



# Watershed Wisdom

**HEALTHY LIFESTYLES FOR NOVA SCOTIANS AND THEIR ENVIRONMENT**





René Cescon

## Healthy Watersheds

A watershed, also known as a catchment or drainage basin, is defined as the total land and water area that contributes flow to a particular body of water. Rainwater runoff, groundwater, connected streams, rivers and lakes are all components of a watershed, which flow downstream to eventually reach a common estuary or ocean.

Water can enter a watershed directly – for example, as surface runoff from rain or snow – or indirectly, such as when water seeps through the ground to enter the groundwater system. Over every metre of its flow, the health of the watershed is affected by the quality of the water sources that contribute to it. Forestry practices, agriculture, climate change, industry, development, domestic use and recreation all have an impact. The nature of a watershed means that once deposited, pollution will follow the flow of water downstream. If water quality is diminished, the entire watershed and its inhabitants are affected.

Regardless of how close or far you live from a water body, everyone lives in a watershed, and thus has an impact on its health. The first step in preserving the health of your watershed is to understand what threatens its health and productivity. Although all of the threats outlined here may not exist currently in your particular watershed, it is important to remember two things:

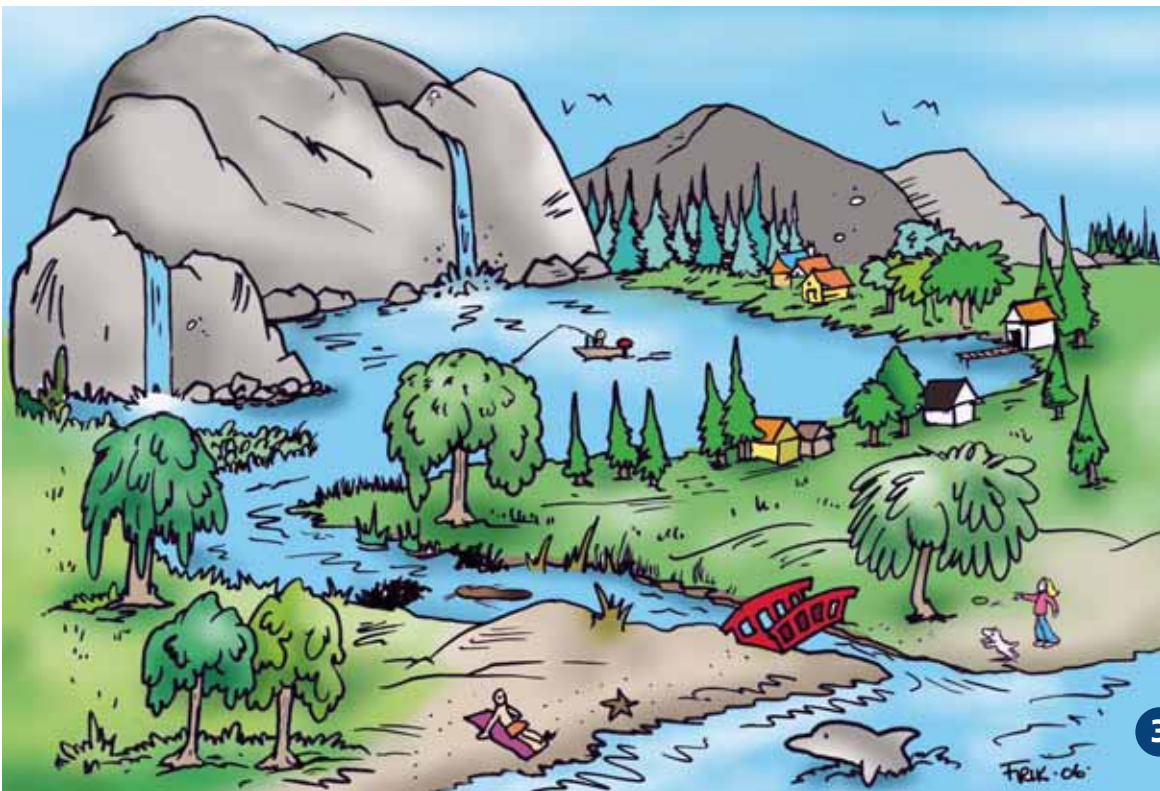
- Pollutants can travel many kilometres downstream from their source.
- Future practices may introduce new threats of pollution – but knowledge, awareness and environmental responsibility could help reduce their potential impacts.

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**“As children of a culture born in a water-rich environment, we have never really learned how important water is to us. We understand it, but we do not respect it.”**

*William Ashworth, Nor Any Drop to Drink, 1982*

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## Watershed Profile: The Mushamush



The Mushamush Watershed drains an area of approximately 350 km<sup>2</sup>, servicing communities such as Farmville, Walden, Sweetland, Lower Northfield, Blockhouse, Cornwall (Upper, Middle, and Lower), Clearland and Mahone Bay. All paths of flow within this watershed lead to the Mushamush River, which in turn flows into the Mahone Bay. Since the late 1800s, the Mushamush River has been the site of numerous sawmills, gristmills and log drive operations, and dams have been constructed across its width to harness the water's electrical power.

As invaluable as this river's contributions have been to the local economy, they have come at the high cost of extensive environmental degradation.

Damming the river blocked access to vital spawning areas for native salmon and trout, while log drives effectively choked the river by inputting high loads of debris and silt. This resulted in a consequent decrease in spawning pools and an increase in water temperature. Collectively, the impacts of past activities such as these have resulted in a substantial decline in fish populations in the Mushamush River.

Since 1998, Bluenose Coastal Action Foundation (BCAF) has been making efforts to recover the natural beauty of the Mushamush River and regain the health of the Mushamush Watershed by restoring a section of the river each year. The Mushamush River Restoration Project strives to restore aquatic habitat along the river and encourage the return of fish populations. In addition to monitoring existing structures, BCAF, along with a crew from the Nova Scotia Youth Conservation Corps and community volunteers, works each summer to install new digger logs, deflectors and rocks sills where appropriate. Three decommissioned power dams have also been removed to improve fish passage. Degraded fish cover and habitat have been repaired further by bank stabilization efforts.

The effects of past activity on the Mushamush River illustrate the impact that human actions can have on watershed health. Through continued effort and community support, the once-degraded Mushamush River will be returned to a healthier and more natural state – to the benefit of the greater Mushamush Watershed and all of its inhabitants.

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### Water Fact

**Just over 45% of Canada's total surface area is highly sensitive to acid rain. Much of this area is in eastern Canada where the Canadian Shield has little ability to neutralize acidic pollutants.**

## Terms at a Glance...

**Deflector:** A habitat improvement structure made of a variety of materials (logs, rocks) that is used to create fish and aquatic macro-invertebrate habitat. These structures are built outward into the river channel from either one or both banks in order to direct water flow away from the banks and consequently prevent stream bank erosion. Deflectors are especially effective in wide, shallow, low gradient streams because they also provide desirable scouring and sorting of channel materials, pools and cover.



BCAF staff installing a digger log on Naas Brook, a small tributary within the Mushamush River watershed, Lunenburg County.

**Rock sill:** Similar in purpose to a digger log but made of non-acid bearing rock and used on a larger scale, usually on wider rivers. Rocks are placed so that they form a 'sill' allowing the water to cascade over causing a natural digging action that forms a pool below and stirs up the gravel facilitating spawning bed formation. Rock sills additionally help to restore natural pools, increase oxygen levels and cool the river temperature.

**Gristmill:** A mill for grinding grain. Gristmills used to be a common site along many rivers in Lunenburg County.



Paul Hammon

Lunenburg County Gristmill Circa 1900.

**Digger log:** A river restoration structure that consists of hardwood logs (~ 6-9ft long, 8 inches in diameter) secured to the streambed at a 30 degree angle to the bank. Boulders and cobble from the downstream side of the log are removed and placed upstream to create a ramp, causing the water to cascade over the log. These structures help to re-establish the natural meander of the stream, create pools and gravel beds for fish spawning, clean and oxygenate the water, and also provide quality habitat for aquatic insects.





Sinclair Lewis

## Pollution Particulars

### GETTING TO THE SOURCE OF THE PROBLEM

Pollution can enter a watershed by means of many different paths – via land, water and sky. Regardless of its vector of travel, the origin of a pollutant is sometimes easy to track, and at other times difficult to isolate. As such, pollution sources are often described as either point or non-point.



**Point source pollution** originates from a clearly identifiable site, such as an oil spill or wastewater discharge from a pulp and paper mill. Because this type of pollution is easier to source, it is also easier to quantify and, in theory, to control.

**Non-point source pollution**, on the other hand, enters a watershed in a more indirect fashion – for example, when road salt enters a roadside stream with the snowmelt, or when air pollution travels from distant industrial sources and falls down on the watershed as acid rain. Due to its diffuse nature, non-point source pollution is much more difficult to measure and manage.

All pollution, however, whether point or non-point source, elicits negative impacts on a watershed. Pollution destroys aquatic habitat, harms fish and other aquatic species, degrades surface and groundwater quality, and potentially creates human health risks for those who rely on the watershed for recreational use, clean drinking water and food.

# Watershed Threats: Water Pollution

Species at the top of food chains may exhibit concentrations of pollutants more than a million times greater than in the water itself. This could result in population declines that last for decades.

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
<p><b>Bioaccumulation</b> Marked increase in pollutants within the body of an organism over its life span</p>	<ul style="list-style-type: none"> <li>Air pollution &amp; direct pollution discharge</li> </ul>  <p style="text-align: right; font-size: small;">Industry</p>	<ul style="list-style-type: none"> <li>Various species ingest water pollutants</li> <li>Pollutants remain in the organism &amp; accumulate over time</li> <li>Pollutants in prey are passed on to predators</li> <li>Species at the top of the food chain may exhibit a concentration of the pollutant that is a million times greater than in the water itself</li> </ul>	<ul style="list-style-type: none"> <li>Increased instances of serious illnesses in species at the top of the food chain</li> </ul>  <p style="text-align: right; font-size: small;">Bald Eagle</p>
<p><b>Heavy Metals</b></p>	<ul style="list-style-type: none"> <li>Highly toxic substances such as mercury &amp; lead</li> </ul>	<ul style="list-style-type: none"> <li>Become increasingly toxic in species at the top of the food chain</li> </ul>	<ul style="list-style-type: none"> <li>Potentially devastating damage to all affected species</li> <li>Increased instances of serious illnesses for humans &amp; wildlife</li> </ul>
<p><b>Industry Mining</b></p>	<ul style="list-style-type: none"> <li>Mine tailing: lead, nickel, arsenic, cadmium, etc.</li> <li>Acidic runoff from strip mines</li> <li>Further pollutants from refinery smelters</li> </ul>	<ul style="list-style-type: none"> <li>Direct disposal into waterways</li> <li>Pollutants flowing into waterways as runoff</li> </ul>	<ul style="list-style-type: none"> <li>Increased instances of serious illnesses for humans &amp; wildlife</li> <li>Bioaccumulation</li> </ul>
<p><b>Oil Spillage</b></p>	<ul style="list-style-type: none"> <li>Various sources: oil tankers, ship bilge cleaning, oil tank leaks, automobile oil, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Oil &amp; its by-products are toxic to plants &amp; animals</li> </ul>	<ul style="list-style-type: none"> <li>Large bird, fish &amp; plant kills</li> <li>Population declines that may last for decades</li> </ul>
<p><b>Pulp &amp; Paper</b></p>	<ul style="list-style-type: none"> <li>Chlorine used for paper bleaching</li> <li>Long living toxic by-products including furans &amp; dioxins</li> </ul>	<ul style="list-style-type: none"> <li>Long living compounds released as wastewater into waterways</li> <li>Contributes to both air &amp; water pollution</li> </ul>	<ul style="list-style-type: none"> <li>Fish &amp; vegetation kills</li> <li>Long term threat of contamination</li> </ul>

Environment Canada

## Watershed Threats: Water Pollution Continued

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
<b>PCBs</b> Polychlorinated biphenyls	<ul style="list-style-type: none"> <li>• Were used in electrical transformers, various home &amp; industrial uses</li> <li>• Clean up &amp; disposal remains a challenge</li> <li>• No longer produced in NA</li> </ul>	<ul style="list-style-type: none"> <li>• PCBs remain active for years making contamination a long term problem</li> </ul>	<ul style="list-style-type: none"> <li>• Long term contamination</li> <li>• Increased instances of serious illnesses for humans &amp; wildlife</li> </ul>
<b>Forestry</b>	<ul style="list-style-type: none"> <li>• Pesticide use</li> <li>• Past use of DDT (banned in Canada &amp; the US since 1970)</li> </ul>	<ul style="list-style-type: none"> <li>• Newer chemical pesticides, although shorter-lived than DDT, are still toxic to people &amp; wildlife</li> </ul>	<ul style="list-style-type: none"> <li>• DDT causes deformities &amp; infertility, especially visible in birds at the top of the food chain. Although its use has been discontinued many populations have yet to recover</li> </ul>
<b>Thermal Pollution</b>	<ul style="list-style-type: none"> <li>• Large quantities of water used to cool machinery</li> <li>• Machinery cooling causes water to become heated</li> </ul>	<ul style="list-style-type: none"> <li>• Releasing heated water into waterbodies changes aquatic habitat</li> <li>• Warm water holds less oxygen than cool water, a harmful consequence for aquatic species</li> </ul>	<ul style="list-style-type: none"> <li>• Potential for invertebrates &amp; fish to be killed</li> <li>• Habitat damage throughout watershed</li> </ul>
<b>Radioactive Waste</b>	<ul style="list-style-type: none"> <li>• Nuclear waste</li> <li>• Thermal pollution</li> </ul>	<ul style="list-style-type: none"> <li>• Radioactive waste remains dangerous for extended periods of time</li> </ul>	<ul style="list-style-type: none"> <li>• Exposure to the waste is harmful to people &amp; wildlife</li> </ul>
<b>Domestic Waste</b>	<ul style="list-style-type: none"> <li>• Household hazardous waste</li> <li>• Road, roof &amp; lawn runoff</li> <li>• Sewage, sewage treatment by-products &amp; fertilizers</li> </ul>	<ul style="list-style-type: none"> <li>• Our everyday domestic waste reaches waterways – many of our actions are easily preventable</li> </ul>	<ul style="list-style-type: none"> <li>• Health risks for people &amp; wildlife</li> <li>• Depleted dissolved oxygen in watersheds</li> </ul>
<b>Agriculture</b>	<ul style="list-style-type: none"> <li>• Chemical fertilizers &amp; pesticides</li> <li>• Manure</li> <li>• Erosion</li> </ul>	<ul style="list-style-type: none"> <li>• Agricultural pollutants wash into waterways, particularly during precipitation events &amp; spring snow melts</li> <li>• Creates a cycle; replaced soil &amp; fertilizers will again enter the water</li> </ul>	<ul style="list-style-type: none"> <li>• Risk of well contamination</li> <li>• Oxygen depletion &amp; siltation in waterways</li> <li>• Potential suffocation of aquatic species</li> </ul>



THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
<p><b>Excess Nitrogen &amp; Phosphorous</b></p>	<ul style="list-style-type: none"> <li>• Sewage</li> <li>• Livestock manure</li> <li>• Farm, garden &amp; lawn fertilizers</li> </ul>	<ul style="list-style-type: none"> <li>• Causes rapid growth of algae, cyanobacteria &amp; other floating plants</li> </ul>	<ul style="list-style-type: none"> <li>• Algal blooms reduce the light &amp; oxygen available to species, suffocating aquatic life</li> </ul>
<p><b>Invasive Species</b> A species introduced into an ecosystem where it did not exist previously</p>	<ul style="list-style-type: none"> <li>• Accidental &amp; intentional introductions</li> <li>• Well-known Canadian examples: purple loosestrife &amp; zebra mussels</li> </ul>	<ul style="list-style-type: none"> <li>• Affects terrestrial &amp; aquatic environments</li> <li>• Potentially drastic population increases if natural predators or competitors don't exist</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat &amp; resource competition with native species</li> <li>• New pathogens, parasites &amp; diseases can be introduced by invasive species</li> <li>• Steep decline in native species populations</li> <li>• Decreased ecosystem biodiversity</li> </ul>

# Watershed Threats: Habitat Loss & Degradation

Many of our normal day-to-day activities including logging, farming, outdoor recreation and building cottages and waterfront homes can have significant impacts on local habitat and wildlife species.

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
<b>Interruption of Water Flow</b>	<ul style="list-style-type: none"> <li>Dams, mills &amp; other intrusions</li> <li>Forestry practices</li> </ul>	<ul style="list-style-type: none"> <li>Changes water levels affecting the water cycle</li> <li>Dams alter water flow; the reservoirs slow water velocities, alter water temperatures &amp; increase chance of predation</li> <li>Interruption of natural fish migration &amp; the flow of nutrients downstream</li> </ul>	<ul style="list-style-type: none"> <li>Significant habitat changes cause displacement of native species</li> <li>Risk of flooding</li> <li>Impeded fish passage</li> </ul>
<b>Agriculture</b>	<ul style="list-style-type: none"> <li>Introduction of monoculture crops</li> <li>Monopolizing nutrient rich lowland or floodplains</li> </ul>	<ul style="list-style-type: none"> <li>Reduces biodiversity &amp; habitat for native species</li> <li>Unique habitat corridors of diverse floodplains are often destroyed</li> </ul>	<ul style="list-style-type: none"> <li>Reducing plant diversity decreases the biodiversity of animals &amp; even micro-organisms</li> <li>Species displacement</li> </ul>
<p><b>Clear-cut Logging</b> All trees from a given area are removed</p> <p><b>Selective Logging</b> Marking of individual trees within an area for cutting</p>	<ul style="list-style-type: none"> <li>After clearcutting, nutrients from the removed wood are lost, making the soil nutrient poor</li> <li>Selective cutting removes the healthiest desirable species, affecting species composition</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation acts as a buffer and absorbs large quantities of water; its removal decreases watershed protection</li> <li>Decreased wildlife diversity</li> <li>Clearcutting causes drastic drops in the water table</li> <li>Reforestation efforts require years to take full effect</li> </ul>	<ul style="list-style-type: none"> <li>Wildlife are confined to smaller areas</li> <li>Logging roads infringe on undisturbed wildlife habitat</li> <li>Silt, soil deposits &amp; run-off harm fish &amp; aquatic life</li> <li>Log debris interrupts fish migration</li> <li>Loss of buffer zone raises water temperatures which are intolerable for some aquatic species</li> </ul>
<b>Recreation</b>	<ul style="list-style-type: none"> <li>Trampling natural areas</li> <li>Careless littering</li> <li>Removal of "souvenirs"</li> </ul>	<ul style="list-style-type: none"> <li>Decreased diversity due to construction of homes, paths, driveways, disturbing &amp;/or removing flora and fauna</li> <li>Threat of forest fires</li> </ul>	<ul style="list-style-type: none"> <li>Threat of forest fires</li> <li>Displacement of wildlife due to habitat destruction</li> </ul>
<b>Domestic</b>	<ul style="list-style-type: none"> <li>Increased desire for waterfront property</li> </ul>	<ul style="list-style-type: none"> <li>Clearing of land to shoreline decreases micro-habitats</li> </ul>	<ul style="list-style-type: none"> <li>No cover for wildlife &amp; no buffer for soil stabilization &amp; shade</li> </ul>



## Watershed Threats: Climate

**Vegetation naturally absorbs carbon dioxide and converts it to oxygen through photosynthesis. Depleting natural vegetation and increasing pollution magnifies the Greenhouse Effect.**

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
<b>Air pollution</b>	<ul style="list-style-type: none"> <li>Coolant used in fridges &amp; air conditioners (CFCs are no longer used in new models)</li> <li>Vehicle &amp; industry emissions</li> </ul>	<ul style="list-style-type: none"> <li>Ozone depletion: thinning of the ozone layer</li> <li>Decreased ozone levels high in the atmosphere</li> <li>Increased low level ozone concentrations</li> <li>Increased ultraviolet light</li> </ul>	<ul style="list-style-type: none"> <li>Increased risk to health</li> <li>Increased smog</li> <li>Increased danger from exposure to sun (i.e. skin cancer)</li> <li>Climate change</li> </ul>
<b>Greenhouse Effect</b>	<ul style="list-style-type: none"> <li>Methane, nitrous oxides &amp; CFCs</li> <li>Carbon dioxide, the greenhouse gas humans contribute to most by burning fossil fuels</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation absorbs carbon dioxide breaking it down to a useful form. Depleting natural vegetation &amp; increasing pollution magnifies the Greenhouse Effect</li> </ul>	<ul style="list-style-type: none"> <li>Climate change: weather variability, regions of drought, melting polar ice, higher sea levels</li> <li>Global warming</li> </ul>
<b>Acid Rain</b> Precipitation with higher acidic levels (pH) than natural rainwater	<ul style="list-style-type: none"> <li>Burning fossil fuels &amp; melting metals</li> </ul>	<ul style="list-style-type: none"> <li>Increased acidic precipitation due to chemical reactions between air pollutants &amp; water vapour</li> </ul>	<ul style="list-style-type: none"> <li>Decline in aquatic &amp; terrestrial plant &amp; animal species sensitive to acidic conditions</li> </ul>



Eastern ribbonsnakes, Tom Herman

## Watershed Rarities

### SPECIES AT RISK IN NOVA SCOTIA

The health of a watershed is vital for each and every organism that lives within it. For species at risk, however, the difference between life and death is an even finer line. As well as large scale measures taken by corporate citizens, many of our own individual, seemingly innocent day-to-day actions impact watershed habitat in Nova Scotia. All of these factors could result in dire consequences for some at-risk species – locally, regionally or even globally.

Many at-risk species living in Nova Scotian watersheds currently have some sort of legislative protection, either provincially, nationally or both; however, as modification and destruction of their habitat continues, efforts need to be made to ensure the balance does not tip in their disfavour. On the following pages, we

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feature six vulnerable species living in our region.

## How to Protect Species at Risk

- Familiarize yourself with species at risk in your area. Learn what they look like and what types of habitat they require.
- Teach others in your community about species at risk, their status and their struggle to survive.
- Learn to distinguish at-risk species from similar-looking, more common species.
- Do not pick or trample at-risk flowers and plants.
- Admire at-risk species from a distance to ensure they are disturbed as little as possible.
- Help stop the introduction of non-native species.
- Contact authorities such as the Nova Scotia Department of Natural Resources or the Canadian Wildlife Service if you spot what you know or suspect to be an at-risk species.
- Volunteer with a local environmental/conservation group working to protect species at risk.
- Practice the watershed-friendly activities outlined in this booklet.

# Atlantic Whitefish

## COREGONUS HUNTSMANI

**National status:** Endangered  
**Provincial status:** Endangered

**Watershed likes:** The Petite Rivière watershed and, historically, the Tusket River, both in Nova Scotia – in fact, Nova Scotia hosts the only known population of Atlantic whitefish in the world.

**Watershed dislikes:** Hydro-electric development, predation by non-native fish such as chain pickerel and smallmouth bass, acidification and fishing pressures.

**Can be recognized by:** its blue to green back, silvery sides and silvery to white belly, adipose fin, elongated body and deeply forked tail. The average length of this fish is 38 cm in anadromous populations, 20-25 cm if landlocked. It has larger scales than the similar-looking Atlantic salmon or brook trout.

**General information:** Like salmon and trout, the Atlantic whitefish is a member of the Salmonidae family. Also known as the Acadian whitefish, the Sault whitefish, the round whitefish and the common whitefish, the Atlantic whitefish is considered the most primitive form of all North American whitefish.



Kelly Benham

### Terms at a Glance

**Anadromous:** a fish that spends most of its life in the sea, but moves to fresh water to breed.

**Acidification:** change in the pH balance of a water body to a more acid state; acid rain and fertilization/eutrophication are common causes.

The first account of the Atlantic whitefish was taken from Millipsigate Lake in Lunenburg County. The species was also known to exist in the Tusket River at one time, but due to dam construction and acidification it has since thought to be extirpated from this part of the province. Today, the Atlantic whitefish is believed to exist only in the Petite Rivière Watershed in Nova Scotia. Though the species is anadromous, the remaining Petite Rivière population is believed to be landlocked and therefore unable to travel to the sea. There is limited information on spawning behaviour and early life stages of this fish.

The Atlantic whitefish was declared endangered in 1984 by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). As a result, this species is protected under the Maritime Fishery Regulations, the Federal Species at Risk Act and the Nova Scotia Endangered Species Act.

## Water Fact

**One fifth of the world's freshwater fish — 2,000 of 10,000 species identified — are endangered, vulnerable or extinct. In N.A. (the continent most studied), 67% of all mussels, 51% of crayfish, 40% of amphibians, 37% of fish, and 75% of freshwater molluscs are rare, imperilled, or already gone.**



Ted D'Eon

## Roseate Tern

### STERNA DOUGALLII

**National status:** Endangered  
**Provincial status:** Endangered

**Watershed likes:** Rocky Atlantic beaches for breeding, mainly on offshore islands and islets, and especially in Nova Scotia and Quebec, though sometimes in New Brunswick, Newfoundland and PEI.

**Watershed dislikes:** Human disturbance at nesting sites and coastal development.

**Can be recognized by:** its gull like features – terns are smaller than gulls, however. Roseate terns can be identified by their white or very pale grey plumage, forked white tail, black cap and bill, and bright red-orange legs. Breeding adults may have a slight rosy tinge to their chest feathers.

**General information:** The Canadian population of the roseate tern represents approximately 3-4% of the northeastern total of the species in North America. Approximately 120 pairs of roseates breed in Canada each year, most of them within two colonies in Nova Scotia: the Brothers Islands, located off Pubnico

in Yarmouth County, and the Country Island complex, located in Guysborough County. Mahone Bay, however, once hosted up to a third of the Canadian population of these rare birds. The colony abandoned their original nesting site in the mid-1990s, and they have been attempting to nest at several other sites within Mahone Bay ever since.

Unfortunately, securing safe nesting sites is not easy for this species. In addition to natural threats such as competition with and predation by gulls, normal island erosion, and predation by other wildlife such as owls and mink, the roseate tern has had to deal with anthropogenic disturbances. Habitat has been lost due to coastal development. Human disturbance at nesting sites has been suspected to be the cause of tern colony abandonment at some sites in Mahone Bay and elsewhere. Toxic chemicals in the environment have also had an effect on roseate tern reproduction, causing eggshell thinning, premature egg breakage and overall reduced reproductive success.

**Human disturbance at nesting sites has been suspected to be the cause of tern colony abandonment at some sites in Mahone Bay.**

The Roseate tern is protected under the Species at Risk Act (SARA), the Migratory Birds Convention Act and the Nova Scotia Endangered Species Act. Conservation management of the species through the *Roseate Tern Recovery Strategy* aims to increase the number of breeding pairs in Canada to at least 150 through the maintenance of secure nesting sites. In Mahone Bay, Bluenose Coastal Action Foundation (BCAF) is attempting to establish such a site on Quaker Island. BCAF's *Roseate Tern Recovery Project* integrates habitat enhancement, social attractants and predator deterrents along with public awareness in an effort to reach this goal.



## Eastern Ribbonsnake

### THAMNOPHIS SAURITUS

**National status:** Threatened  
**Provincial status:** Threatened

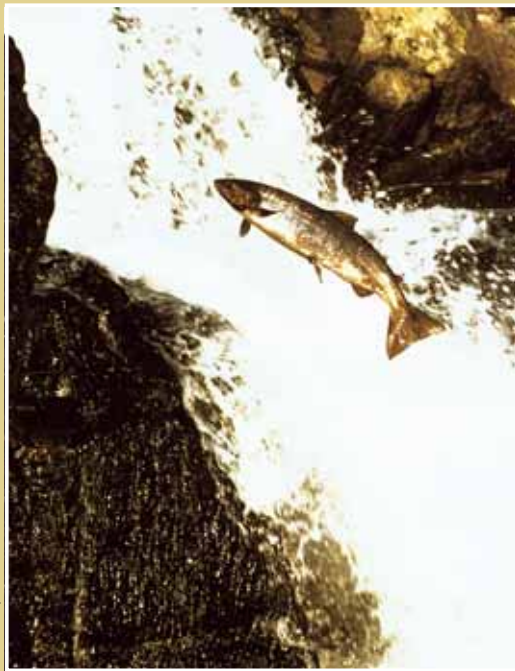
**Watershed likes:** Edges of shallow ponds, streams, marshes, swamps or bogs that have thick vegetation to provide protective cover, and the upland areas adjacent for nesting.

**Watershed dislikes:** Habitat loss due to shoreline development.

**Can be recognized by:** its dark brown to black skin with three yellow stripes running longitudinally down its back, white chin and throat, and pale green, yellow or white belly. Adults are approximately 46 to 86 cm long and resemble common garter snakes, but tend to be thinner with a longer tail.

**General information:** The eastern ribbonsnake exists in only two areas of Canada: southern Ontario and Nova Scotia. The Nova Scotian population is estimated at only 1,000 to 3,000 individuals, and is limited to three watersheds in the southern portion of the province. Thought to be a relic from milder post-glacial times, the eastern ribbonsnake requires a very specialized habitat and thus is especially vulnerable to environmental change.

The greatest threat to eastern ribbonsnakes in Nova Scotia is shoreline development, such as the building of lakeshore cottages. Domestic cats also wreck havoc on the species, as do automobiles and collection by humans. The fact that little is known about the eastern ribbonsnake increases these risks. This species is currently protected under the Species at Risk Act (SARA). The Kejimikujik National Park population is also protected under the National Parks Act.



McMullen, Atlantic Salmon Federation

## Atlantic Salmon

### INNER BAY OF FUNDY POPULATION, SALMO SALAR

**National status:** Endangered

**Provincial status:** Not listed

**Watershed likes:** When in freshwater, clean, cool rivers and streams with rapids, pools and gravelly bottoms. Pollution-free is a must!

**Watershed dislikes:** Chemical pollution, excess silt and other organic pollution, and tidal barriers that block the mouths of spawning rivers and streams.

**Can be recognized by:** its pointed head, full set of teeth, and slightly forked caudal fin. When at sea, Atlantic salmon are characterized by a silvery belly and sides and a dark back in shades of brown, blue or green; black pectoral and caudal fins; and numerous black spots along

body. When spawning in freshwater, both sexes are a purple-bronze colour and are scattered with red spots.

**General information:** Inner Bay of Fundy Atlantic salmon spend the first two years of their life in the freshwater body of their birth. After two years, they move to the marine areas of the Bay of Fundy and beyond, where they usually spend one winter before returning to freshwater to spawn.

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**“Water is life’s mater and matrix, mother and medium. There is no life without water.”**

***Albert Szent-Gyorgyi, Hungarian biochemist and Nobel Prize Winner for Medicine.***

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Threats to the species while in freshwater are problematic, but the main cause for the decline of Inner Bay of Fundy Atlantic salmon is thought to be linked to high levels of marine mortality. Although it is known that smolts have been leaving their home rivers to enter the ocean, few adults have been returning to breed. The complex process of identifying and resolving these marine threats is currently in progress. In the meantime, efforts are being made to preserve the remaining population. Fisheries and Oceans Canada (DFO) is raising young salmon and releasing them into rivers to allow ‘wild exposure’ thereby helping to conserve the genetic fitness of the population while hopefully increasing the returns of adult salmon. Efforts by community groups are also underway to restore degraded Inner Bay of Fundy Atlantic salmon habitat in tidal and freshwater areas, as well as to improve fish passage.

Inner Bay of Fundy Atlantic salmon are protected under SARA, and within the boundaries of Fundy National Park, the species is protected under the National Park Act. Destruction of fish habitat is prohibited under the Fisheries Act.



## Piping Plover

### CHARADRIUS MELODUS MELODUS

**National status:** Endangered

**Provincial status:** Endangered

**Watershed likes:** Exposed sandy or gravelly beaches, above the high water mark, usually on sand spits, ocean beaches or barrier beaches.

**Watershed dislikes:** Habitat loss due to human use and development, human disturbance at nesting sites, predation by those attracted to nesting areas by picnicking garbage, and flooding of nesting areas due to the effects of global warming.

**Can be recognized by:** its primarily sandy colour (which affords it some camouflage), highlighted by a black collar, black 'headband,' partially black tail, and bright orange legs. Piping plovers are small shorebirds with stout bills that are orange with a black tip in the summer and fully black in the winter.

**General information:** About 25% of piping plovers in Canada breed in the Atlantic provinces. The species constructs its shallow nests on cobble and

gravel in coastal areas where its speckled eggs blend in with their environment. The fact that humans covet the same surroundings as the piping plover often results in disturbance or destruction of the nest either directly, due to human presence, or indirectly, through the attraction of plover predators such as raccoons, crows and gulls to the site. Feral dogs and cats will also prey on the eggs and young.

Despite continental efforts to recover the species, piping plover numbers are declining. At last count, only about 40 breeding pairs were present in Nova Scotia, and just 17 beaches in the province have been deemed by the species as suitable nesting habitat.

Piping plovers are protected under SARA, and individuals within national parks are protected by the National Parks Act. Piping plovers in Quebec are covered by the Act Respecting Threatened or Vulnerable Species, and within New Brunswick, Newfoundland and Labrador, and Nova Scotia, the species is protected under provincial Endangered Species Acts. Nationally, Piping plovers are also protected by the Migratory Birds Convention Act.



Mark Elderkin, NS DNR

## Golden Crest **LOPHIOLA AUREA**

**National status:** Threatened

**Provincial status:** Endangered

**Watershed likes:** exposed, gently sloping shores within only six Nova Scotian wetlands – it is found nowhere else in the world.

**Watershed dislikes:** Human alteration of wetland and shoreline habitat and manipulation of wetland water levels; eutrophication.

**Can be recognized by:** its hairy, whitish stalk topped with a cluster of many small, yellow flowers. The golden crest is a perennial herb that stands about 50 cm tall, with green, grass-like leaves that reach about half that length. At their base, the leaves are tinged red.

**General information:** The golden crest is a member of an elite group, the Atlantic Coastal Plain Flora. Plants of this designation are found on lake and river shores, bogs, fens and estuaries in conditions that most other plants would not tolerate: low nutrients, high winds, constant wave action and fluctuating water levels. Because they are so highly specialized to these

conditions, and due to their small size and slow-growing nature, golden crests are overtaken easily by more aggressive plants in areas that are more fertile and/or less disturbed. This also makes them especially vulnerable to disturbances that change local ecology such as shoreline construction and alteration, agriculture (such as cranberry production), permanent changes in water levels due to draining or dam construction, and trampling by all-terrain vehicles or foot traffic.

Over 60 plants are considered Atlantic Coastal Plain Flora. Many of these are unique to Nova Scotia, and 11 of them, including the golden crest, are species at risk. At present, the golden crest is known only to exist in six wetlands in southwestern Nova Scotia, all of which are under some sort of threat. Golden crests are protected nationally under SARA, and in Nova Scotia, under the NS Endangered Species Act. The Ponthook Lake Nature Reserve offers safe haven to one population of this species.

### Terms at a Glance

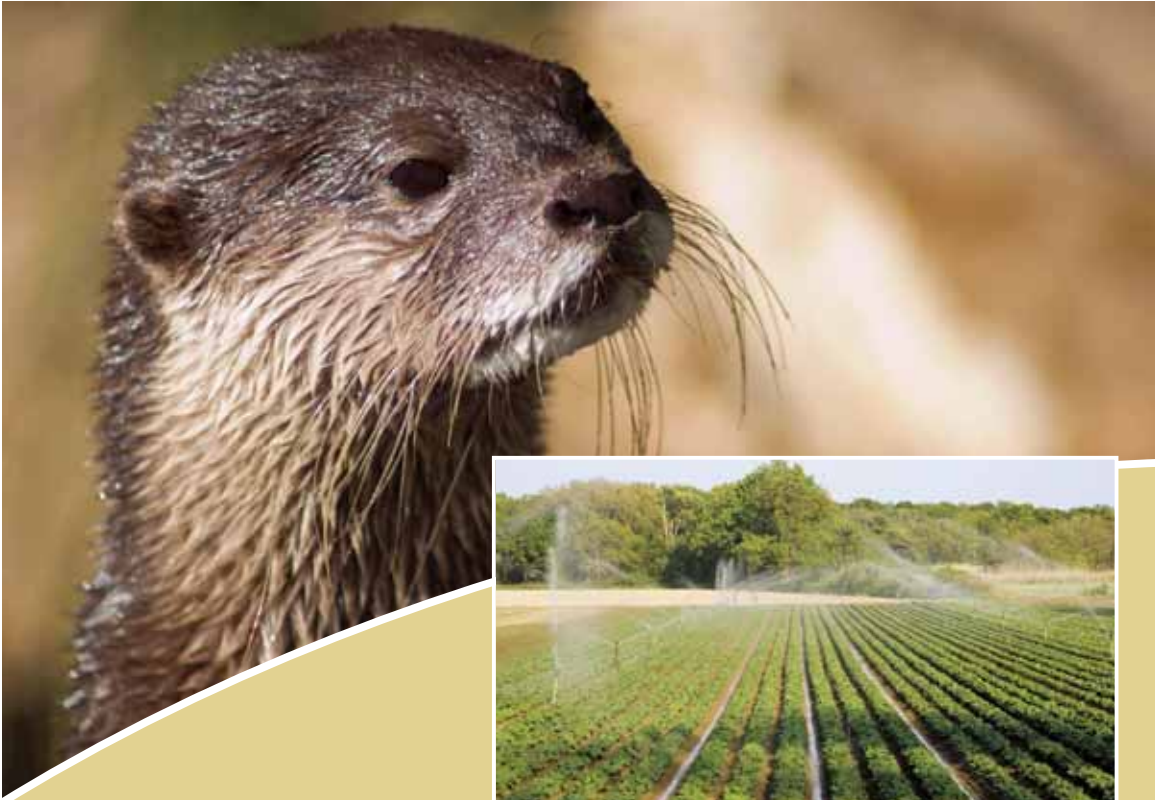
**Endangered:** a species that faces imminent extinction or extirpation.

**Eutrophication:** chemical enrichment of an ecosystem resulting in excessive nutrient levels. Commonly, compounds containing nitrogen, phosphorus or both, such as fertilizers or fecal waste, are the culprit.

**Extirpation:** extinction from part of the species' former range; i.e. absent from the wild in Canada, but present elsewhere.

**Threatened:** a species is likely to become endangered if current limiting factors are not reversed.

For more information on wildlife designations in Canada, visit [www.cosewic.gc.ca](http://www.cosewic.gc.ca).



## **Watershed Watch**

### **PROTECTING WILDLIFE HABITAT**

Humans have a profound ability to modify their surroundings. We can build great structures, plant agricultural species in areas they otherwise would not grow, clear large tracts of land, change the paths of water bodies, and even create new ones. Often, we make these changes naively or selfishly, not thinking of the profound effect they may have on species other than ourselves that use the land and water as well.

#### **The Impacts of Agriculture**

Agricultural land use can contribute to watershed degradation in many ways. Clearing of natural vegetation, tilling of the soil, and overgrazing of pastures can contribute to increased soil erosion. Draining or dyking of wetlands for farm use results in loss of wildlife habitat. Moreover, when wetlands are removed, or when the land is left bare (such as during spring tilling), water runs through or over the soil more quickly, often overwhelming the capabilities of the receiving water bodies and increasing the risk of flooding. Alteration of natural stream and river channels for the purpose of draining fields more quickly also causes water to flow at a faster rate, making banks less stable and contributing to erosion and flooding. In addition, field irrigation consumes huge amounts of water – in Nova Scotia, 85% of agricultural water use is for irrigational purposes.



### **The Impacts of Agriculture Continued...**

Agricultural inputs and outputs can also impair water quality if not managed correctly. Animal waste, fertilizers and agricultural chemicals such as pesticides can all pollute the watershed if these substances find their way into the water supply. Allowing livestock access to lakes and streams can harm the watershed when animals trample and compact soil and vegetation along the bank, directly pollute the water source with waste and bacteria, or break up or loosen the soil, making it more prone to erosion.

### **Watershed-Friendly Farmland**

There are many strategies available to farmers to help make agricultural operations more watershed-friendly. Not every strategy will work on every farm, but by integrating some of the following techniques into your farm management plan, you can help ensure that the watershed stays clean, for the benefit of the watershed, as well as the farm itself.

**>> Fence livestock away from rivers and lakes.** Keeping livestock away from natural water sources reduces erosion and pollution.

**>> Practice rotational grazing.** Rotating livestock through smaller paddocks of pasture rather than allowing continuous grazing on a larger area gives each paddock a rest period and prevents overgrazing.

**>> Leave or create a permanent buffer of native trees along water bodies.** Leaving a buffer strip along shorelines and stream and river banks can reduce erosion, provide shade, keep water cool for fish, and provide wildlife habitat. For more information on how to create a buffer zone, see page 27.

**>> Avoid filling in wetlands for agricultural use.** These are ecologically diverse and productive areas that slow runoff and help control flooding. Wetland areas also help recharge ground water supplies while trapping and filtering pollutants.

>> **Try to irrigate in the early morning and on calm days.** This will help minimize water loss from evaporation.

>> **Plant grass waterways on paths of erosion.** Planting a shallow channel with thick grasses will help carry water runoff away from planted crops while controlling erosion and the rate of water runoff.

>> **Reduce the use of chemical fertilizers and pesticides.** Opt for more natural and less ecologically harmful products where possible, and only use as much as necessary.

>> **Leave part of the farm as a natural woodlot.** This will not only provide wildlife habitat, but will also provide an area for recreation and a free source of firewood.

>> **Leave plant residue from the previous year's crop on the fields.** This will help to reduce soil erosion and restore some nutrients. Planting 'cover crops' – such as clover or grasses – following harvest in the fall can also reduce erosion in the winter and spring, and some crops, such as legumes, have the added benefit of drawing nitrogen into the soil. Crop rotation and fallow periods will also replenish soil nutrients.



### **The Impacts of Urban Development**

Most urban development dramatically alters the land from its natural state – native vegetation is cleared, wetlands are filled, and soil is dug up, graded and paved over. All of these changes can have significant effects on the surrounding watershed.

Buildings, roads, sidewalks and parking lots are all impervious surfaces incapable of absorbing water. Instead, rain, snowmelt and floodwaters flow directly over these surfaces, collecting pollutants such as car oil and fluids, lawn fertilizers and dirt as they go, then flowing into storm sewers or directly into freshwater supplies.

By reducing the amount of permeable surfaces and wetlands that would normally filter water and release it more slowly into rivers and streams, runoff instead flows more quickly and forcefully, contributing to stream bank erosion, channel widening or deepening, and increased flood risk. As a result, water quality is diminished and wildlife habitat is lost.

## **Water Fact**

**Canada has about 25% of the world's wetlands – the largest wetland area in the world. Canada also has more lake area than any other country in the world.**

## Wildlife Habitat on Your Property

There are a variety of things that you can do to make your property more wildlife-friendly. Most preferable is to leave some natural spaces when the property is being developed, but areas that have already been altered from their natural state can be restored with a bit of ecological landscaping.

- Use leftover (untreated) wood or rock from landscaping projects to create rock, log or brush piles that will act as wildlife sanctuaries.
- Build nest boxes for birds and bats. As an added bonus, it will help reduce the mosquito population on your property!
- Retain downed trees as well as dead or decaying trees that are still standing, unless it is unsafe to do so. Many different wildlife species rely on these types of vegetation for habitat. Downed trees on shorelines or in shallow water also help to absorb some of the erosive energy of waves and currents.
- Plant a variety of native vegetation, in clumps if possible, and ensure a diversity of vegetation types, ages and sizes.
- Create edges (places where one type of vegetation meets another) and choose jagged edges over straight ones.
- Protect wetlands.
- Reduce or avoid pesticide use – insects are an important part of the food chain!

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### Watershed-Friendly Development

When developing on your own land, there are measures you can take to reduce the negative impacts on the watershed ecosystem. Below are just a few suggestions on how to make building on your property more watershed-friendly.

>> **Leave native trees and plants on your lot, or plant more of them.** Native plants and trees help absorb carbon dioxide and air pollutants and provide habitat for wildlife.

>> **Limit impermeable surfaces.** Avoid paving large areas such as driveways or parking areas, or consider installing surfaces that are more porous and will allow water to seep through, such as gravel or porous paver blocks.

>> **Install mechanisms to control roof runoff.** Move or extend downspouts so that they flow onto vegetated areas that can absorb the water, or collect rainwater in a rain barrel for use in the garden.



>> **Research non-native plants before planting to avoid competition with native vegetation.** Non-native plants can choke out native species.

>> **Leave a buffer zone of trees and vegetation on the shoreline of your home and cottage.** Prune them rather than remove them. (See page 26 for more information on buffer zones).

>> **Avoid building on floodplains.** Floodplain development can be harmful to the ecosystem and may be hard to insure!

>> **Ensure septic tanks and drainfields are properly installed in well-drained areas.** See page 34 for more information on septic systems.

>> **Avoid leaving too much of the ground bare at one time.** Leave ground covered with vegetation for as long as possible rather than clearing large tracts of land at

once. If possible, cover bare ground with mulch or burlap at the end of the day during construction. Covering bare ground helps limit soil erosion.

>> **Cover fill piles.** Fill that is left uncovered will erode away and could pollute nearby water bodies and destroy wildlife habitat. It could also make a mess of your construction site!

>> **Make sure construction equipment is well maintained.** Leaky equipment could contaminate the soil, leading to water pollution.

>> **Avoid building permanent docks or wharves.** Permanent shoreline structures have a greater and longer lasting environmental impact. Consider building a seasonal or floating dock instead, or sharing a dock with a neighbour. Choose non-toxic building supplies wherever possible to avoid polluting the water.



## Harvesting in the Watershed

### SUSTAINABLE FORESTRY PRACTICES

There are approximately 4.25 million hectares of forested land in Nova Scotia. Thirty-one percent of it is publicly owned and about 318,000 hectares of this lies within provincial parks or protected areas. The remaining 69% is under private ownership – including Christmas tree farms, corporate-owned lands and private woodlots. With so much of the forest being managed privately, it is important to ensure it is also being managed sustainably.

Poorly managed forests can severely degrade the health of the watershed. Trucks and heavy machinery compact the soil, disrupting its natural filtering ability and contributing to erosion. Road building, tree removal and other forestry activities can also push sediment into water bodies and degrade water quality and wildlife habitat. Harvesting too close to stream and river beds can destroy streamside vegetation, raising the water temperature and affecting fish and other aquatic organisms. Clearcutting and other intensive forestry operations significantly transform the surround-

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## NS Forestry Regulations

As of January 2002, new regulations in Nova Scotia exist to guide forestry operations. These regulations are mandatory and aim to provide protection for water quality, wildlife habitat and wildlife diversity on both crown and private land. Some highlights include:

- Buffer areas of 20 metres must be left on both sides of any watercourse wider than 50 centimetres.
- Legacy trees and clumps must be left on harvested sites. These are living or partially living trees that are left to grow, decay and be available to cavity using species while ensuring plants and small animals remain on the site.
- Coarse woody debris must be left scattered over the harvested area to provide wildlife habitat. This includes standing dead trees, large trunks, pieces of trunk and large branches.

For more information on these regulations, consult the Wildlife Habitat and Watercourse Protection Regulations at <http://www.gov.ns.ca/just/regulations/regs/fowhwp.htm>

ing ecosystem and contribute to increased erosion, bank and slope instability, and nutrient loss. Forest chemicals such as pesticides, fertilizers and fire retardants used to increase production in managed areas have the potential to pollute the soil, migrate to the water supply, and degrade wildlife habitat.

By integrating more sustainable forestry measures, or 'best management practices,' into timber harvesting plans, landowners, foresters, loggers and others can protect the health of the watershed during all stages of the forestry process.

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**"In an age when man has forgotten his origins and is blind even to his most essential needs for survival, water along with other resources has become the victim of his indifference."**

*Rachel Carson*

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#### **'Best Management Practices' for Watersheds**

Considering the ecological 'big picture' can help ensure forestry practices are sustainable and keep their impact on the watershed to a minimum. The following outlines some sustainable suggestions for each facet of forestry management.

**>> Prepare a pre-harvest plan.** Survey the area to be harvested before commencing work. Consider the lay of the land and plan for the least impact possible on critical wildlife habitat, natural drainage channels and water bodies, and unstable areas (such as steep slopes). Avoid sensitive areas such as wetlands and threatened and endangered species habitat.

**>> Leave behind Special Management Zones (SMZ).** SMZs are 'greenbelts' or buffer zones left adjacent to watercourses to protect this sensitive habitat. For more information on buffer zones, see "NS Forestry Regulations" on page 24.

**>> Ensure road systems are well located, constructed and maintained.** Poorly designed road systems are the number one contributor to water pollution in forestry activities. Plan to minimize the number and length of roads, avoiding water bodies and sensi-

tive areas, and taking care to follow the natural contour of the land. Keep the grade of the road as low as possible. Where possible, use or extend existing roads rather than constructing new ones.

**>> Avoid clearcutting and other high-intensity forms of forestry, especially on steep slopes.** Practice selection cutting instead, where individual trees, especially those that are sick or injured, are harvested rather than large tracts of forest. This produces a more variable stand with a range of tree ages and reduces erosion and nutrient loss.

**>> Replant harvested areas.** Plant a variety of native tree species, as well as native grasses and other plant species, to help stabilize the soil and control erosion, sedimentation and nutrient loss. Do not introduce non-native species.



**>> Remove unneeded roads and temporary structures as soon as possible to help recover the area to a more natural state.**

**>> Avoid the use of pesticides, fertilizers and fire retardants.** If these substances must be applied, apply with care and use the minimum amount possible. Avoid applying during periods of precipitation, high wind or humidity.



Peter Dickinson

## Watershed Buffers

### THE IMPORTANCE OF SPECIAL MANAGEMENT ZONES (SMZs)

Special Management Zones (SMZs), also known as greenbelts or buffer zones, are essentially strips of vegetation that are left along the edges of watercourses to protect the watercourse and retain important wildlife habitat. SMZs perform many important functions – they help shade the watercourse and maintain cool water temperatures, provide stability to banks, and help retain channel width. They act as filters for overland flow, pulling silt and nutrients from runoff before it reaches the water body. SMZs also ensure a continued supply of large woody debris to the watercourse, which provides in-stream wildlife habitat and helps control water flow. In addition, SMZs are used as travel corridors for some wildlife species, are sources of food for aquatic organisms, and are essential areas for species that live in both water and on land.

In Nova Scotia, SMZs of at least 20 metres in width must be left on all watercourses wider than 50 centimetres, on both public and private land. While partial harvesting is allowed within the SMZ, there are regulations in place regarding the types of trees that may be harvested and the method of harvest. More information on regulations surrounding SMZs can be found on the Government of Nova Scotia website: [www.gov.ns.ca/just/regulations/regs/fowhwp.htm](http://www.gov.ns.ca/just/regulations/regs/fowhwp.htm).

### Constructing a Buffer Zone on Your Property

As mentioned, buffer zones do a lot to maintain the health of a watershed. If properly established and maintained, a buffer zone can filter out large amounts of fertilizers, pesticides, bacteria and sediment from runoff before these chemicals reach the watercourse. On shoreline property, buffer zones have the added benefit of reducing the energy of wave and currents, thus reducing shoreline erosion. They also are a great source of shade and help block wind. If the natural buffer zone on your property has already been removed or altered, there are things you can do to restore it. The following tips can help.

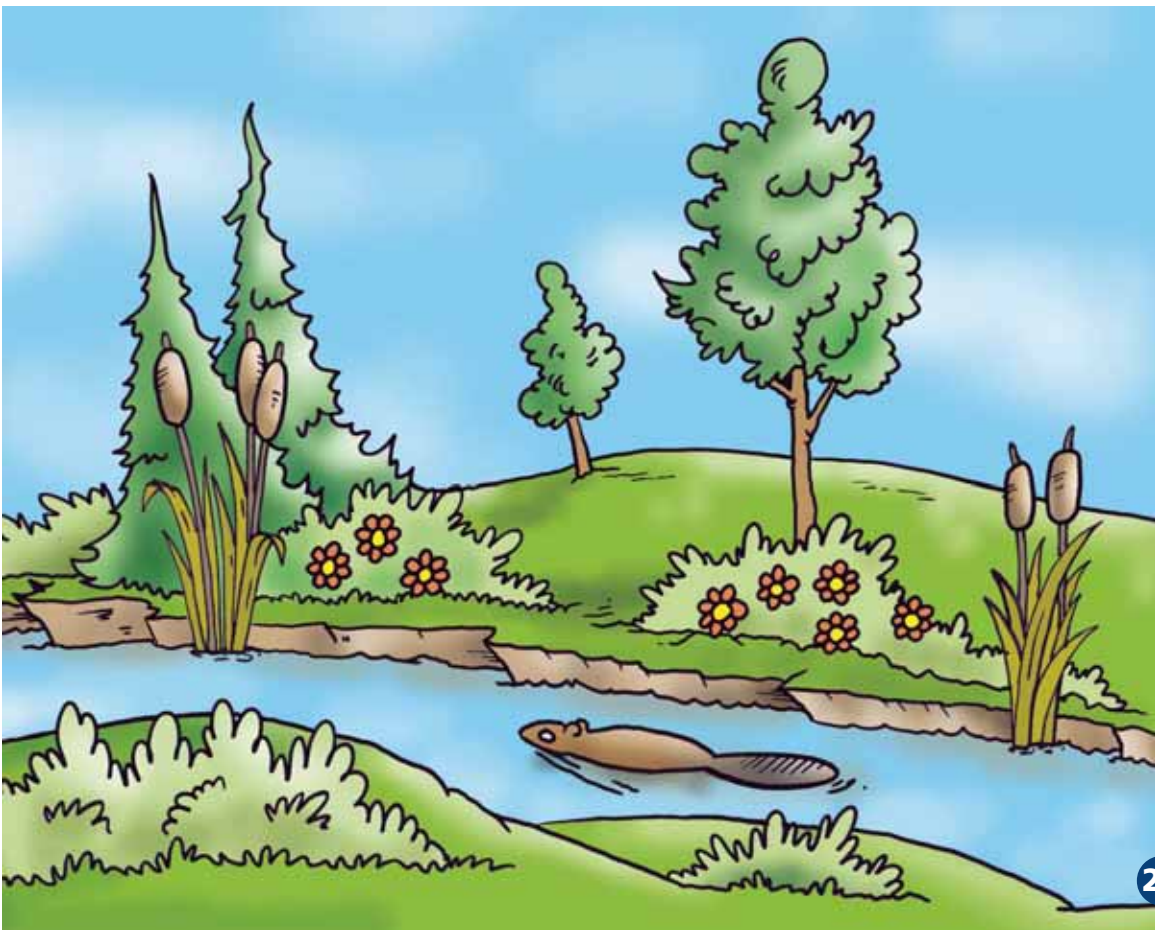
>> If your property is covered by lawn up to the water's edge, start by leaving a few feet of it

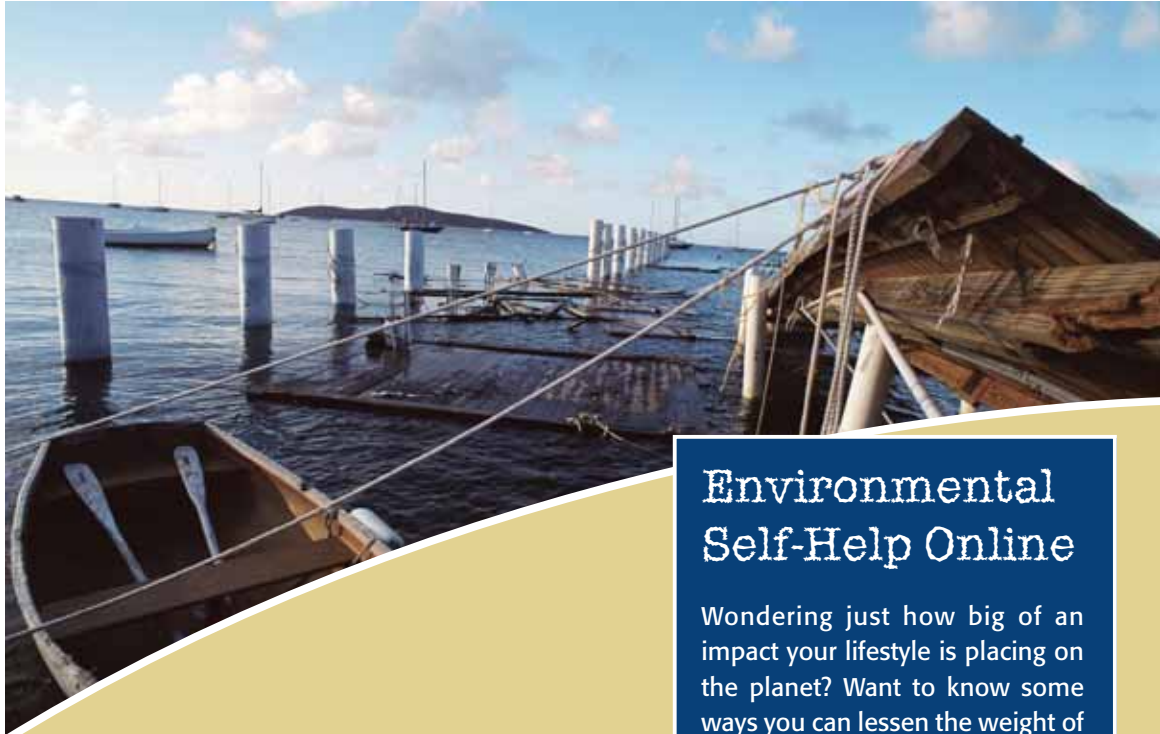
unmowed – remember, wildlife prefer jagged lines over straight ones!

>> Allow nature to take over. Do not remove the plants that grow in your buffer strip unless you are sure they are not native to the area.

>> Consider helping your buffer strip along by planting a variety of native vegetation that is commonly found on wild shorelines in your area. Trees, shrubs, grasses and wildflowers will all add to the beauty and function of your buffer strip.

>> Within a few years, your buffer strip should be well established. Consider extending its boundaries a bit more each year – a minimum width of 15 metres is best and 30 metres or greater is ideal.





## Watershed Worries

### CLIMATE CHANGE

Climate change is a term that for most has become all too familiar. Simply defined, it is the change in the earth's climate over time. Climate change is a natural phenomenon. What is not natural, however, is the escalated rate of change we are currently experiencing as a result of human activities.

The 'greenhouse effect' is the effect that insulating gases such as water vapour, carbon dioxide, methane and nitrous oxide have on keeping the sun's radiation within the earth's atmosphere instead of it reflecting back into space. While this phenomenon is necessary to keep the earth's temperature at a life-sustaining level, the excess 'greenhouse gases' we are releasing into the atmosphere due to excessive fossil fuel use is magnifying the greenhouse effect. This combined with deforestation and the destruction of natural vegetation, which normally absorb

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## Environmental Self-Help Online

Wondering just how big of an impact your lifestyle is placing on the planet? Want to know some ways you can lessen the weight of your actions on the world? Below are some websites that can help you along.

### Personal Greenhouse Gas Calculator:

[www.climatechange.gc.ca/calculator/english](http://www.climatechange.gc.ca/calculator/english)

Calculate your contribution to greenhouse gas emissions and discover ways to reduce them!

### Calculate Your Ecological Footprint:

[www.mec.ca/coop/communit/meccomm/ecfoot.htm](http://www.mec.ca/coop/communit/meccomm/ecfoot.htm)

Take this short multiple choice quiz to determine the amount of resources you and your family are using each year.

carbon dioxide and convert it to oxygen through photosynthesis, is causing global warming at an unprecedented rate.

Climate change affects all aspects of life on earth. A small rise in the earth's average temperature, as little as 0.5°C, can result in increased melting of polar ice caps, sea level rise, shifts in the habitat ranges of flora and fauna, and increases in severe weather events.

The effects of climate change on watersheds are numerous, impacting both water quantity and quality. In Atlantic Canada, changes in precipitation could result in increased frequency of ice jams and spring flooding. Rising sea levels would have a particular impact in Nova Scotia, a province with so much coastal area. Erosion and sedimentation could increase, resulting in a loss of habitat for fish and other aquatic organisms. These changes could also affect the range, distribution and breeding success of seabirds in the region.



## What Can You Do?

In order to reduce the impact of human activity on climate change, we need to make some key changes in the way that we live. Even small changes can make a difference.

- Carpool, walk or cycle whenever possible.
- Practice the 3 Rs: Reduce, Reuse, Recycle!
- Use higher octane (cleaner burning) gasoline.
- Limit unnecessary vehicle idling.
- Consider fuel-efficient vehicles.
- Keep vehicle maintenance up-to-date, including recommended tire pressures and wheel alignment. Your vehicle will work more efficiently and last longer.
- Reduce electricity and fossil fuel burning needs by ensuring your home is adequately insulated – and use programmable thermostats to reduce the heat at night or when rooms are not in use.
- Ensure that environmentally friendly coolants are used in fridges and air conditioners.
- Use EnerGuide Ratings to help choose energy efficient appliances. Visit [www.oeenrcan.gc.ca/energuide](http://www.oeenrcan.gc.ca/energuide) for more information.
- Explore and consider alternative energy options, such as solar or wind power.
- Use your consumer power to tell industry and government that you want to see them being environmentally responsible.
- Support environmentally responsible companies and industries as a consumer.



## Responsible Recreation

Nova Scotia is blessed with a wealth of natural beauty. By participating in responsible recreation, outdoor recreationists can do their part to ensure the province's wild spaces remain beautiful, productive and healthy. Through awareness of and respect for the natural ecosystem, and by following the tips below, the impact of outdoor recreation activities can be kept to a minimum.

### Responsible Angling

>> Know your provincial and federal fishing regulations. In Nova Scotia, it is illegal to release fish into provincial waters, except under a license issued by Fisheries and Oceans Canada.

>> Do not move fish from one lake, river, stream, brook or any waterway to another. Empty live wells before leaving each waterbody.

>> Discard bait into the body of water from which it was taken. For bait, avoid use or possession of bass, bullhead, white perch, yellow perch, goldfish, chain pickerel or any other fish not taken from provincial waters. It is illegal to use or possess these species as bait whether alive or dead.

>> Read the Nova Scotia Angler's Handbook – part of the package you receive when you purchase your fishing license.

>> Contact Fisheries and Oceans Canada at 902-354-6030, or toll-free at 1-800-565-1633 if you observe fishing activities that appear to be suspect or harmful.

### Responsible Transportation

- >> Carpool, walk or cycle whenever possible.
- >> Keep your vehicle well maintained.
- >> Use higher methane (cleaner burning) gas.

### Responsible Boating

- >> Choose a 4-stroke versus a 2-stroke motor. 4-stroke motors are quieter, less disturbing to wildlife, and use less gasoline, thus producing less air and water pollution.
- >> Ensure that no flora or fauna are transferred from one body of water to another when transporting your watercraft (for example, on the bottom of your boat, in the rudder, or in bilge water).
- >> Regularly maintain your engine and choose natural cleaning alternatives over toxic products.
- >> Drive at a 'no wake' speed when near the shore.
- >> Choose non-polluting water recreation such as canoeing, kayaking and sailing more often.

For more boating tips, pick up the *Maritime Clean Boating Guide* from the Bluenose Coastal Action Foundation (BCAF).



Discover Boating

### Engine Statistics

- As much as 40% of a 2-stroke engine's gas and oil enters the water unburned.
- 4-strokes consume 30% less gas at full speed, 80% less when idling.
- A 70 horsepower 2-stroke engine produces the same mass of hydrocarbon pollution in one hour as a new car does driving 8,000 kilometres!
- Testing for total hydrocarbons, nitrogen oxides, carbon monoxide, carbon dioxide, oil, grease, and BTEX (benzene, toluene, ethylbenzene, and xylenes) showed that 2-strokes produce 12 times as much BTEX as 4-strokes, 15 times more unburned hydrocarbons than 4-strokes, and almost 125 times more than a light duty van. Furthermore, a 9.9 hp 2-stroke produces 50% more carbon monoxide than a 9.9 hp 4-stroke and 60 times more than a light duty van!

### Water Fact

**97% of earth's water is in the oceans. Only 3% of the earth's water can be used as drinking water. 75% of the world's fresh water is frozen in the polar ice caps. By 2025, 52 countries — with two-thirds of the world's population — will likely have water shortages.**



### **Purchasing an Outboard Motor**

The majority of two-stroke engines require the lubricating oil to be mixed directly with the gas in the fuel tank. The oil in four-stroke engines remains separate and is not burned, making the exhaust cleaner and less smoky.

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**If you could tomorrow morning make water clean in the world, you would have done, in one fell swoop, the best thing you could have done for improving human health by improving environmental quality. William C. Clark**

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Exhaust ports in two-stroke engines remain open for a short period of time while a new charge of air, gas, and oil enters the cylinder. This allows gas and raw oil to escape directly into the water. The lighter hydrocarbon compounds are released into

the air after a few hours while the heavier hydrocarbons, like oil, remain on the water's surface. These design differences cause two-stroke engines to pollute more than four-stroke engines.

**Pros & Cons of Two-Strokes.** On the positive side, these motors are less expensive, have a larger used market and higher resale value, are easier to repair, have fewer parts, and are lighter with faster acceleration. Cons include the need to mix oil with gas (most models), a rougher and noisier idle, often more difficult to start, potential carburetor problems, poor performing spark plugs, and more smoke and pollution are produced.

**Pros & Cons of Four-Strokes.** These motors are quieter (smoother running and idling), have great trolling motors, require no oil/gas mixing, are more reliable, and produce less pollution. Currently, cons

can appear daunting. They include motor weight, they can be expensive to buy (new technology still being tested) and repair (fewer trained mechanics), and there is a limited used market. Finally, more parts means increased chances of repair.

**Regulations.** Outboard motors have not been subject to the same regulations and standards as the automotive industry. Automotive engine technology has consequently advanced while some two-stroke motors have changed very little since the 1940s. In 2000, a memorandum of understanding was signed between the Canadian Marine Manufacturers Association and Environment Canada stating that beginning in 2001, all new motors had to meet American Environmental Protection Agency (EPA) emission standards. EPA's goal is to reduce emissions by 75%.



**Your Choice.** There is no law against purchasing a two-stroke motor. Each individual must decide if the environmental benefits outweigh the economic costs. When it's time to replace your engine, consider buying a four-stroke and help keep our watershed clean.



## Leave No Trace

- Plan ahead and prepare.
- Travel and camp on durable surfaces.
- Dispose of waste properly.
- Leave what you find. Take pictures as your only souvenirs. Remove litter someone else left behind as well as your own.
- Minimize campfire impacts (check the local forest fire index).
- Respect wildlife.
- Be considerate of other visitors.

For more information on Leave No Trace, visit [www.lnt.org](http://www.lnt.org)



## Watershed Homes

### LIVING WITH AN ENVIRONMENTAL CONSCIENCE

Environmental consciousness is an important consideration for all homeowners. However small or simple they may seem, our everyday activities, such as doing the washing or working in the garden, can have a significant impact on the environment. Below are some suggestions to help lighten the burden of these activities on the earth.

#### Home Sewage Disposal Made Easy

As responsible homeowners, it is our duty to ensure that our sewage disposal systems are in good working order. A little preventative maintenance can prevent highly disruptive, not to mention odorous, events!

The first step to ensure that our sewage disposal systems are in good working order is to understand how they work. There are three major parts to an on-site system: the septic tank, disposal field, and the surrounding soil.

The septic tank is a large buried tank, usually made from concrete. Tanks made from steel tend to rust and leak and should be replaced. All household waste water should flow into this tank. Heavier solids settle to form sludge while fat and grease float to the top to form a layer of scum. Partly treated effluent leaves the tank and flows to the disposal field.

The disposal field is either a trench or large bed containing perforated pipes, crushed rock, filtered sand, and sometimes sand buffers. It is attached to the septic tank by an un-perforated pipe. Once effluent reaches the disposal field, it is dispersed through perforated pipes situated in the gravel. With poorly drained soil it may be necessary to build the field in a mound of imported sand.

The soil or imported sand around the disposal field further removes solids including bacteria and disease-causing organisms, when the effluent filters through it.



It is important to regularly pump out your system to stop sludge and scum from accumulating in the septic tank. If these solids reach the outlet pipe and flow into the disposal field, they can clog the perforated pipes. Clogged systems can cause problems such as:

- Pollute sources of drinking water.
- Contaminate the environment.
- Harm health.
- Be unsightly and cause foul odors.
- Be expensive to repair.
- Reduce property values.

## Maintenance Tips

### Tips for Maintaining Your System

- Inspect your septic tank every two years to determine pumping intervals.
- Wash clothes throughout the week instead of doing many loads on one day.
- Use low-flush toilets, toilet dams, and low-flow showerheads.
- Record the location of the septic tank and disposal field for future reference.
- Check any pumps, siphons, other moving parts plus the inceptor drain regularly.
- Remove trees with large roots or keep them from growing near the disposal field.
- Keep a healthy grass cover over the disposal field to stop erosion.
- Keep surface water from uphill or roof drains away from the disposal field.

### Do not...

- Overload the system with high volumes of water.
- Discharge water treatment backwash to the on-site sewage disposal system.
- Enter a pumped septic tank: sewage gases can be fatal.
- Wait for the warning signs to inspect and pump the system.
- Allow vehicles or heavy equipment to drive over the disposal field as they could crush the pipes.

### Signs of a Malfunctioning System

- Sewage backing up into toilets/tubs/sinks.
- Slowly draining plumbing fixtures.
- Smell or presence of raw sewage on the ground.
- Soggy spots on the disposal field.

## Water Facts: Domestic Water Use

The average North American uses about 350 litres of clean, treated water per day. A good portion of this could be conserved by reducing water demands using the simple tips listed below.

ACTIVITY	AVERAGE WATER USE	CONSERVATION TIPS
Flushing	15-20 litres per flush	Place a displacement bottle in the back of the tank and save up to 5 litres per flush, or install a water-conserving toilet.
Showering	15-20 litres per minute	Install a low flow shower head and limit shower length to save 7-10 litres per minute or more.
Bathing	60 litres per full tub	Do not completely fill the tub to bathe – 1/2 full will do – and save 45 litres or more.
Shaving	50 litres (tap running)	Plug and partially fill the basin to rinse the razor rather than running the water – uses 1/15 the amount of water.
Brushing teeth	10-20 litres (tap running)	Wet your brush and turn the water off until it is time to rinse and you'll use 1/10 the amount of water.
Washing hands & face	8 litres (tap running)	Plug and partially fill the basin to wash, or turn off the water while lathering.
Running faucet to cool water for drinking	4 litres	Keep water in the refrigerator – it will always be cool and you will use only what you need.
Running dishwasher	60 litres (full cycle)	Using the economy cycle and only running the dishwasher when full will use half the amount of water.
Washing dishes by hand	35 litres or more (tap running to rinse)	Fill the sink or a container with water to rinse and save 30 litres or more.
Washing clothes	225 litres (full cycle at top water level)	Set machine on short cycle and use the minimum water level possible for the load – save 100 litres or more.
Outdoor watering	35 litres per minute	Use a watering can or bucket to water outdoor plants rather than running the hose or sprinkler.
Washing the car	240 litres	Using a self-serve or drive through car wash can save up to 180 litres. Better yet, use a sponge and bucket – and use soaps and detergents sparingly!



### Environmentally Friendly Cleaning

According to the US Environmental Protection Agency, 50% of all of our illnesses can be traced to indoor pollution. Listed below are some basic alternatives to using hazardous household cleaners.

#### General Cleaners

- All-purpose household cleaner: baking soda + vinegar, or lemon juice combined with a borax paste of borax + water (borax is a bleach substitute)
- Glass cleaner: 1 part vinegar + 1 part water, wipe with rag or newspaper
- Drain cleaner: plunger followed by 1/2 cup baking soda + 1/2 cup of vinegar + 2 litres boiling water
- Shoe polish: banana peel
- Water softener: 1/4 cup vinegar

#### Kitchen and Bathroom

- Grease cutter: 1 cup of lemon juice + 1 cup of water
- Scouring powder: 1 cup of baking soda + enough water to form a paste
- Toilet bowl cleaner: 1 cup of vinegar left in the toilet bowl overnight, then brush
- Mildew remover: equal parts vinegar and salt



### Laundry

- General stain remover: 1 tsp. of white vinegar or baking soda per load
- Perspiration spot remover: baking soda
- Wine stain removal: salt

#### Carpets and Floors

- Rug & carpet cleaner: baking soda or dry cornstarch (use club soda for spots)
- Floor cleaner: 1 cup vinegar + 8 litres water
- Odor remover: sprinkle with baking soda or borax, let sit, then vacuum

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**Throughout the history of literature, the guy who poisons the well has been the worst of all villains... *Author Unknown***

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#### Furniture and Polishes

- Floors & furniture: 2 parts vegetable oil + 1 part lemon juice or 1 tablespoon lemon oil in 500 ml of mineral oil
- Leather: 1 cup vinegar + 1 cup linseed oil
- Chrome: apple cider vinegar to clean, baby oil to polish
- Stainless steel: baking soda or mineral oil to polish, vinegar to remove spots

Adjacent: native starflower; inset: introduced red clover; both Catherine Pross



## Natural Gardening

### DIVERSITY IS THE KEY TO SUCCESS

Long before we planted, pruned, mowed, and sprayed pesticides, natural gardens flourished. These gardens supported a wide variety of native plants and provided habitat and food for local wildlife. Why spend time and money on a boring, flat lawn when you could create an interesting and colourful natural garden? A natural garden is not just an overgrown lawn!

The chemicals and fertilizers you add to your lawn and garden also enter the watershed. Native shoreline plants help prevent erosion and act to filter-out harmful nutrient-rich runoff. When plants are under stress, often because of poor climate and soil conditions, they become more susceptible to insects, disease, and competition from weeds. Plants that are native to Nova Scotia are accustomed to our climate, soils and insects, and therefore, do not require toxic fertilizers, pesticides, and herbicides.

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### Benefits of Native Plants

- Increased biodiversity.
- Provide habitat for birds, butterflies, and other wildlife.
- Provide homes for rare wild plants.
- Reduced need for pesticides, herbicides, and fertilizers.
- Reduce need to water your garden; natural rain water is usually sufficient.
- Most native plants are perennial and thus are low cost and maintenance.

### **Conserve Water, Time, and Money**

Kentucky bluegrass is a popular non-native choice for lawns but requires almost 100 centimetres of rain over the summer. In Bridgewater, from April to September, the average rainfall is only 61.88 cm. You can spend more time enjoying your yard and less time watering by purchasing native grasses. They are adapted to our climate and only need natural rainwater to flourish.

Growing a variety of plants will help to attract birds, butterflies, bats, and other wildlife. Planting trees or shrubs with berries, flowers and grasses will ensure that there is plenty of food year round while adding three-dimensional structure and habitat.

### **Pesticides Harm More Than Just Pests**

>> Pesticides can seriously harm helpful pollinators such as butterflies and bees. Herbicides also destroy food for pollinators.

>> Pesticides remove or poison part of the food chain. Many toads, bats, and birds eat a variety of insects and naturally control pests.

>> Killing beneficial insects that prey on pest species could leave your garden vulnerable to a worse pest problem.

>> Pesticides are poisonous! They can harm your pets, children, and yourself.

### **Not all Wild Plants are Native**

Many common plant species growing in the wild, such as Queen Anne's Lace, have been introduced to Nova Scotia. There is plenty of information available on the internet and from libraries and gardening centres on native plants and the varieties best suited for your yard. With a bit of planning, you can have a beautifully landscaped natural garden that will not pose a threat to the environment.





**The river moves from land to water to land, in and out of organisms, reminding us what native peoples have never forgotten: that you cannot separate the land from the water, or the people from the land.**

*Lynn Noel, from 'Voyages: Canada's Heritage Rivers'*



Dragonfly, R. McCaw; Shells on cliff, M. Moir; Cover golden crest, M. Elderkin

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IS PRODUCED BY**



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