gc.ca

Fisheries and Oceans Canada: www.dfo-mpo.gc.ca

Ontario Brownfields Registry:
www.ene.gov.on.ca/enviromet/BESR/search.htm
(no charge, public search of registered
contaminated sites)

Ontario Environmental Assessment Registry:
www.ene.gov.on.ca/en/eaab/index.php

Ontario Environmental Groups: www.oen.ca/dir/
(no charge, searchable directory provided by
Ontario Environment Network)

Ontario Environmental Registry (Environmental Bill
of Rights): www.ebr.gov.on.ca

Ontario Laws (e-Laws/Lois-en-ligne, official site):
www.elaws.gov.on.ca

Ontario Ministry of Natural Resources:
www.mnr.gov.on.ca

Ontario Ministry of the Environment:
www.ene.gov.on.ca

Blogs

Ecojustice: <http://blog.ecojustice.ca/>

Environmental Commissioner of Ontario:
<http://www.eco.on.ca/blog/>

Saxe Environmental Law News:
<http://envirolaw.com/>

WATERFRONT GROUPS IN ACTION

Volunteerism: How to Reel Them in and Get Them Started

Sylvia Stock

Volunteer Recruiting and Turnover

The strength of your organization and the success you will achieve in carrying out your lake stewardship initiatives will be largely dependent upon your volunteer workforce. Volunteers bring to the table enthusiasm, dedication, and often specialized knowledge and expertise. Your success with your volunteer workforce, however, is in **recruiting the right person with the right skills, in the right job at the right time**. This seems to be an overwhelming task but it really can be made simple by breaking down the recruitment process into manageable steps and taking it one step at a time.

Step 1: Defining the Need

Identify what jobs need to be done and categorize the services that volunteers may bring to the organization. There are essentially four types of volunteer roles with different levels of responsibility and community contact. Choosing the number of volunteers needed for each category will help you target your efforts more effectively and it will give your volunteers a greater choice in the roles available to them.

Direct Service Role: Volunteers in this category develop strong one-on-one community ties. They deliver your message to the community and enjoy being in the public spotlight.

Indirect Service Role: These volunteers participate in many community initiatives but do not necessarily have direct contact with people.

Administrative Service Role: Administrative volunteers enjoy planning, organizing, and

arranging for the implementation of initiatives. They are the behind-the-scenes facilitators to your special events.

Policy-Maker Role: This type of volunteer serves on the local board and enjoys policy making that involves the analysis of problems and issues, and the creation of a broad vision with goals and objectives. These individuals would feel comfortable with resolving sensitive issues.

Step 2: Targeting Highly Skilled Volunteers

When establishing your organization there are a few key positions that require unique or specialized skills and experience. Finding volunteers to fill these critical positions will significantly reduce operating costs and their input and advice will enrich your decision-making process. Should you have difficulty recruiting these specialists, seek out other volunteer organizations that may be in a position to provide free advice. Targeted volunteers and some alternate methods for obtaining needed advice are listed below:

- accountant/bookkeeper: Revenue Canada, business leaders, fellow cottagers with this expertise
- lawyer: Canadian Environmental Law Association, Legal Aid
- planner: University/college students
- biologist/ecologist: University/college/MNR/ MOE
- communications advisor: Sustainability Network, fellow cottagers with this expertise
- marketing specialist: Business leaders, fellow cottagers with this expertise, students with web expertise
- fund-raiser: Fellow cottagers with this expertise or willing to learn

- native issues: Indian and Northern Affairs Canada
- civil/environmental engineer: University/college students
- insurance agent: Business leaders, fellow cottagers with this expertise

Step 3: Developing Job Descriptions

People volunteer for a wide range of reasons and if your organization can meet those base needs it will ensure a happy and enthusiastic member of your team. Volunteer organizations have identified the following motivations for volunteering:

- provides a learning and growing experience;
- is satisfying because it offers help to others;
- provides opportunities for increased social contacts, new friendships and relationships with others who share the same interests and concerns;
- provides opportunities to use present skills and to develop new skills and self- confidence;
- provides a concrete work experience and educational activity that may eventually help the volunteer join the working force;

- provides an opportunity to enhance or build existing careers;
- provides an opportunity to repay personal debts to a society that may have helped the volunteer through his/her own rough times; and
- is a constructive outlet for energetic use of leisure time.

To help volunteers choose the role they wish to play in your organization you should develop clear and concise job descriptions that outline your expectations for each volunteer role. When volunteers understand what is expected of them, they are more likely to make a firm commitment of their time. When developing a job description, you will begin to understand the scope of work required to get your initiatives underway.

Volunteers need to feel a sense of satisfaction and reward for the tasks they undertake. It is important that volunteer roles be developed that will include achievement, recognition, challenge, responsibility, and growth. As the volunteer's skills and reliability grow, introduce new and more challenging tasks while removing some controls.



Sample Job Description

Title	Canvasser
Purpose	Canvas homes and business for contributions to the organization's initiatives; donations may be in cash or in kind.
Responsibilities	<ul style="list-style-type: none"> • attend monthly fundraising meetings • participate in the development of a canvassing schedule • participate in the development of a fundraising kit • contact homes and businesses to solicit donations (in-person, telephone, or letter canvassing) • collect donations • prepare donation tally sheets
Qualifications:	<ul style="list-style-type: none"> • interest in people • ability to communicate orally and in writing • ability to manage cash and negotiate
Relationships:	<ul style="list-style-type: none"> • responsible to the fundraising committee • communicate with other canvassers
Time Commitment:	<ul style="list-style-type: none"> • six months per year • up to 2 hours per week • attend monthly meetings
Benefits:	<ul style="list-style-type: none"> • increased knowledge of environmental issues within your community • personal satisfaction • opportunity to meet new people • visibility in community and organization

This process will give the volunteer a sense of personal growth, challenge, and achievement.

Step 4: Recruitment Strategies

The greatest challenge for non-profit organizations is finding volunteers. Some recruitment techniques that have proven to be effective are:

- identify individuals from your membership;
- canvas schools (public, high school, college, and university);
- contact businesses—some have environmental policies and encourage executives and staff to participate in special events (great publicity move if covered by newspaper, TV, or radio);
- contact service organizations such as the Girl Guides, 4H Clubs, Boy Scouts;
- contact sport clubs (baseball, hockey, soccer);
- contact local church groups;
- solicit newspaper articles/ads;
- involve local cable TV;
- develop flyers for home delivery or for hand-out at malls;
- develop a travelling exhibit for fairs, schools, malls;
- develop posters;
- participate in a volunteer fair;
- foster personal contact, word-of-mouth recruiting; and
- develop an advertising campaign.

It is always wise to match the volunteer to a position or role that fits with his/her motivation. Have the volunteer complete an information form that identifies the following key interests:

- special skills, talents, interests—things the volunteer does well and enjoys doing;
- areas that the volunteer would like to learn more about – areas of interest in which the volunteer may not have skills but would enjoy learning; and
- activities the volunteer really doesn't want to do.

Remember that you will not always find the exact match between the volunteer and the volunteer activity. Rank potential candidates based on how well they meet the required qualifications and select the best person for the job. Additional training may be an option to raise the skill set of the volunteer.

Step 5: Interviews

You may wish to conduct interviews for your key positions within your organization. These screening

8 Tips for Good Recruitment

- Recruit with a specific role in mind, rather than asking for "anybody to do anything."
- Go to people whose interests match your organization's needs.
- Actively seek out the skills your organization needs.
- Be honest. Don't cover up or downplay the task as unimportant, the "anybody can do it" syndrome.
- Recruit year round and plant the seeds early – "May you be approached this November when our elections are being held?"
- Use many different recruitment techniques.
- Treat the job as an opportunity, not as a task that the person ought to be concerned about (guilt).
- In addition to using your organization's own membership list, be sure to consider the entire community. Go to places where people congregate. Approach other organizations for help.

Source: Ministry of Agriculture, Food and Rural Affairs, Working with Volunteers Factsheet

interviews will help you to confirm whether your volunteer candidate has the required skill set to undertake the task. It also will establish whether the volunteer candidate has the right attitudes, values, and work habits that your organization is seeking. This is a good time to present a copy of the job description to your candidate and to discuss, in detail, the requirements of the position. Assure the volunteer you will get back to him/her with a decision. Although the volunteer may not be chosen for the interviewed position, you may find another position for which he/she is well suited. Remember, how well you treat your volunteer force, even during the interview process, will spread throughout the community and affect future recruitment efforts.

Step 6: Orientation and Training

After you have recruited the volunteer, he/she needs to know more about your organization and its objectives. An overview of the organization's structure, policies, procedures, objectives, long- and

Remember:

There is no such thing as a bad volunteer – just the right person in the wrong job!

short-term goals, and activities accomplished within the last 3 to 6 months will acquaint the volunteer with the direction in which the organization is heading.

General Goals of an Orientation Program

- To acquaint volunteers with the policies and procedures of the organization, and the philosophy and objectives of goals.
- To provide an opportunity for new volunteers to meet each other and become acquainted with other volunteers in the organization.
- To familiarize people with the programs and services offered.
- To discuss the role of the volunteer in the organization and the community.
- To allow an opportunity for new people to ask questions about the organization and their involvement in it.
- To set the tone for future involvement.

After the volunteer is acquainted with your organizational setup and objectives, you need to identify what additional training, if any, is required by the volunteer. Training provides the volunteer with the necessary tools that are needed in order to be successful in the volunteer activity. When a volunteer is successful with a task he/she feels a sense of accomplishment and self-worth and is more likely to accept additional volunteer tasks within your organization.

Step 7: Keeping Volunteers

Keeping volunteers motivated is a great challenge to any organization. Volunteers want to believe that their actions and opinions are valued and that the organization genuinely supports them in their endeavours. The organization must continuously monitor the well-being of the volunteer workforce. Signs of volunteer discontent or dissatisfaction are not always clearly evident. Poor volunteer behaviour at meetings, poor volunteer turnout or inability to complete assigned volunteer tasks are all indicators of volunteer unrest or loss of commitment. Treat the volunteer fairly. Ask the volunteer if he/she needs help or whether there is something else he/she would rather do.

Volunteer burnout is another concern for your organization. It is important that volunteers who are high achievers are not left with more and more

A satisfied volunteer will

- do a good job for the organization;
- have only good things to say about your organization;
- give your organization a good reputation;
- recruit volunteers by word and example; and
- be committed and enthusiastic.

to do. Rotate them into less stressful tasks such as stuffing envelopes or photocopying so they can recoup their energy and enthusiasm.

Step 8: Follow-Up and Recognition

Recognizing the efforts of your volunteers is a key component to retaining that workforce. Volunteers need to feel that they have made a difference and that their efforts and opinions are valued. Developing a volunteer recognition program for your organization will give you a framework that will ensure that this important activity is not forgotten.

Step 9: Exit Interviews

When a volunteer decides to leave your organization, it is worthwhile to try and find out why. An exit interview conducted in an informal manner could help you to assess the effectiveness of your volunteer program and give you insightful feedback on improvements you can make. Always thank the volunteer for all the hard work, regardless of the true value, that they have done for the organization.

Recognition Tips

- a smile or "thank you"
- volunteer of the month
- pins, plaques
- write-up in the newspaper
- do a profile of the volunteer in your organization's newsletter or flyer
- more complex, challenging tasks
- appoint as a team leader
- ask for advice and guidance
- request feedback on specific tasks
- letters of thanks
- volunteer honour roll
- gift of small intrinsic item (T-shirt with organization logo)

Case Study: Recruiting Volunteers

Charles Stewart

President, Bobs and Crow Lakes Association

For lake associations volunteers are our lifeblood – they are our leaders and they complete individual projects. But just how do you successfully recruit and keep volunteers? Every non-profit and community organization has wrestled with this challenge. Over time many techniques and universal concepts have emerged. I have learned from my mistakes, others' successes, and the lessons learned by established organizations.

Almost everyone in our society volunteers at some time. They will support a project about which they feel passionately or one that directly affects them. For example, if they have children they may offer to help in scouting, a school program, or a youth sports league. They may join a service organization such as Rotary, Civitan, or Lions or they may volunteer to help an organization whose mission is to eliminate hunger or a devastating disease.

One lesson I've learned is that people will respond to a personal request for help. General appeals are ineffective; it's essential to ask someone directly. A former associate of mine used to be a recruiter for the navy. Later, when she was working for a community organization she was immensely successful in recruiting volunteers. She said that you had to identify the "dominant buyer's motivation," or as she said, "the DBM." She would develop a list of specific projects for which she needed help. Then, during a personal conversation with the prospective volunteer she would uncover the issues about which that person felt passionately. She would then outline the projects that most closely aligned with the person's issues. Invariably they would decline one or two proposed projects but after three or four were outlined, there usually would be one he or she would support.

The projects have to be specific. They must have a finite end – both in time and result – and the prospective volunteer has to see value in the effort. Most people will not volunteer for an open-ended commitment. But they may help on a project that takes a day, a week, or a longer period if there is an end date and it requires a limited amount of time. One non-profit organization states, "Matching the potential volunteer to a specific position description is the basis of recruitment success." We may need people to put up signs, maintain market barrels, take water-quality samples, distribute literature, or help with the annual meeting. We can define each of these needs precisely.

During a recent seminar, one of the speakers offered another recruiting suggestion. He recommended organizing family-oriented projects such as sampling for invertebrates in a stream, building birdhouses or a nature walk. Through these activities everyone could learn about issues facing our area, methods for gathering essential data, and potential initiatives to protect our environment. When people learn first-hand about our challenges, they might volunteer for related projects.

Resources

Ministry of Agriculture and Rural Affairs. 1996. Recruiting volunteers: Fact sheet. Accessed at <www.omafra.gov.on.ca/english/rural/facts/96-005.htm>.

Sustainability Network:
www.sustainabilitynetwork.ca

Volunteer Canada: www.volunteer.ca

Communications

Joseph Kozelka

All organizations aiming to create action to protect the environment face an array of challenges. For example, how to communicate issues that many people view as distant from their day-to-day concerns, how to give immediacy to issues that involve longer-term impacts, or how to achieve lasting change given the constraint of limited resources, both human and financial.

Full consideration must be given to how communication in all forms can help your organization to move the public agenda and public opinion in favor of the responses you seek on your issues. Here are two fundamental steps that you can undertake to move your communications forward.

Involve Your Organization: Building Your Communications Team

As a first step you may want to build a working group or communications team. Your staff, your board members, and your volunteers each have a unique perspective, as well as valuable expertise, resources, and insights.

Recognize How Issues Gain Prominence: Understanding the Context for Public Opinion and Behaviour

Researchers of all stripes have long sought the answer to what influences people's behaviour. Naturally, a conclusive formula would greatly simplify the communication process; however, people cannot be that neatly explained. What we do know is that public opinion is influenced by a combination of factors including media exposure and sources closer to home.

There is a cycle through which issues move to prominence. Studies have shown that important

issues typically move through a seven-stage cycle – starting small and moving in fairly predictable stages to prominence, with public opinion largely following the same pattern.

As might be anticipated, discussion of new issues typically begins within an industry, appearing on the pages of in-house publications and industry speeches. In stage two, issue coverage moves into the industry's nationally circulated professional journals, specialty or trade books, and commercial newsletters. Then, the issue starts to appear in various sections of the daily papers and as the issue begins to generate critical mass, editorial writers start to take up aspects of the issue. From there it will move to the front pages of the daily paper. Then the network news starts to provide coverage. Finally, the issue may enter pop culture, for example, showing up in TV movies, soap operas, feature films, and other TV events.

Sources closer to home are also very influential. People seek validation from their nuclear and extended families, friends and associates, and finally from those in positions of trust (e.g., clergy and doctors).

The starting point for every successful communications program is a strategic-planning process. This process ensures that you have a clear road map and a destination for your communication efforts. An effective plan should also help you integrate all of your organization's work on a particular issue. This includes your media activities but also your government-relations work, grassroots organizing, fundraising efforts, and your communications with members.

Step One.

Start with the Facts: The Situation Analysis

A comprehensive analysis – including a detailed examination of both your organization and the

external environment—will provide a cornerstone for both your current and future plans. The more you know about the existing landscape (i.e., the key players, the public's current perceptions, the opportunities, and the threats to your success) the sharper will be the goals and objectives that you ultimately decide will advance your mission.

Step Two.

Define Success: Your Overarching Goals and Objectives, Plus Your Communication Objectives

Based on your now clarified view of the current landscape, you're ready to define, refine, or simply bring forward the goals and objectives you have already and to delineate the communication objectives that will form the basis of this particular communications plan.

Your goals describe your ultimate destination

Written as simple, almost mission-like statements, goals define the ultimate outcomes you want to achieve on your issue. Your goal statements should



also include a sense of where your action is focused, for example, whether you're aiming to influence government policy, to change a corporate practice, or to cause a change in the public's behaviour. And, finally your goals should be governed by a deadline, whether it is a broad time period (over the next five years) or a specific date (by April 10).

Your objectives describe where you need to focus now

Objectives define the short-term or more immediate outcomes that, if achieved, will help you meet each of your stated goals. To be effective, your objectives should be concrete and measurable.

Make Your Objectives SMART

- **Specific:** Ensure each is a clearly defined statement
- **Measurable:** Use numbers where logical
- **Achievable:** It's important to stretch but also to be realistic
- **Relevant:** They should be directed at achieving your overarching goals

Now the focus is

on your communication objectives

Based on your overarching goals and your more specific objectives, you're ready to establish the concrete communication objectives that will help you to move your audience forward.

Through your communications, you will be aiming to influence what your audiences understand (building basic awareness or greater knowledge), what they think or feel (their current attitudes), and ultimately what they are doing (their actions or behaviour) about your issue. Again, these objectives should be outcomes-oriented, as well as concrete and measurable (i.e., "SMART").

Step Three.

Identify who you need to reach: your target audiences

With your overarching goals and objectives, and your communication objectives in place you're ready to identify exactly whom you need to reach—and this is critical. Not only is aiming to reach the entire population well beyond any organization's means, usually only specific segments of the public can or will make a difference on your issue.

Any cross-section of ten individuals will fall into one of four categories. There will always be:

- those who are completely opposed to your position;
- those who are apathetic;
- those who are completely supportive; and
- at last, there are the persuadables.

Targeting your audiences is a multi-step process that involves a combination of logic, research, and consideration of your available resources. Once you have identified the "who," you need to develop your understanding of what makes these audiences tick. You will likely need to further delimit your target audiences to match the dollar and human resources that you have available. This means identifying the smallest, clearly defined group that can make the most potent difference.

Step Four.

Find the Right Words: Your Messages

Now, you are ready to craft your messages.

Step Five.**You're ready to get creative: your communications strategies and tactics**

The strategy (how) and tactics (what) that you select to achieve your campaign's aims depend on your objectives, your target audiences, and the knowledge you have gathered about what will move them to respond. You may find that a single briefing with a key decision maker would advance your issue more effectively than a strategy that generates 1,000 faxes to his or her office.

Your communication strategies are the "how"

How will you stop that corporation from proceeding with its new development? Your strategy might be to reach its executives directly. Your tactics might then include arranging a series of meetings and creating a briefing document.

Clearly the "how" of your campaign depends on your objectives and can be answered in a multitude of ways. It's worthwhile to spend some time brainstorming a range of options. Each of the potential options you identify should be closely examined and then assigned a priority ranking of how effective (cost vs. outcomes) it will be in meeting your objectives. You also need to consider whether you have the resources, human and financial, to successfully carry it out.

Your tactics describe the activities you'll undertake

There are dozens of methods for reaching an audience—from billboards to one-on-one conversations. In selecting and prioritizing the tactics you'll use to meet your objectives, you might begin by considering these kinds of questions:

1. What resources (human and financial) are available to this project?
2. Where do your target audiences get their information? Your tactics should take into account the communication channels preferred by your key target audiences. What media do they pay attention to? How do they prefer to get their information: on the web, through mail, etc.? Who might they listen to: their bosses, husbands/wives, doctors, etc.?
3. Based on your strategy, what kinds of activities would assist you to deliver your key message(s) to your target audiences?

- Public events such as public meetings, demonstrations, rallies.
- Private events such as meetings and briefings.
- Print communications such as newsletters, flyers, direct mail.
- Electronic communication such as website and e-mail.
- Media tactics such as advertising, news releases, editorial meetings.

Step Six.**Choose Your Moment!****Your Timing and Timelines**

With your plan almost complete, you're ready to determine the timing of your initiative. When would your message have the greatest impact? Then, based on the timing you select, you need to timeline every task that needs to be completed to meet the deadlines you've set.

Your timing

In considering the timing of your communications, it's useful to consider the natural links onto which you can hook your communications. Note as many items as you can. For example:

- When would your communications have the greatest impact?
- Does your issue have seasonal implications?
- Are external events occurring that you can respond to?

Your timeline

To ensure your program stays on track, and that you meet the deadlines you have established in setting your timing, you must create a timeline that details every step that is required to complete the activity, incorporating deadlines and establishing who is responsible for making each activity happen.

The Last Step.**Identify the Best Messengers:****Your Spokespeople**

The fact is who you elect to deliver the messages you have designed is as important as the messages themselves. This makes sense: a senior scientist addressing young people might not work as well as the message delivered by a youth peer. Here are some questions to consider:

TAKE THE PLUNGE

1. What situations will require a spokesperson? You may want to train one person to address the government and editorial boards and another to share your message with stakeholders. If you are dealing with a number of issues, you may also want to designate more than one spokesperson.
2. Based on your target audiences, what kinds of spokespersons would be most effective? Consider who can best reflect the kind of authority that will be effective with your specific target audiences.
3. Who should receive media training? Naturally, providing media training for spokespersons that are not comfortable with the interview process is a vital consideration.

Resources

Sustainability Network:

www.sustainabilitynetwork.ca

Getting the message out: A step by step guide for environmentalists.

Tools of change.

CASE STUDY

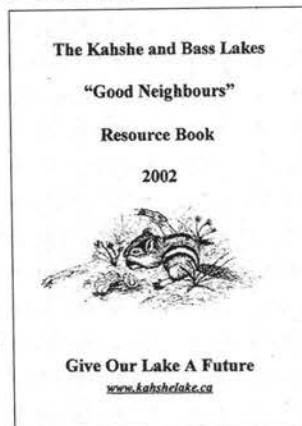
Kahshe Lake

Eleanor Maclean

At the Kahshe Lake AGM in 2001, the president gave a presentation on the usefulness of a Lake Plan and it was supported by the membership. I contacted the people who were vocal about it at the AGM and we created a committee that started the whole process. Our mayor, who had a home on the lake, supported it also. We were lucky enough to involve some very smart and knowledgeable people and thanks to the computer world and email we could communicate our thoughts between monthly meetings.

We fundraised with a cocktail party complete with arm-twisting; we created flyers (thanks to my computer) and then sent them to all Kahshe Lake residents whether they were members or not; and worked in our local town of Gravenhurst to send residents advertising about a workshop to identify issues such as boating, lake pollution, light pollution, noise pollution, taxes, and roads.

Out of this came more educational tools – the Kahshe Lake Good Neighbours Resource and the Kahshe Lake website (www.kahshelake.ca). Of course all along we have had the Kahshe Lake Newsletter, which has been published three times a year since about 1980 and the Kahshe Lake Plan Committee published a report in each issue.



We held two workshops with local residents and sent numerous applications to the local council. In

2008 the Lake Plan had still not been totally accepted into the municipal bylaws. However, the playing field has changed as the population has become more educated about the concerns of a sustainable world and community. It used to be a fight between the local businesses and the cottage community. Some of that has changed and there has been a huge source of support in Muskoka, including the Muskoka Watershed Initiative and the Muskoka Heritage

Foundation.

Our Lake Plan Committee has been very organized as well and started a process of reviewing the town's business, having a committee member present at meetings, and responding to all variances requested on our lake.

With my committee members' expertise, we wrote a manual for our Kahshe Lake Directors, outlining all the jobs of the executive and what they require. We are especially proud of this initiative and share our manual on our website at www.kahshelake.ca.

Fundraising or "Show me the money!!"

Tanya Phillips

(Updated by: Kelly Warner-Rosen)

Goals

Funding is an essential part of any voluntary activity, for without it many programs would never be implemented. This is the stage where you can begin to see some of your visions become reality, where words turn into actions. Indeed, your ultimate goal here is to raise money but to reach that goal requires a process or an organized approach. Random requests for money are not productive. Thus, your lake stewardship program, Lake Plan, or other initiative will be successful only

if you carefully plan a fundraising strategy. Think of fundraising as a means to an end!

Know that fundraising is competitive. In these difficult economic times, fundraising becomes even more challenging. Government support at all levels has been drastically reduced. Not only are there across-the-board cuts but entire groups that were previously funded by government have been

eliminated. What this means is the demand for the charitable dollar far exceeds the supply of funds available. Your program is competing with other organizations for these same funds. Now is the time to get creative and take advantage of the untapped possibilities right outside your doorstep.

Elements for Success

Although there is no perfect equation for fundraising, there are several key elements to its success:

- know what motivates individuals/groups to donate;
- know your project;
- be aware of potential sources of funding; develop a strategy; and
- Be familiar with your own organization.

Motivation: To Give and Receive

Your first task would be to get to know your potential donors. What motivates them to give? What type of donation can you expect? Have they contributed previously? Always remember that "people give to people." Whether donors are motivated by community pride, concern for the cause, or guilt your fundraising program should be designed with these various motivating factors in mind to maximize your possibilities. Research your donors and develop a plan that can satisfy both of your needs. Find the common ground and create a proposal that offers a win-win situation! Also be prepared to turn down offers. You should not take money at any cost. Do not let funding compromise your principles or get in the way of your group's mandate.

Realize that it is hard work. It won't just happen, you must make it happen! Do not give up easily or get discouraged at the first sign of rejection. Raising money is strenuous and stressful. It is hard to determine how to interest potential sponsors and what businesses to target. There is an unfavorable connotation with regard to asking others for financial support. No one likes to beg for money but you must remember the reason why you are asking for this support.

Causes Don't Raise Money, People Do

Assign a member of your organization to take the role of fundraiser. This significant phase of your project requires a qualified and responsible overseer. See below for a brief job description.

Who should be a fundraiser?

Qualifications

- self-motivated
- committed
- good communicator
- organized, strategic thinker
- copes with demands and disappointments
- previous experience
- excellent writing skills
- influential
- polite yet persistent

Your Project

Have a well-defined project mission. Show donors how your program will benefit the community, such as through improved water quality, preservation of fish, wildlife and their habitats, and through greater involvement in local land-use planning issues. It may also help to stress how your community will suffer without such a project. It is important to explain why you are raising these funds (operating needs or special events). Organize all of this information into a brief positive document, a mission statement to distribute to funders.

Remember that money is just a means to an end; however, if the goals of your program are not clear to cottagers then these neighbours and potential donors will not know what they are being asked to support. A mission statement of objectives lets your target audience know what your organization is doing and why it is necessary.

Sources of Funding

There are a variety of sources from which to gather funds. Know these sources and take advantage of all the possibilities. Utilize some creativity when selecting from these sources. The best fundraising strategies appreciate and exploit various sources. Do not rely on one source of funding! Include all types to diversify your funding base.

INDIVIDUAL DONATIONS

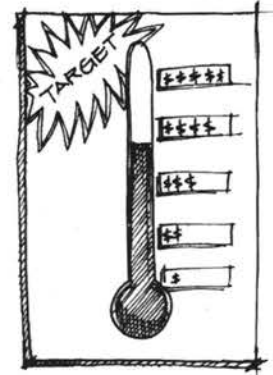
(direct mail, email, and membership)

If you can find someone to design and maintain a website for your project you will have an invaluable tool to use when soliciting donations and informing supporters and volunteers about developments and

upcoming events. The website can also serve as a place for donors to be recognized and large sponsors to advertise. You might even find a company willing to do your website for nothing or at a discounted rate if you acknowledge their contribution. Though it can initially be time-consuming to develop your site, it will cut down on mailing costs and make your organization look professional. A word of caution, be sure to plan for someone to regularly update the site as there is nothing more off-putting than going to a site that is out of date.

Studies have shown the most important source of support comes from individual donations. The main approach to garnering financial support from this source is through mass mailing or emails. Mass outreach is the idea of sending out your message through letters, brochures, or emails to potential donors. Be careful, direct mailing or mass mailing can be disastrous and costly if executed incorrectly. Emails, although addresses are harder to obtain, are less costly overall and provide a two-way dialogue with potential and active donors.

Do not expect high returns. The typical response rate for direct mail is only around ten percent above costs. Anything better than that would be outstanding. **When it comes to direct mail and email it is critical to target your audience.** Form various mailing lists and email lists to be used strategically. Have a "hot list" for very interested individuals that have perhaps contributed in the past and are very involved in the community. This hot list is the best one to use for emails as potential donors will recognize your organization and be more likely to at least read your appeal. These are the permanent residents of your cottage community, the "year-rounders!" The "warm list" will include people who have at one time shown interest or are local residents. These may be your seasonal cottagers. The "cold list," which is rarely used, will include names of anyone who has used the lake, vacationers, or indifferent cottagers. It is still good to have a list of these people so that if something comes up in the future that may be of interest to them, you have their information readily available. These last two groups will probably be more responsive to direct mail, although soliciting their email or drawing them to a



website is an effective way of facilitating future contact.

Membership dues provide the largest and most consistent form of funding. In addition to a stable annual income, membership provides an instant volunteer base. You may also choose to have various levels of membership, encouraging members to upgrade their support each year. Go even farther and use membership to create an action fund. This can be quite successful for non-profit organizations because it ensures that money is put aside and available for specific tasks. To sell this creative idea to membership you need to demonstrate what each member will get in return (i.e., newsletter, yearbook, email updates, recognition).

Recognize and thank supporters both past and present; it is only through strong donor appreciation and feedback that your program can ensure financial support for the future.

FOUNDATIONS

Foundations are another source of funding. These organizations exist strictly to administer funds for various projects. Apply to those foundations that share a similar mandate. To attain funding from this source requires extensive research to determine the applicable charities. For further information on related foundations, check out Imagine Canada (www.imaginecanada.ca). This site contains over 600 foundations, their interests, financial limitations, application procedures, and deadlines.

Your lake stewardship organization may also apply for a government grant although this form of funding has been drastically cut. Grants are available from all three levels of government. Typically, they lean toward specific projects so it is important to focus only on grants relevant to your program. Like foundations, applications for grants are very detailed, tedious, and time-consuming. However, if approved, grants provide a major source of income. Contact your local Conservation Authority (www.conservationontario.ca), Ministry of Natural Resources (www.mnr.gov.ca) and the Ministry of the Environment (federal: www.ec.gc.ca); provincial:

www.ene.gov.on.ca) for appropriate grant applications.

CHARITABLE STATUS

Although charitable status is not a source of funding it is very important for obtaining funds. Most corporations will not donate to organizations without charitable status. The benefit of charitable status is that all donations become tax exempt. No one wants to give without receiving anything in return. By advertising that you have a registration number you increase your funding potential. Charity Village (www.charityvillage.com) is a wonderful resource with information from how to work with volunteers to how to register your organization as a charity.

Your organization can obtain a charitable status in one of two ways. You can apply for a tax exemption registration with Revenue Canada. Once approved, you would be issued a charitable registration number that entitles you to issue tax-deductible receipts for donations. If you would like to have a charitable registration number visit the website for Revenue Canada (cra-arc.gc.ca) and follow the links to registering charities. They also have useful publications and related links. Establishing a charitable status for your organization can be both costly and time-consuming. The other method is to become a member of an already existing charitable organization, preferably one with a similar mandate. Pay your membership dues and then you have access to their registration number. This is a quick and easy alternative that achieves the same goal.

CORPORATIONS

The first thing to realize is that corporate sponsors see themselves or want to be perceived as part of the community. Take advantage of this information when approaching potential corporations. This is a great source of funding in that these donations are usually larger and more constant. Most businesses allot a segment of their budget for sponsorship and donations. It serves as a tax write-off in the form of business expenses. It is your job to find out the key interests of the prominent directors within these corporations and manipulate those interests to fit with your project. Focus on those corporations that have a vested interest in your cause and in

your area. Talk to the businesses in your area, for instance the local bank manager or the manager of your local hardware store franchise. The branch offices or stores may have budgets for local giving. Brainstorm and formulate a list of businesses in your area. Research those businesses that have money for charitable groups. Often their websites will have a page dedicated to their green or community giving. These become your target sponsors.

Compile a fundraising kit containing all necessary documents to distribute to potential sponsors. This organizational strategy is instrumental in the success of your fundraising campaign. Distribute these kits to a predetermined contact person for each target corporation.

You may find some corporations that want to give but are limited by budget restraints. Consider moving beyond "in-cash" sponsorship to requesting "in-kind" donations (i.e., office equipment, employee expertise, door prizes for special events). Again, be imaginative when soliciting donations in kind and take advantage of these opportunities.

Network and develop partnerships! Here is your chance to form "win-win" relationships where you get your necessary funding and businesses benefit from tax exemptions, good public relations, and community service. Be strategic in your planning; if you obtain the right corporate sponsor, they could serve as leverage or credibility to get other donors.

Whether in-kind or in-cash donations, always remember to keep the lines of communication open. Thank your donors. Remind them of your existence and appreciation for their support by sending out newsletters and articles. This way, you have them abreast of your success when it comes around to your next fundraising campaign. Special events.

Fundraising Kit

- letters of request (positive and personal to get the reader to donate)
- pre-paid return envelopes (make it as easy as possible to donate)
- brochures about the group
- media articles/reports (shows credibility within the community)
- thank you letters (explain what you have done with their money)

Finally, special fundraising events provide yet another source of funding. While these events should be fun, they ideally relate to the mandate of your project (i.e., eco-tours, lakefront cleanup drives, barbecues) As a resident of your community, you know the types of events that will draw a large turnout. Use this knowledge to your benefit. Remember that planning is key, as the success of these events depends on low overhead, great publicity, many volunteers, and plenty of time. In the end, not only have you raised funds but you have created a cohesive community and established credibility for your program. This will help in future fundraising endeavours.

Developing A Strategy

Now that you know what skills are required to raise funds and you have successfully researched all the available sources, it is time to create a realistic strategy. It should include both a budget and a proposal. When creating your budget, be sure to include the operational costs of your stewardship program as well as costs for special projects. Do not exaggerate your budget because potential donors may see this and refuse to contribute. You could lose your credibility. At the same time, try to be as specific and detailed as possible while being realistic. Know the sources that you intend to target and include them in your plan. See below for a sample fundraising budget.

Before putting your plan together, find a good bookkeeper. They are worth their weight in gold. They will save a lot of headache later when you have to account for donations and explain expenditures. They will also have experience with budgeting. Don't spend a dime or ask for donations until you have someone who will manage the accounts.

Once you have a budget strategy down on paper it becomes easier to put your tasks into perspective. You can see your goal and what needs to be done to achieve it. The budget also forms a basis for delegating responsibilities. In the sample budget above you can see that the most difficult donations will be five individual donations of \$100 and five corporate sponsors contributing \$1,000 each. Assign qualified and committed members of your organization to each of these tasks. By breaking down the workload, the fundraiser does not become overwhelmed by the task.

Appendices: It is always beneficial to include staff profiles. This shows the potential sponsor who is involved, and this adds some tangibility to your proposal. Also include any letters of support from related and influential sources (i.e., government officials) that would enhance the credibility of your organization.

Cover Letter: This is the first impression! This is where you state your mission, why you are doing what you are doing, and your request for donations. Be brief and concise without being flashy. Make sure to present the cover letter in a positive and professional manner. This page alone will determine whether the donor will read on.

Once you have successfully completed your case statement and researched your various sources of funding, it is time to target those sources! The best way to do this is by breaking down the funding types. There are three main types of funding:

- core funding,
- project funding, and
- capital funding.

Core funding is synonymous with operational costs, which typically come from the dues and membership base. Project funding is where you involve the sponsors. Corporate sources like to support specific projects because they can see the results of their investment quickly. Therefore, this type of funding is the most popular in terms of generating support. Capital funding is the most difficult of the three because it is the most costly. This funding is specifically for large ticket expenses such as buying office space. This is where foundations come into play. Charitable foundations have the asset base to get involved at this level.

Once you understand your target and the type of funding you expect to generate from that source it is just a matter of customizing your funding proposal to cater to each source. Case statements for foundations and grants will be very different from those presented to a corporation; prepare packages accordingly.

Reviewing the Principles of Fundraising

1. Diversify your funding base. If you depend on one or a few sponsors then you leave your group vulnerable as economic situations change. Maintaining a wide base of sponsors allows the

group to overcome these inevitable funding policy changes. Make sure to draw also from a variety of sources. Do not focus on one funding source alone. Explore all the untapped resources available.

2. Generate revenue. Consider all the ways to get money. Whether it is income from membership fees or co-operative projects with other associations, always be imaginative. Again, the opportunities are endless.

3. Involve people. You need more than one fundraiser to raise money. Get everyone involved from the planning stages to implementation and evaluation. Your local community is an excellent volunteer base. Also take advantage of experienced people within your community (i.e., professional fundraisers). They are a good source of information. Remember that it is important to always keep your volunteers informed and motivated.

4. Constantly plan fundraising. This is not a one-time job but rather requires organization and scheduling. You must be proactive and plan your strategy on an annual basis. Develop a timetable. Remember deadlines and holidays when planning fundraising events. Make sure your events do not overlap with other major fundraising campaigns.

5. Execute the plan. You need to move past the reluctance to ask for money. We believe that we are self-sufficient and to beg for money would imply dependency. The truth is we are somewhat dependent. The only way to get the money is to ask and the only way to learn that is through experience. Sometimes you will fail and other times you will succeed but remember your motivation, your purpose, and your commitment.

6. Co-operate with others. The environment is already competitive in terms of available money and resources. Do not let your fundraising campaign compete with others. Instead, share information, skills, and resources to prevent overlapping. Furthermore, by working with others

Quick Fundraising Tips

- Have an assigned fundraising decision maker
- Make it as easy as possible for the donor
- Have a prepared budget
- Make appointments
- Keep records of everything
- Offer receipts
- Follow-up and thank donors
- Inform media to acknowledge your contributors
- **DON'T GIVE UP IF AT FIRST YOU DO NOT RECEIVE!**

you can maximize your gains (money) with minimum effort.

7. Advertising is key. During the start-up phase, donors will be impressed by a professional presentation. This is especially true of business or corporate donors who will be asking for publicity in return for their contribution. They rate their interest in helping you in terms of impressions; every impression they make, for example a person reached by the ad, they are that much closer to making a sale. Remember businesses are not philanthropists; they are in the business to make money. Even though they may be genuinely interested in your project, they want to know their money will be well spent and effectively contribute to the community. Your project should have regular "wrap-up" emails or progress circulars. Yes, they take time and can cost money but business people often use these items to justify their contributions.

8. Fundraising is a process. It is a continuous motion broken down into many smaller steps. Remember to consider all these steps.

9. Fundraising builds an organization. The benefits of fundraising go far beyond just raising revenue: it builds a sense of shared commitment; it establishes credibility in your community that your organization is responsible; it promotes awareness and public education for your objectives; it can help in recruiting new members and establishing new mailing lists; and it spreads goodwill and most of all it is fun! Remember all of these benefits as you plan your fundraising campaign and it is sure to be a success. Remember that your goal is not just to raise money, it is to complete a project.

Resources

Canadian Environmental Grantmakers Network
www.cegn.org

Charity Village: www.charityvillage.com

Environment Canada Funding Programs:
www.on.ec.gc.ca/funding_e.html

Imagine Canada: www.imaginecanada.ca

Sloggie, Neil. 2002. *Tiny essentials of fundraising*. France: White Lion Press. Available through the Sustainability Network.

Sustainability Network:
www.sustainabilitynetwork.ca



Mixed Sources

Product group from well-managed forests,
controlled sources and recycled wood or fiber
www.fsc.org Cert no. SW-COC-000952
© 1996 Forest Stewardship Council

ISBN-13: 978-0968423615



62000

9 780968 423615

