

# COASTAL WATER QUALITY

## THE 2009 STATE OF NOVA SCOTIA'S COAST REPORT

### HOW DO WE PROTECT COASTAL WATER QUALITY WHILE STILL USING THE COAST?

Good quality coastal water is an important part of keeping our coasts healthy for the future. Natural marine systems, including plant, animal, and fish life need clean coastal water to survive. Humans need these marine systems to stay healthy in order for us to benefit from them. But we also need to use the water for domestic and industrial purposes, and for other activities. If we want to develop the coast in a sustainable way, we must protect coastal water.

Coastal water quality refers to the physical, chemical, and biological characteristics of salt and brackish water. Brackish water is a mixture of salt and freshwater, found typically in estuaries where freshwater rivers and streams mix with the tide.

People assume that the overall quality of the province's coastal waters must be good because much of the coastline remains undeveloped or has only light residential development. When we compare the province to many places in the world, we can say that Nova Scotians enjoy relatively clean coastal waters.

However, we haven't been able to determine an overall picture of coastal water quality in the province, because there currently isn't a system in place that pulls together all this information. In many places we are not measuring the quality of our coastal waters. Existing monitoring or reporting covers only specific geographic areas or sectors, such as harbours, aquaculture, shellfish zones, and recreational beaches. These results gathered from specific monitoring are useful, and can serve as important lessons for the current and future management of activities.

Deteriorating water quality can have many ecological, social, and economic effects. These include the loss of marine plant, animal, and fish species, deteriorating shellfish quality, and restriction of recreational use. Areas of our coast are prone to coastal water quality problems, particularly in estuaries, bays, and waters next to densely populated areas. The coastline is long and many activities, both land and marine based, take place close to the shore. Figure 1 shows how the water quality of a coastal watershed can be influenced in different ways.

#### LEGEND

1. Headwaters
2. Private Well
3. Septic (on-site system)
4. Rural Communities
5. Protected Areas
6. Buffers
7. Forestry
8. Wind Power
9. Agriculture
10. Power Dams
11. Recreation
12. Groundwater
13. Municipal Drinking Water Supplies
- 13 a) Ground Water
- 13 b) Surface Water
14. Small Town
15. Estuary
16. Fisheries
- 16 a) Aquaculture
- 16 b) Fisheries
17. Fish Processing Plant
18. Wastewater Discharge
19. Power Plant
20. Urban Centre
21. Working Waterfront
22. Shipping
23. Watershed Divides [-----]



Figure 1: Diagram of a watershed showing activities that can influence coastal water quality.

Coastal water quality is influenced by natural geological and oceanographic processes, and by human activities. The human impacts to coastal water quality come from land, shoreline, and marine activities.

#### Some human activities that can affect water quality

##### 1. LAND-BASED ACTIVITIES

- Municipal discharge from wastewater treatment plants
- Failing domestic septic systems
- Industrial discharge
- Petroleum-refining wastes
- Seepage of pollutants, nutrients, or sedimentation from residential, agricultural, and forestry activities
- Storm water drainage

##### 2. MARINE-BASED ACTIVITIES

- Dredging and ocean dumping
- Wharves and coastal structures
- Fishing, fish processing, and aquaculture activities
- Ballast water discharged from ships
- Activities by shipyards
- Activities by the offshore energy industry

## FACTS AND FIGURES

Narrowing down the potential sources of impact to Nova Scotia's coastal water quality is a challenging task. Some activities may cause significant effects, while others may not affect water quality at all.

*The following are just a few potential sources of impact to consider when we are looking at coastal water quality*

- 126 municipal wastewater treatment plants
- 260 fish-processing plants
- 316 wharves
- 319 aquaculture sites
- 46 primary watersheds with natural and storm water runoff
- on-site septic systems used by over 400,000 Nova Scotians

## INDUSTRIAL CONTAMINATION

Current levels of toxic elements, such as copper, cadmium, lead, arsenic, and organics can indicate poor water quality in industrialized harbours. Sydney Harbour is severely polluted by contaminants such as polycyclic aromatic hydrocarbons (*PAHs*), polychlorinated biphenyl (*PCBs*), and metals from industrial activities. The Muggah Creek watershed, which drains into the harbour, is a major source of contaminants. Monitoring shows distinct increases in the effects on biological communities the closer they are to the pollution source in Muggah Creek. This pollution has closed the lobster fishery in Sydney Harbour for many years.

Sydney Harbour is an extreme example of a polluted harbour, but it isn't unique. Nor is industrial contamination just an urban problem. Rural areas, such as Clam Harbour and Isaacs Harbour, show high concentrations of arsenic and mercury, likely from historic gold mining activities. Officials have closed the recreational clam fishery in several areas because of arsenic contamination. Throughout the province, mussels and periwinkles show PAH concentrations near creosote-treated wharf pilings.

## EXCESSIVE ALGAE GROWTH

The unwanted growth of algae is another important water quality problem. Results from monitoring specific regions from 1996–2001 show a general increase in the amount of nutrients, particularly nitrogen, entering coastal waters from land-based sources. Nitrogen is released into coastal water from agricultural or household sources such as lawn fertilizers and failing septic systems.

The problem is that nitrogen and other nutrients entering coastal water, called nutrient loading, encourages excessive growth of algae. This process creates algal blooms, which lower the oxygen content in water, and can cause massive deaths of other organisms. Monitoring results show that coastal waters off parts of Cumberland, Pictou, Antigonish, Inverness, Colchester, Kings, Annapolis, and Digby counties are at a higher risk of algal blooms from excessive land-based nutrients.

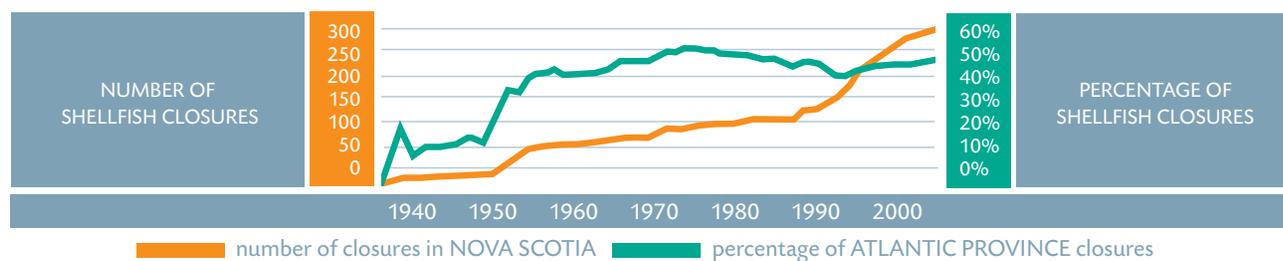
## RECREATIONAL IMPACT

Poor water quality can hamper recreational activities at public beaches throughout the province but especially in urban areas. Concentrations of fecal coliform bacteria, such as *E.coli*, can exceed 200 counts per 100 ml in inshore waters. Beaches around Halifax Harbour, for example, have been closed for years because raw sewage released into the harbour causes high concentrations of coliform bacteria. Halifax Regional Municipality (*HRM*) closes its freshwater beaches immediately if the *E.coli* count is 400 or over, and considers closure if the count is greater than 200. New treatment systems in Halifax Harbour are coming into operation along with associated management programs, and we anticipate these beaches will be reopened.

Some provincial saltwater swimming beaches are tested for Enterococci, a microorganism found in animal and human waste. Officials close beaches if the level reaches 70 counts per 100 ml of water. At 35 counts per 100 ml, beaches are retested and closure is considered.

## ECONOMIC IMPACTS

Poor water quality can have an immediate effect on businesses that depend on clean coastal waters. Shellfish harvesters and aquaculture operators have particularly felt the problem. From 1985–2000, Nova Scotia had the greatest increase in shellfish closures from contamination among the Atlantic provinces. During that time, the number in the province doubled, as Figure 2 shows.



▲ Figure 2: Shellfish Closures, Nova Scotia, 1940–2000.

*Nova Scotia shellfish closures in 2000 included*

- 278 areas closed to shellfish harvesting
- a total area of 939 sq. km and 3,314 km of coastline
- about half of the shellfish closures in Atlantic Canada

## WHAT NOVA SCOTIANS ARE DOING NOW

Many groups are monitoring coastal water quality for different purposes. Table 1 shows some of the programs.

▼ Table 1: Examples of coastal water quality monitoring programs.

PROGRAM	OPERATING AGENCY	PURPOSE	LINK
Environmental Monitoring Program	Nova Scotia Fisheries and Aquaculture	Monitors effects of aquaculture on coastal waters	<a href="http://www.gov.ns.ca/fish/aquaculture">www.gov.ns.ca/fish/aquaculture</a>
Canadian Shellfish Sanitation Program	Jointly run by federal Fisheries and Oceans Canada, Canadian Food and Inspection Agency, and Environment Canada	Protects water quality for shellfish operations and consumers in Canada	<a href="http://mollusca.gc.ca">http://mollusca.gc.ca</a>
National Agri-Environmental Health Analysis and Reporting Program	Agriculture and Agri-food Canada	Monitors effects of agriculture on the environment	<a href="http://www.agr.gc.ca">www.agr.gc.ca</a> <i>Click on Programs and Services</i>
Atlantic Zone Monitoring Program	Fisheries and Oceans Canada	Provides information on the status of coastal ecosystems in Atlantic Canada	<a href="http://www.dfo-mpo.gc.ca/science">www.dfo-mpo.gc.ca/science</a>
Halifax Harbour Water Quality Monitoring Program	Halifax Regional Municipality	Monitors conditions within Halifax Harbour and the effectiveness of the <i>Harbour Solutions Project</i>	<a href="http://halifax.ca/harboursol">http://halifax.ca/harboursol</a> <i>Click on Harbour Water Quality</i>
Bedford Basin Plankton Monitoring Program	Fisheries and Oceans Canada	Monitors plankton levels within Halifax Harbour	<a href="http://www.dfo-mpo.gc.ca">www.dfo-mpo.gc.ca</a> <i>Click on A-Z Index</i>
Community Aquatic Monitoring Program	Fisheries and Oceans Canada	Monitors the health of estuaries	<a href="http://www.dfo-mpo.gc.ca/oceans">www.dfo-mpo.gc.ca/oceans</a> <i>Click on Community Projects</i>

PROGRAM	OPERATING AGENCY	PURPOSE	LINK
Environmental Monitoring Network	Community-based but operated by Saint Mary's University	Helps individuals, community groups, and other organizations with monitoring projects by training, supporting, and lending equipment	<a href="http://www.envnetwork.smu.ca">www.envnetwork.smu.ca</a>
Atlantic Coastal Action Program	Community groups administered by Environment Canada	Helps restore and sustain watersheds and coastal areas	<a href="http://atlantic-web1.ns.ec.gc.ca">http://atlantic-web1.ns.ec.gc.ca</a> <i>Click on Community Programs</i>
Gulfwatch Program	Gulf of Maine Council on the Marine Environment	Measures contaminants in blue mussels within the Gulf of Maine	<a href="http://www.gulfofmaine.org/gulfwatch">www.gulfofmaine.org/gulfwatch</a>

## WHERE ARE THE INFORMATION GAPS?

- Lack of information on coastal water quality provincewide
- Lack of information on the combined effect of multiple contaminants that are discharging into coastal environments, especially estuaries
- No access to long-term data from some of the existing monitoring programs
- No government agency that oversees monitoring programs to track coastal water quality in Nova Scotia

## THE FUTURE: HOW NOVA SCOTIANS CAN PROTECT THE WATER AND USE THE COAST

Protecting and improving the quality of coastal water is critical to a healthy and productive coast. Nova Scotians must work together to protect the quality of our coastal water.

### *Some possible ways include*

- Effective controlling of point sources of pollution, such as municipal sewage outfalls or fish processing plants
- More integrated approaches to watershed management
- Seeking ways to improve the administration and enforcement of existing regulations
- Developing a comprehensive monitoring system, because current data isn't stored in consistent or easily accessible ways
- Considering the economic cost of poor water quality
- Developing ways to address nonspecific sources of pollution, which are particularly difficult to identify, measure, control, and manage

### *Further Reading*

Environment Canada. "Toxic Chemicals in Atlantic Canada – Polynuclear Aromatic Hydrocarbons (PAHs)." 2002. *Environment Canada Envirofacts*. [www.atl.ec.gc.ca/epb/envfacts/pah.html](http://www.atl.ec.gc.ca/epb/envfacts/pah.html) (August 12, 2009)

Lee, K., P. Yeats, J. Smith, B. Petrie, T. Milligan, J. Payne, K-L Tay, W. Ernst, K. Doe, C. Greer, D. MacKay. 2002. "Environmental Effects and Remediation of Contaminants in Sydney Harbour, Nova Scotia." *TSRI Project Number 93*. Sydney, Nova Scotia: Sydney Tar Ponds Agency.

Stewart, P.L., and L. White. 2001. *A Review of Contaminants on the Scotian Shelf and in Adjacent Coastal Waters: 1970 to 1995*. Canadian Technical Report of Fisheries and Aquatic Sciences 2351: xvii + 158pp.

