

NOVA SCOTIA'S
**Petite Rivière
Watershed**



Our Watershed. Our Responsibility.



BLUENOSE COASTAL ACTION FOUNDATION

Petite Rivière Watershed: Conserving the Atlantic Whitefish

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Blunose Coastal Action Foundation (BCAF) is a non-profit, community based organization addressing environmental issues in Lunenburg County watersheds. In 2003, BCAF joined the efforts of the Atlantic Whitefish Conservation & Recovery Team (AWCRT) working towards the recovery of the endangered Atlantic whitefish – a species found only in Nova Scotia’s Petite Rivière watershed.

BCAF’s background in environmental education prompted the introduction of our Atlantic Whitefish Project. With the direction of AWCRT members, BCAF has produced an array of education materials designed to raise awareness of the Atlantic whitefish and its critical state within the Petite Rivière watershed.

The purpose of this booklet is to celebrate the Petite Rivière watershed and the Atlantic whitefish, while offering practical tips to ensure that future generations will be able to enjoy both.

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Collecting Atlantic Whitefish Roe

Kelly Bentham

Fish Kill



Environment Canada

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A HEALTHY WATERSHED

Any point in a watershed bears the accumulation of pollutants from upstream. When we protect our water quality, we are protecting the health of all watershed residents. In the case of the Atlantic whitefish, its survival is already fragile – even small actions could be devastating.

A watershed, or drainage basin, is the land and water area that drains into a common river or lake system through rainwater runoff, groundwater, connected streams, rivers and/or lakes. Watersheds flow downstream, eventually reaching an estuary or ocean.

Water quality can be affected by various sources. Some pollutants or threats originate from a point within the watershed (e.g. an oil spill). Others, such as air pollution, may originate from industrial sources as far away as the United States. Regardless of the source of pollution, the nature of a watershed means that once deposited, the pollution will follow the flow of water downstream. Therefore, any point in the watershed bears the accumulation of pollutants from upstream.

If water quality is diminished, the entire watershed and its inhabitants are affected. In the case of the endangered Atlantic whitefish, its survival is already fragile – even the smallest negative action could be devastating.

The first step in preserving the Petite Rivière watershed is to understand what threatens its health and productivity. Although not all of these threats may exist now, it is important to remember two things:

- Pollutants can travel many kilometres through the atmosphere.
- Future changes may introduce new threats of pollution for which education will be a benefit.

Petite Rivière Watershed Facts



Its total area is approximately 244 km², about 19% belongs to waterbodies.

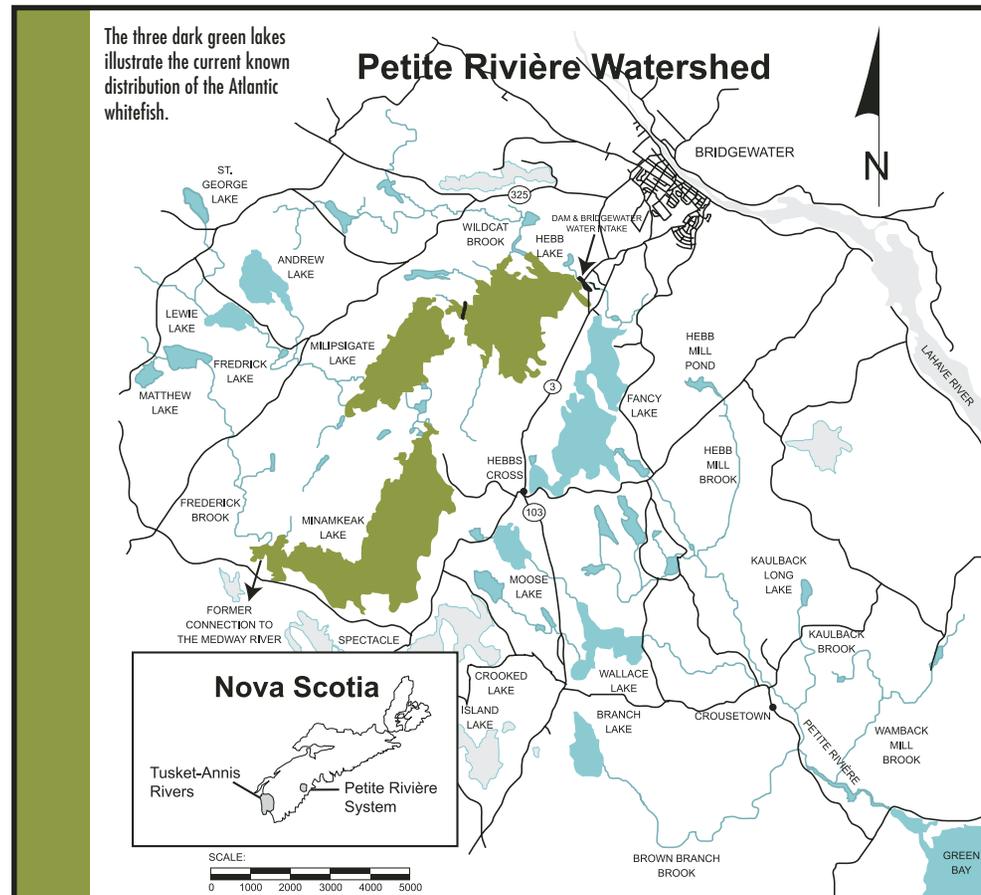
The watershed includes four major lakes: Fancy, Millipsigate (also known as Leipspigate), Minamkeak and Hebb.

The watershed also includes 22 smaller lakes, 8 tributaries, and many swamps and bogs.

The watershed above Hebb Dam is the drinking water supply for the Town of Bridgewater.

For More Information...

Much of the pollutant information and healthy watershed tips have been referenced from *Watersheds: a Practical Handbook for Healthy Water* by Clive Dobson and Gregor Gilpin Beck. This basic watershed ecology book is a valuable reference for everyone.



Courtesy of AMCRT



Atlantic Whitefish Official Status



Status: Declared endangered in 1984 by COSEWIC, the Committee on the Status of Endangered Wildlife in Canada. Status confirmed by COSEWIC in 2000.

Protection: Protected under the Maritime Fishery Regulations, the Federal Species at Risk Act, and the Nova Scotia Endangered Species Act.

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ATLANTIC WHITEFISH, *COREGONUS HUNTSMANI*

Considered the most primitive form of all the North American whitefishes, the first account of the Atlantic whitefish was taken from Millisigate Lake, Lunenburg County.

The Atlantic whitefish is facing the threat of extinction. Not only is this member of the Salmonidae family endangered, it occurs only in one global location, the Petite Rivière watershed in Lunenburg County, Nova Scotia. Historically, it was also found in the Tusket River watershed, Yarmouth County, Nova Scotia, but has since thought to be extirpated from this part of the province.

Biology

The Atlantic whitefish is a member of the Salmonidae family which means that it is related to salmon and trout. This fish is also referred to as Acadian whitefish, Sault whitefish, round whitefish, and common whitefish. It is dark blue to green on the back with silvery sides and a silvery to white belly. The

tail is deeply forked and the fish has an adipose fin, typical of salmonids.

It is an anadromous species, meaning that it spends part of its life in the ocean but returns to freshwater lakes and rivers to spawn. The remaining Petite Rivière population, however, is believed to be landlocked and therefore unable to travel to sea. There is limited information on spawning behaviour and early life stages of this fish.

Threats to Atlantic Whitefish Survival

- Historically, the Atlantic whitefish was confused with the lake whitefish and consequently angled as a food fish.
- In 1929, dams were constructed on the Tusket River. Although fish ladders were

installed to guide fish upstream, the migratory movement of the Atlantic whitefish was interrupted. Concentration at fish ladders also may have made fish easier targets for poachers.

- Acidification in the Tusket River has made conditions poor for the Atlantic whitefish.
- The Petite Rivière population, found in Hebb, Millipsigate, and Minamkeak lakes, is believed to be land-locked. These lakes cannot be accessed from the sea due to a man-made dam. Any Atlantic whitefish that drop below the dam have no opportunity to reproduce.
- Non-native fish such as smallmouth bass

threaten native fish populations because they compete for food and habitat and may act as predators.

Each of these factors has contributed to the current critical state of the Atlantic whitefish. The Atlantic Whitefish Conservation & Recovery Team (AWCRT) is working to raise awareness of the endangered Atlantic whitefish and to encourage support for its recovery. The Atlantic whitefish situation acts as a reminder of how fragile the survival of a species can become. Individuals make choices everyday. The same wise choices that protect the species of our watershed also conserve the integrity of the watershed as a resource for future generations.

Conservation/Recovery Efforts

The Atlantic Whitefish Conservation & Recovery Team was formed in 1999. The group consists of representatives from various levels of government, community groups and other concerned individuals, all working towards the recovery of this endangered species.

AWCRT members have a variety of expertise, skills, and interests. They represent the research community, management experts, regulatory bodies, the recreational community, and the Tusket River and Petite Rivière watershed communities. Fisheries experts carry out research that may one day lead to the reestablishment of a feasible population of Atlantic whitefish in the wild. Research has been undertaken to explore such aspects

Body

Elongated. Average length: anadromous population 38 cm, land-locked 20-25 cm.

Mouth

At end of snout rather than under its head.



Scales

Lateral line scales 91-100. Larger scales than Atlantic salmon or brook trout.

Fins

Adipose fin present. Deeply forked tail.



as genetics, interactions with introduced species, and habitat requirements. The Atlantic whitefish has also been the subject of graduate and undergraduate theses.

Local angling groups such as the Bluenose Bassmasters have supported the AWCRT by offering input at meetings and by acting as watershed guides. Anglers play an important role in Atlantic whitefish recovery by sharing information about sightings and reporting issues that may set back the recovery of the species.

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The Bridgewater Public Service Commission (PSC) is currently developing a source water management plan for the upper reaches of the Petite Rivière Watershed. The purpose is to evaluate risks to water quality and determine if current regulations provide adequate protection for surface and ground water. This watershed supplies private wells and acts as the reservoir for the Town of Bridgewater and surrounding area.

Help us preserve your watershed – for today and tomorrow. We all can make small lifestyle changes.

The Petite Rivière Watershed Advisory Group (PRWAG) is an active community group dedicated to ensuring that the water quality within the watershed be maintained. PRWAG members are working towards their goal by partnering with the Bridgewater PSC and ensuring that accurate information is available and presented to all watershed residents. The goals of these two organizations combine to support the recovery of the Atlantic whitefish by encouraging residents to maintain healthy watershed practices.

Atlantic Whitefish Did You Know?



Food: Scientists are collecting information to discover more about what Atlantic whitefish eat. Before the decline of the Tusket population, Yarmouth Harbour specimens yielded stomach contents that included amphipods, periwinkles, and marine worms. Scientists suspect that the landlocked populations in the Petite Rivière feed on plankton, aquatic insects, minnows, and fish eggs.

Identification: The number of lateral line scales help to distinguish the Atlantic whitefish and lake whitefish. Atlantic whitefish have over 88 scales. Lake whitefish possess fewer than 88 lateral line scales.

Roots: The root of the word *Coregonus*, the scientific name for whitefish, comes from Greek words meaning pupil and angle of the eye.

Wildlife Conservation in Nova Scotia

What is a species? A genetically distinct group of plants or animals capable of reproducing viable offspring.

What does it mean to be endangered?

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) has created seven categories of risk for species in Canada. The following are lists of Nova Scotia species only.

Extinct: A species that no longer exists.

Passenger Pigeon, Great Auk, Labrador Duck, Sea Mink, Eelgrass Limpet

Extirpated: A species that no longer exists in the wild in Canada but is present elsewhere. None currently designated.

Endangered: A species facing imminent extinction or extirpation. Inner Bay of Fundy Atlantic Salmon, Atlantic Whitefish, Eskimo Curlew, Piping Plover, Roseate Tern, Pink Coreopsis, Eastern Mountain Avens, Thread-leaved Sundew, Boreal Felt Lichen



Monarch Butterfly



Roseate Tern
Ted D'Eon

Threatened: A species that is likely to become endangered if limiting factors are not reversed. Blandings Turtle, Eastern Ribbon-snake, Peregrine Falcon, Golden Crest, Plymouth Gentian, Redroot, Turbucled Spikerush, Water-pennywort

Special Concern: A species is of special concern if it has characteristics that make it particularly sensitive or vulnerable to human activities or natural events. Eastern Lilaeopsis, Long's Bullrush, New Jersey Rush, Sweet Pepperbush, Barrow's Goldeneye, Bicknell's Thrush, Gaspé Shrew, Harlequin Duck, Monarch Butterfly, Savannah Sparrow, Short-eared Owl, Southern Flying Squirrel, Wood Turtle, Yellow Lampmussel

Other Categories: *Not at Risk.* A species that has been evaluated and was determined not to be at risk. *Data Deficient.* A species for which there is insufficient scientific information to support a designation.

Visit www.cosewic.gc.ca for more information.



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WATERSHED THREATS: *CLIMATE*

Vegetation naturally absorbs carbon dioxide and converts it to oxygen through photosynthesis. Depleting natural vegetation (trees, shrubs, grasses, etc.) and increasing pollution magnifies the Greenhouse Effect.

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

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>Bioaccumulation <i>Marked increase in pollutants within the body of an organism over its life span</i></p>	<ul style="list-style-type: none"> Air pollution & direct pollution discharge 	<ul style="list-style-type: none"> Various species ingest water pollutants Pollutants remain in the organism & accumulate over time Pollutants in prey are passed on to predators 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 	 <p>Bald Eagle</p> <ul style="list-style-type: none"> Increased instances of serious illnesses in species at the top of the food chain
<p>Heavy Metals</p>	<ul style="list-style-type: none"> Highly toxic substances such as mercury & lead 	<ul style="list-style-type: none"> Become increasingly toxic in species at the top of the food chain 	<ul style="list-style-type: none"> Potentially devastating damage to all affected species Increased instances of serious illnesses for humans & wildlife

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
Industry Mining	<ul style="list-style-type: none"> • Mine tailing: lead, nickel, arsenic, cadmium, etc. • Acidic runoff from strip mines • Further pollutants from refinery smelters 	<ul style="list-style-type: none"> • Direct disposal into waterways • Pollutants flowing into waterways as runoff 	<ul style="list-style-type: none"> • Increased instances of serious illnesses for humans & wildlife • Bioaccumulation
Oil Spillage	<ul style="list-style-type: none"> • Various sources: oil tankers, ship bilge cleaning, oil tank leaks, automobile oil, etc. 	<ul style="list-style-type: none"> • Oil & its by-products are toxic to plants & animals 	<ul style="list-style-type: none"> • Large bird, fish & plant kills • Population declines that may last for decades
PCBs <i>Polychlorinated biphenyls</i>	<ul style="list-style-type: none"> • Were used in electrical transformers, various home & industrial uses • Clean up & disposal remains a challenge • No longer produced in NA 	<ul style="list-style-type: none"> • PCBs remain active for years making contamination a long term problem 	<ul style="list-style-type: none"> • Long term contamination • Increased instances of serious illnesses for humans & wildlife
Pulp & Paper	<ul style="list-style-type: none"> • Chlorine used for paper bleaching • Long living toxic by-products including furans & dioxins 	<ul style="list-style-type: none"> • Long living compounds released as wastewater into waterways • Contributes to both air & water pollution 	<ul style="list-style-type: none"> • Fish & vegetation kills • Long term threat of contamination

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
Forestry	<ul style="list-style-type: none"> • Pesticide use • Past use of DDT (banned in Canada & the US since 1970) 	<ul style="list-style-type: none"> • Newer chemical pesticides, although shorter-lived than DDT, are still toxic to people & wildlife 	<ul style="list-style-type: none"> • DDT causes deformities & infertility, especially visible in birds at the top of the food chain. Although its use has been discontinued many populations have yet to recover
Thermal Pollution	<ul style="list-style-type: none"> • Large quantities of water used to cool machinery • Machinery cooling causes water to become heated 	<ul style="list-style-type: none"> • Releasing heated water into waterbodies changes aquatic habitat • Warm water holds less oxygen than cool water, a harmful consequence for aquatic species 	<ul style="list-style-type: none"> • Potential for invertebrates & fish to be killed • Habitat damage throughout watershed
Radioactive Waste	<ul style="list-style-type: none"> • Nuclear waste • Thermal pollution 	<ul style="list-style-type: none"> • Radioactive waste remains dangerous for extended periods of time 	<ul style="list-style-type: none"> • Exposure to the waste is harmful to people & wildlife
Domestic Waste	<ul style="list-style-type: none"> • Household hazardous waste • Road, roof & lawn runoff • Sewage, sewage treatment by-products & fertilizers 	<ul style="list-style-type: none"> • Our everyday domestic waste reaches waterways – many of our actions are easily preventable 	<ul style="list-style-type: none"> • Health risks for people & wildlife • Depleted dissolved oxygen in watersheds

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
Excess Nitrogen & Phosphorous	<ul style="list-style-type: none"> • Sewage • Livestock manure • Farm, garden & lawn fertilizers 	<ul style="list-style-type: none"> • Causes rapid growth of algae, cyanobacteria & other floating plants 	<ul style="list-style-type: none"> • Algal blooms reduce the light & oxygen available to species, suffocating aquatic life
Agriculture	<ul style="list-style-type: none"> • Chemical fertilizers & pesticides • Manure • Erosion  <p>Purple Loosestrife</p>	<ul style="list-style-type: none"> • Agricultural pollutants wash into waterways, particularly during precipitation events & spring snow melts • Creates a cycle; replaced soil & fertilizers will again enter the water 	<ul style="list-style-type: none"> • Risk of well contamination • Oxygen depletion & siltation in waterways • Potential suffocation of aquatic species
Invasive Species <i>A species introduced into an ecosystem where it did not exist previously</i>	<ul style="list-style-type: none"> • Accidental & intentional introductions • Well-known Canadian examples: purple loosestrife & zebra mussels 	<ul style="list-style-type: none"> • Affects terrestrial & aquatic environments • Potentially drastic population increases if natural predators or competitors don't exist 	<ul style="list-style-type: none"> • Habitat & resource competition with native species • New pathogens, parasites & diseases can be introduced by invasive species • Steep decline in native species populations • Decreased ecosystem biodiversity

Robert McCaw

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
Interruption of Water Flow	<ul style="list-style-type: none"> • Dams, mills & other intrusions • Forestry practices 	<ul style="list-style-type: none"> • Changes water levels affecting the water cycle • Dams alter water flow; the reservoirs slow water velocities, alter water temperatures & increase chance of predation • Interruption of natural fish migration & the flow of nutrients downstream 	<ul style="list-style-type: none"> • Significant habitat changes cause displacement of native species • Risk of flooding • Impeded fish passage
Agriculture	<ul style="list-style-type: none"> • Introduction of monoculture crops • Monopolizing nutrient rich lowland or floodplains 	<ul style="list-style-type: none"> • Reduces biodiversity & habitat for native species • Unique habitat corridors of diverse floodplains are often destroyed 	<ul style="list-style-type: none"> • Reducing plant diversity decreases the biodiversity of animals & even microorganisms • Species displacement

THREAT	HARMFUL COMPONENTS & USES	ENVIRONMENTAL CONSEQUENCES	WATERSHED DAMAGE
<p>Clear-cut Logging <i>All trees from a given area are removed</i></p> <p>Selective Logging <i>Marking of individual trees within an area for cutting</i></p>	<ul style="list-style-type: none"> • After clearcutting, nutrients from the removed wood are lost, making the soil nutrient poor • Selective cutting removes the healthiest desirable species, affecting species composition 	<ul style="list-style-type: none"> • Vegetation acts as a buffer and absorbs large quantities of water; its removal decreases watershed protection • Decreased wildlife diversity • Clearcutting causes drastic drops in the water table • Reforestation efforts require years to take full effect 	<ul style="list-style-type: none"> • Wildlife are confined to smaller areas • Logging roads infringe on undisturbed wildlife habitat • Silt, soil deposits & run-off harm fish & aquatic life • Log debris interrupts fish migration • Loss of buffer zone raises water temperatures which are intolerable for some aquatic species
Recreation	<ul style="list-style-type: none"> • Trampling natural areas • Careless littering • Removal of “souvenirs” 	<ul style="list-style-type: none"> • Decreased diversity due to construction of homes, paths, driveways, disturbing &/or removing flora and fauna • Possible threat of forest fires 	<ul style="list-style-type: none"> • Threat of forest fires • Displacement of wildlife due to habitat destruction
Domestic	<ul style="list-style-type: none"> • Increased desire for waterfront property 	<ul style="list-style-type: none"> • Clearing of land to shoreline decreases microhabitats 	<ul style="list-style-type: none"> • No cover for wildlife protection • No buffer for soil stabilization & shade



WATERSHED LIVING: *WHAT CAN YOU DO TO MAKE A DIFFERENCE?*

Everyone lives in a watershed. Effective, healthy lifestyle choices practiced in the Petite Rivière watershed can apply no matter where you live or travel. The Petite Rivière watershed is beautiful, productive, and relatively healthy. Residents should be aware that their actions can help to ensure that it remains as such.



Money Saver



Habitat Protection



Waste Reduction

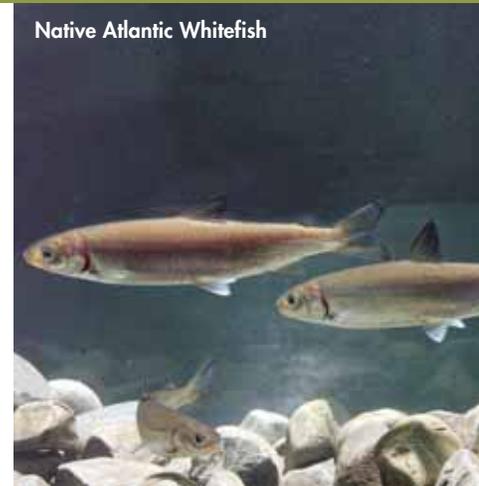


Pollution Prevention

Help Save the Atlantic Whitefish

<p>What Can You Do To Make a Difference? Talk about the Atlantic whitefish with others in your community. Canadians, especially Nova Scotians, should know about its status and its struggle to survive.</p>	
<p>Gently and carefully release accidentally caught Atlantic whitefish. Under the Maritimes Fishery Regulations, it is an offence to catch and retain or possess Atlantic whitefish. Under the new federal Species at Risk Act, it is an offence to kill, harm, harass, capture, or take Atlantic whitefish. Report Atlantic whitefish sightings to Fisheries and Oceans Canada or the Nova Scotia Department of Agriculture and Fisheries. Note the date, size, appearance, and location.</p>	
<p>Learn to distinguish the Atlantic whitefish from lake whitefish.</p>	
<p>Help stop the introduction of invasive species. It is illegal to move fish from one body of water to another.</p>	
<p>Contact the Atlantic Whitefish Conservation & Recovery Team to become involved in the recovery efforts.</p>	

Native Atlantic Whitefish



Invasive Rainbow Trout



Top, Kelly Benham; Adjacent Environment Canada

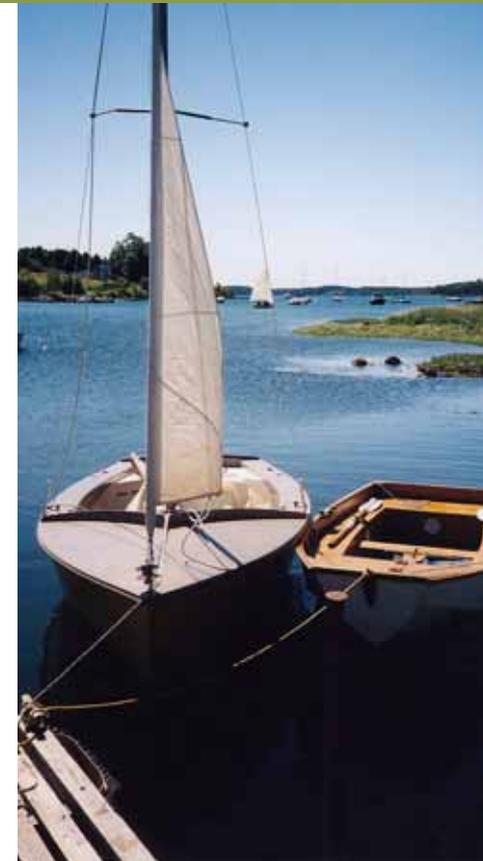
Responsible Angling



<p>What Can You Do To Make a Difference? 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 & Oceans Canada.</p>	
<p>Do not move fish from one lake, river, stream, brook or any waterway to another.</p>	
<p>Empty live wells before leaving each waterbody.</p>	
<p>Discard bait into the body of water from which it was taken.</p>	
<p>Avoid use or possession of bass, bullhead, white perch, yellow perch, goldfish, chain pickerel, or any fish not taken from provincial waters as bait. It is illegal to use or possess these species as bait whether alive or dead.</p>	
<p>Read the <i>Nova Scotia Angler's Handbook</i> you receive when you purchase your fishing license.</p>	
<p>Contact Fisheries & Oceans Canada (902-354-6030 Liverpool local office, 1-800-565-1633 Dartmouth regional office) if you see activities taking place that appear to be suspect or harmful.</p>	

Outdoor Recreation

<p>What Can You Do To Make a Difference? Choose a 4-stroke vs. a 2-stroke motor. 4-stroke motors are quieter, less disturbing to wildlife, and use less gasoline producing less air and water pollution (for more details read pp. 30-31). For more boating tips, pick up the <i>Maritime Clean Boating Guide</i> available from BCAF.</p>	
<p>Ensure that no invasive species are transferred from one body of water to another when transporting watercraft (for example on the bottom of your boat).</p>	
<p>Take part in non-polluting recreation such as hiking, kayaking, canoeing, sailing, and cross-country skiing.</p>	
<p>Adhere to the seven <i>Leave No Trace Principles</i> (visit www.lnt.org):</p> <ol style="list-style-type: none"> 1. Plan ahead and prepare. 2. Travel and camp on durable surfaces. 3. Dispose of waste properly. 4. Leave what you find. Take pictures as your only souvenirs. Remove litter someone else left behind as well as your own. 5. Minimize campfire impacts (check the local forest fire index). 6. Respect wildlife. 7. Be considerate of other visitors. 	



Michael Ernst

Travelling



Sustainable transportation is defined as finding alternate forms of transportation in a manner that supports human and ecosystem health while operating efficiently, being affordable, and supporting the economy. For more information on BCAF's sustainable transportation initiatives such as the *Anti-Idling Campaign* and *Commuter Challenge*, check out their website at www.coastalaction.org.

<p>What Can You Do To Make a Difference? Carpool, walk, or cycle whenever possible.</p>	
<p>Use higher methane (cleaner burning) gasoline.</p>	
<p>Consider fuel-efficient vehicles.</p>	
<p>Keep vehicle maintenance up-to-date including recommended tire pressures and wheel alignment. Your vehicle will work more efficiently and last longer.</p>	
<p>Use a container to collect leaking vehicle fluids so they can be properly disposed. Vehicle fluids can be toxic to children, pets, and wildlife and can also contaminate the ground.</p>	

At Home: Indoor Changes

<p>What Can You Do To Make a Difference? Reduce electricity and fossil fuel burning needs:</p> <ul style="list-style-type: none"> • Make sure your home is adequately insulated. • Check for and repair any drafts at windows and doors annually. • Use programmable thermostats to reduce the heat when rooms are not in use. 	
<p>Dispose of household hazardous waste at your local depot (see p. 24).</p>	
<p>Use vegetable waste in composts to create a great garden fertilizer.</p>	
<p>Further decrease the threat of treated waste water:</p> <ul style="list-style-type: none"> • Do not use toxic cleaning chemicals. • Reduce water demands (less wastewater means less chlorines needed to treat it) by using low-flow showerheads; low-flow toilets or place a brick in the toilet tank; turn off the tap while brushing teeth or shaving; use tap aerators; repair all water leaks immediately; and avoid running water unnecessarily. 	
<p>Use environmentally friendly cleaners (ideas available on p. 32).</p>	
<p>Use paper and wood products sparingly and reuse when possible.</p>	



At Home: Indoor Changes *continued*

Hazardous Household Waste

Hazardous household waste (HHW) is defined as materials that are corrosive, flammable, reactive, or toxic. The Lunenburg Recycling and Composting Facility accepts the following HHW: base and acid corrosives, solid and liquid flammables, oxidizers, and poisons. They do not accept business, industrial, and institutional hazardous wastes; PCBs, radioactives, or explosives; or compressed gas cylinders (i.e. refillable propane tanks).

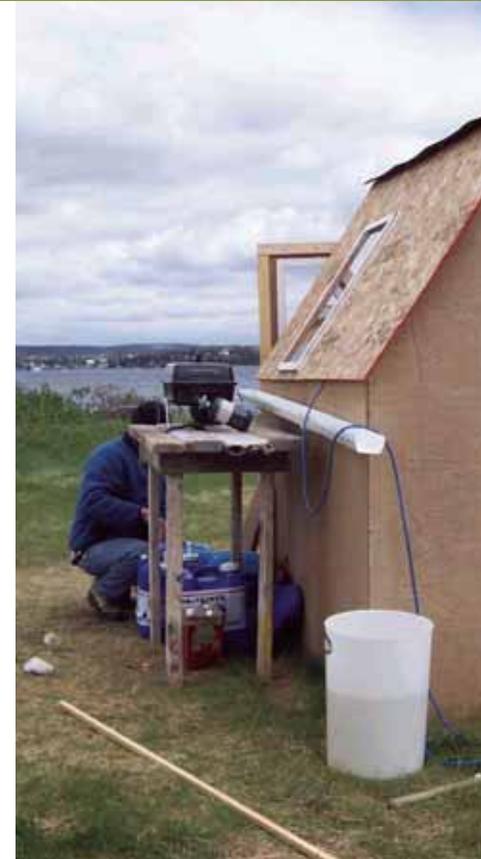


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<p>What Can You Do To Make a Difference? Recycle all paper and cardboard products in the municipal pick-up.</p>	
<p>Properly install, maintain, and pump out septic systems to ensure they work efficiently. There is a significant risk to nearby wells and waterbodies should the septic bed not function properly (see p. 33 for more information).</p>	
<p>Household Appliance Changes Ensure that environmentally friendly coolants are used in fridges and air conditioners. Read labels and avoid products containing harmful components.</p>	
<p>Use EnerGuide Ratings to help choose energy efficient appliances. Visit www.oeenrcan.gc.ca/energguide for more information.</p>	
<p>Avoid the use of household hazardous products.</p>	
<p>Use your consumer power to tell industry and government that you want to see them being environmentally responsible.</p>	
<p>Support environmentally responsible companies and industries as a consumer.</p>	

At Home: Yard Changes

<p>What Can You Do To Make a Difference? Leave trees on your lot or replant trees and shrubs to help reduce carbon dioxide and air pollutants.</p>	
<p>Rake leaves and clear pathways with a straw broom instead of using a leaf blower or hose.</p>	
<p>Add yard waste (leaves and sticks, etc.) to your compost pile. Use grass clippings and leaves as free lawn fertilizer. Yard waste shades the soil, reducing the need for watering.</p>	
<p>Research organic alternatives to pesticides and chemical fertilizers.</p>	
<p>Consider naturalizing your yard with native plants (see pp. 35-36 for some advice).</p>	
<p>Research non-native plants before planting to avoid competition with native vegetation.</p>	
<p>Connect downspouts to barrels to collect rainwater for your garden.</p>	
<p>Replace road salt with sand, kitty litter, or calcium chloride.</p>	





At Home: Waterfront Changes & Pets

Save money and reduce erosion and the destruction of aquatic habitat by using public access docks or sharing with neighbours.

<p>What Can You Do To Make a Difference? Waterfront Changes Leave some trees and vegetation on the shoreline of your home and cottage. Prune them rather than remove them.</p>	
<p>Use public access or join neighbours to make a community boat launch or dock. This will cut down on erosion and the destruction of aquatic habitat.</p>	
<p>Consider replacing solid docks with floating or pipe cantilever docks. Solid docks destroy habitat, alter currents, and result in increased siltation.</p>	
<p>Visit www.livingbywater.ca for more information.</p>	
<p>Responsible Pet Owners Do not allow pets to run free where they may become predator, competitor, or prey for native wildlife.</p>	
<p>Wash pets at least 50 metres upland from shore using phosphate free soaps or shampoos.</p>	



Farming

Riparian Management

Livestock producers may receive up to \$5,000 in assistance for the fencing of wetlands, salt marshes, and some watercourses, stream crossings, and controlled watering systems. Funding is available from the Nova Scotia Department of Natural Resources, Eastern Habitat Joint Venture. For further information, contact Glen Parsons at 902-679-6223 or parsonsj@gov.ns.ca.



Environment Canada

<p>What Can You Do To Make a Difference? Fence livestock away from rivers and lakes to reduce erosion and pollution.</p>	
<p>Leave plant residue from the previous year's crop to reduce soil erosion and restore some nutrients. Crop rotation and fallow periods will also replenish soil nutrients.</p>	
<p>Leave or create a permanent buffer of native trees along waterbodies to reduce erosion, provide shade, keep water cool for fish, and provide habitat for wildlife.</p>	
<p>Choose early mornings and calm days for irrigation to minimize water loss from evaporation.</p>	
<p>Reduce the use of chemical fertilizers and pesticides and investigate less harmful products.</p>	
<p>Leave part of the farm as a natural woodlot to provide wildlife habitat, an area for recreation, and a free source of firewood. Depending on the species, your woodlot may even yield maple syrup.</p>	
<p>Avoid filling wetlands in for farming. These are unique and productive areas.</p>	

Forestry & Working Together

<p>What Can You Do To Make a Difference? Forestry</p> <ul style="list-style-type: none"> • Cut selectively. • Avoid clear-cutting – especially on steep slopes. • Install road crossings carefully to reduce erosion. • Leave natural buffers as wide as possible around streams. 	
<p>Working Together Get together with a group of friends or an existing community group and clean up a section of river or lakefront.</p>	
<p>Learn about issues of concern within your watershed.</p>	
<p>Attend meetings addressing environmental concerns within your watershed.</p>	
<p>Keep informed of, or join in, the actions of watershed groups such as the Petite Rivière Watershed Advisory Group (PRWAG).</p>	
<p>Take part in BCAF's Lunenburg County Climate Change Challenge!</p>	
<p>Join a low impact recreation or community group. If there is not a group addressing your interests or concerns, consider starting one.</p>	



PURCHASING AN OUTBOARD MOTOR

Although boating is a popular activity, it can be highly damaging to our watersheds. Making environmentally friendly decisions means weighing the pros and cons of two- versus four-stroke engines and assessing how much we're willing to compromise for economic and/or personal reasons.

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.

Outboard motors have not been subject to the same regulations and standards as the automotive industry. Some two-stroke motors have changed very little in decades.

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.

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.

According to Environment Canada



- 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!



Discover Boating

Pros & Cons of Two-Stroke

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-Stroke

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.



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

Laundry

- General stain remover: 1 tsp. of white vinegar or baking soda per load

Carpets and Floors

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

Furniture and Polishes

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

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 unperforated 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.

It is important to regularly pump out your system to prevent sludge and scum accumulation.

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 accu-



mulating 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.

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 an automatic washer with a lint trap.
- Install an effluent filter.
- 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, or sinks.
- Slowly draining plumbing fixtures.
- Smell or presence of raw sewage on the ground.
- Soggy spots on the disposal field.

**Protect Your System
Never Flush...**



- Coffee grounds
- Cigarette butts
- Hair or fur
- Cotton swabs
- Dental floss
- Disposable diapers
- Sanitary napkins or tampons
- Condoms
- Pesticides
- Paints, thinners, or varnishes
- Photographic chemicals
- Waste oils
- Kitty litter
- Other chemical wastes



NATURAL GARDENING

Diversity is the key! A variety of native plants leads to increased productivity, better nutrient retention and greater ecosystem stability.

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.

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 to your yard.



Native blue violet

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.

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.



Native starflower



Introduced red clover

A BRIEF HISTORY OF PETITE RIVIÈRE

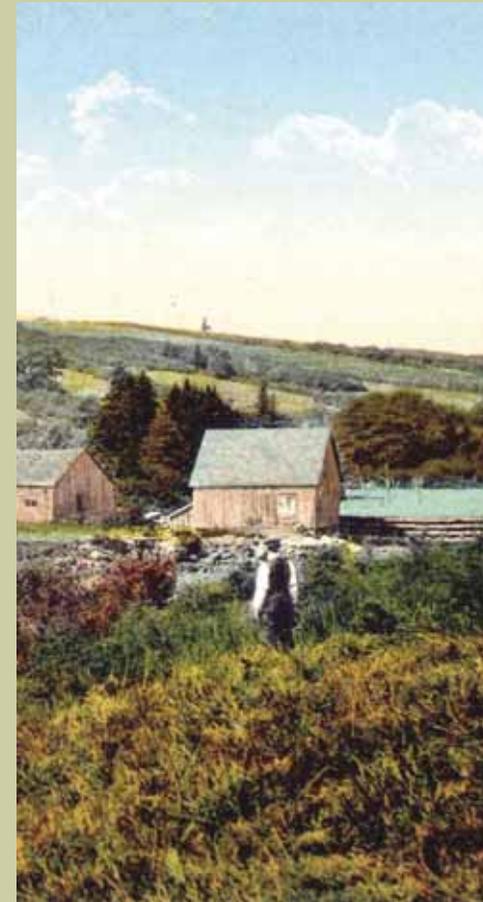
Nineteenth-century Petite Rivière was a self-contained community with its own tradesmen (tailors, weavers, coopers, shoemakers, blacksmiths, and carpenters) and its own retailers of goods brought in by sea.

Four hundred years ago, in May 1604, Samuel de Champlain named on his chart of the area the small river flowing into Green Bay “une petite riviere.” The settlement that eventually grew up on both sides of the estuary and along the lower courses of the river retained that name as Petite Rivière. The first people in what is now the village, however, were the Mi’kmaq, who set up their wigwams on Indian Hill and along the nearby shore from spring until autumn for centuries before Europeans appeared on the scene.

The earliest Europeans to visit the site were probably French fishermen, who by the late 1500s may have set up a summer shore station on the estuary. The first recorded visit by Europeans occurred on May 8, 1604, when De Monts and Champlain anchored

their ship in Green Bay and spent at least three days recovering from their Atlantic voyage. While ashore, they refilled their water casks and obtained fresh food while Champlain took soundings of the bay, calculated the latitude with his astrolabe, and drew a chart of the bay and its environs.

What at first promised to be the first permanent settlement by Europeans occurred from 1632 to 1636 when Isaac de Razilly established a fort and colony at LaHave and placed French settlers at Petite Rivière. By 1636, this was a thriving hamlet of 40 *habitants*. The death of Razilly in July 1636 brought an abrupt end to the little colony, for Charles de Menou d’Aulnay, who assumed command of the new French settlements, moved most of the settlers from LaHave and Petite Rivière to Port Royal,



Paul Harmon

considering it to be a much better base for control of the fur trade, his primary interest. A few settlers remained in both places, but between 1640 to 1760, Petite Rivière was very sparsely settled. Finally, the Expulsion of the Acadians in 1755 brought an end to even that remaining tiny settlement.

In the 1760s, Petite Rivière at last became a permanent settlement, this time by English-speaking people mainly from British American colonies to the south and Northern Ireland. By 1770, the little village had a population of 41 and over one quarter of the total population of New Dublin Township, the western part of what is now Lunenburg County. By 1791, the village had grown only slightly to 62, but it was already a substantial farming community raising a variety of crops. It was in the 1800s, however, that Petite Rivière grew into a thriving village. By the 1890s, its population had increased substantially to a total of 500.

Nineteenth-century Petite Rivière was a self-contained community with its own tradesmen (tailors, weavers, coopers, shoemakers, blacksmiths, and carpenters) and retailers

of goods brought in by sea. Many residents were sea-goers, either as inshore or offshore fishermen or as mariners in coastal or international trade. Many of the fishermen and mariners were also part-time farmers, for there was an abundance of arable land.

Ship-building became a significant industry in the 1800s and later until the gradual demise of the age of sail in the early 1900s. Several small shipyards on the river-mouth built a considerable number of schooners for the fishing and coastal trade. Mills, both grist and lumber, though centred in Crousetown, were also built and run in Petite Rivière.

The old way of life in Petite Rivière lasted well into the twentieth century, but strains on the integrity of village life emerged, especially during the Depression. It was becoming much more difficult to earn one's living at home, and consequently, some residents had to find work elsewhere, even as far away as New England. After World War II the changes became more obvious. The inshore fishery suffered severely as catches became smaller and the market for dry fish

shriveled; moreover, the Grand Banks fishery was employing a much smaller work force as the fishing schooners with their two-man dories had been replaced by trawlers. Although Petite Rivière continued to be a popular summer resort, many of its wage-earners had to work in nearby towns, especially Bridgewater. When the old schoolhouse with its high school was abandoned in the 1960s and replaced by a district elementary school, village students in the higher grades had to ride buses to schools many miles away. Like many other villages, Petite Rivière has been affected by the inevitable changes that are characteristic of the modern era.

Today Petite Rivière is still a prosperous community and by no means the "tiny village" it has been called by unenlightened newspaper reporters. Its year-long population of well over 300 is no longer isolated – radio, television, and other technology have transformed its communication with the world outside. At the same time, it has managed to retain many of the advantages of semi-rural life while adding beneficial modern services.

— *Malcolm Parks, resident and historian*



Resources & Acknowledgements

Online Resources

Bluenose Coastal Action Foundation:
www.coastalaction.org

Living by Water: www.livingbywater.ca

Wild About Gardening:
www.wildaboutgardening.org

Leave No Trace: www.lnt.org

Nova Scotia Department of Agriculture & Fisheries: www.gov.ns.ca/nsaf

Nova Scotia Department of Natural Resources: www.gov.ns.ca/natr

Environment Canada (Fresh Water Site):
www.ec.gc.ca/water/en/nature/prop/e_cycle.htm

Fisheries & Oceans Canada:
www.mar.dfo-mpo.gc.ca

Acknowledgements

Thank-you to the following for their assistance with this publication: Malcolm Parks, Bridgewater Public Service Commission, Petite Rivière Watershed Advisory Group, Fisheries & Oceans Canada, Nova Scotia Department of Agriculture and Fisheries, and the Nova Scotia Department of Environment. BCAF would also like to extend thanks to the following individuals who contributed photographs (we regret not having the space to use all of them): Sinclair Dewis, Paul Harmon, Reg Newell, Catherine Pross, Paul Schwartz, and Jill Comolli.

References

For a complete list of references used to produce this guide, please email BCAF at info@coastalaction.org, call 902-624-9888, or drop us a line at P.O. Box 10, Mahone Bay, Nova Scotia B0J 2E0.

Funding Agencies

We gratefully acknowledge the support of:



Atlantic Coastal Action Program



**Environment
Canada
Environnement
Canada**



Kelly Bentham

Atlantic Whitefish CONSERVATION & RECOVERY TEAM

The Atlantic whitefish is facing the threat of extinction. Not only is this member of the *Salmonidae* family endangered, it occurs only in one global location, the Petite Rivière watershed in Lunenburg County, Nova Scotia. Historically, it was also found in the Tuskent River watershed, Yarmouth County, but has since thought to be extirpated from this part of the province.

The Atlantic Whitefish Conservation & Recovery Team (AWCRT) is working to raise awareness of this endangered species and to encourage support for its recovery. A healthy watershed benefits both residents and wildlife. We can all choose to make lifestyle changes that will benefit our environment – for us and future generations.



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