

Perspectives on current and emerging issues of concern to the coastal and ocean policy community in the Atlantic Region  
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## Addressing Coastal Water Quality as a Priority Coastal Issue in Nova Scotia

The May 2008 edition of the *Marine Affairs Policy Forum* highlighted some of the substantive and procedural elements affecting the success of Nova Scotia's long-awaited coastal management effort and the proposed Sustainable Coastal Development Strategy (SCDS). Six priority coastal issues were identified by the province to be addressed, namely sea-level rise and storm events, coastal access, working waterfronts, water quality, sensitive ecosystems and habitats, and coastal development.

This edition of the *Marine Affairs Policy Forum* focuses on the priority issue of coastal water quality and is the fourth of a coastal priority issues "six-pack". The goal of this series is to provide an overview of some of the key factors and policy implications for effective management of coastal issues in Nova Scotia. Although each edition of the "six pack" will focus on a specifically identified priority issue, linkages between the priority issues will be highlighted to demonstrate the interconnectedness among them.

### Introduction

Coastal water quality refers to the physical, chemical, and biological characteristics of salt and brackish water. While there is no official boundary separating *coastal* and *offshore* waters, it seems reasonable to use the 12 nautical mile limit of Canada's Territorial Sea established under the *Oceans Act* as a proximate boundary when discussing coastal water quality because this distance should encompass most, if not all, marine waters affected by land-based activities. Human activities on land and in the water can affect coastal water quality and negatively impact human health and the marine environment. The pollutants found in coastal waters come from many different sources. These sources are often classified into two main categories: point and non-point sources. Point sources refer to fixed, identifiable sources of pollution such as sewage outfalls, fish processing plants, aquaculture sites, pulp and paper mills or petroleum refining facilities. Non-point sources refer to diffuse sources of pollution that are not easily identifiable such as runoff from agricultural and forestry operations and impervious surfaces in urban areas.

Contamination from untreated sewage and chemicals is a major threat to coastal water quality and can result in coastal waters that are unsafe for certain human activities such as swimming or resource harvesting. Additional factors influencing coastal water quality include nutrient enrichment or eutrophication, invasive species, erosion/sedimentation and a variety of climate change related impacts.

### Where is coastal water quality a concern in Nova Scotia?

Coastal water quality is an issue of growing concern in most areas of Nova Scotia. In late August of 2009, a low pressure system

tracked across the Maritimes provinces bringing heavy rains to much of the region. The following day, the federal government temporarily closed the entire coastline of the Maritime Provinces to shellfish harvesting as a precautionary measure over concerns of widespread bacterial contamination.<sup>1</sup> While shellfish harvesting was re-opened in these areas within a few weeks, the number of long-term shellfish closures in Nova Scotia has increased steadily since 1940 and has more than doubled since 1985. There are now over 300 shellfish closures in Nova Scotia comprising over half of all shellfish closures in Atlantic Canada (Figure 1). In 2000, a total of 939 km<sup>2</sup> and 3,314 km of coastline in Nova Scotia was closed to shellfish harvesting (Figures 2 and 3). The growing number of shellfish closures in Nova Scotia may not be due entirely to deteriorating coastal water quality. This trend could also reflect a combination of more stringent standards, increased monitoring capabilities, or insufficient resources to re-test and subsequently re-open closed areas that are no longer contaminated.

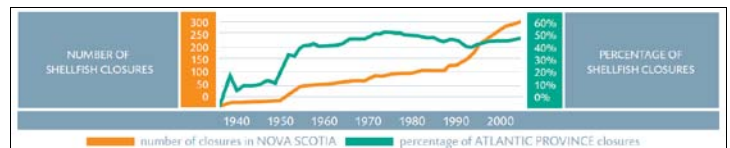


Figure 1. Shellfish closures in Nova Scotia and Atlantic Canada, 1940-2000. Source: State of Nova Scotia's Coast Report, Nova Scotia Fisheries and Aquaculture

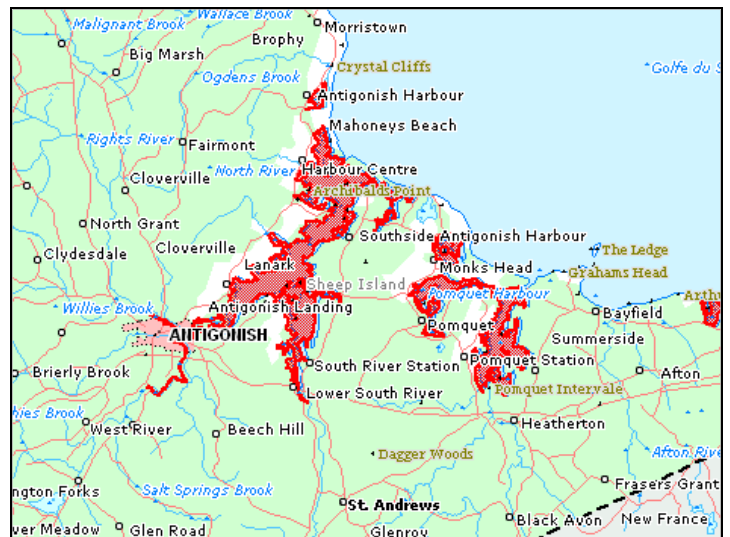


Figure 2. Shellfish closures (shown in red) near Antigonish, Nova Scotia. Source: Fisheries and Oceans Canada

In Halifax, the city's new sewage treatment malfunctioned in January of 2009 and as a result raw sewage continues to be released into the harbour. The 2009 summer tourist season was marred by complaints of "floatables" and the smell of sewage

<sup>1</sup> DFO Media Release: [http://www.dfo-mpo.gc.ca/media/infocus-alaune/2009/20090904\\_1-eng.htm](http://www.dfo-mpo.gc.ca/media/infocus-alaune/2009/20090904_1-eng.htm)

NovaNewsNow.com: <http://www.novanewsnow.com/article-372198-Major-closure-of-Nova-Scotia-coastline-to-shellfish-harvesting.html>

along Halifax's busy waterfront. In addition, industrial and commercial operations in, and along, Halifax and Sydney Harbours have caused these water bodies to be severely contaminated with heavy metals and organic compounds. In rural areas of the province, pollution from industrial operations is less common. Here, agricultural run-off, municipal wastewater and seepage from aging or poorly maintained domestic septic systems are of greater concern. Nova Scotia has 46 primary watersheds, all of which drain into coastal waters (Figure 4). This means that all human activities carried out in both inland and coastal areas of the province have the potential to affect coastal water quality. Contaminants originating tens and even hundreds of kilometers inland can be transported by surface water and groundwater to the coast. Because of this, some have argued that the entire province should be considered as part of the coastal zone if coastal water quality is to be addressed effectively.



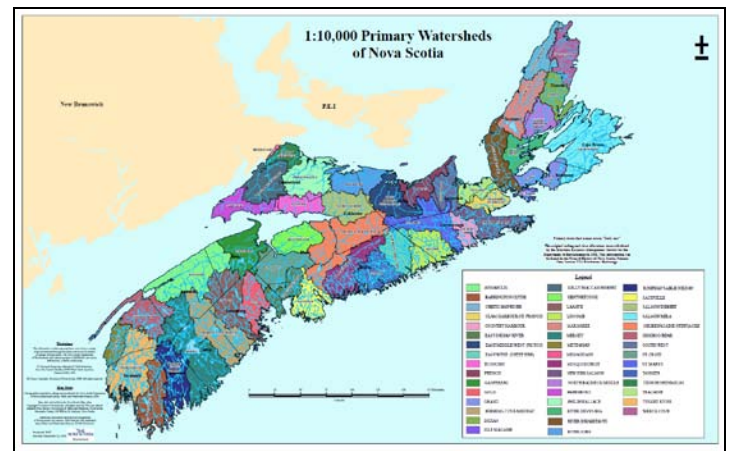
**Figure 3. A government sign notifies visitors to the area that it is closed to shellfish harvesting because of bacterial contamination.** Source: Environment Canada

### Who should be concerned and why?

Key stakeholders and organizations with an interest in coastal water quality in Nova Scotia include the public; the provincial, federal and municipal governments; community groups and environmental NGOs; the tourism industry; the commercial fishing and aquaculture industries; the agriculture and forestry industries; and the marine transportation industry.

**The Public:** All Nova Scotians should be concerned about coastal water quality. Good coastal water quality is important to human health and the health of coastal ecosystems. During the summer, beaches are among the most popular recreational destinations for Nova Scotians. Dominion Beach in Cape Breton was one of the most popular beaches in the province before it was closed in 2004, due to elevated levels of fecal bacteria in the water. A sewage treatment project in the towns of Dominion and Bridgeport is almost complete and the beach is scheduled to reopen this summer. Apart from a brief re-opening in 2008, beaches in Halifax Harbour have been closed due to bacterial contamination for decades. Some coastal cities in North America are reporting significant concentrations of pharmaceuticals and household chemicals in coastal waters, as these are not removed by most wastewater treatment facilities. There is growing evidence that some of these chemicals, such as those found in birth control medications, can adversely affect reproduction in some aquatic species.

**Provincial Government:** Some of the province's most valuable industries such as commercial fisheries, aquaculture and tourism are directly affected by coastal water quality. Shellfish and beach closures can result in a substantial loss of revenue for the province. Under the *Environment Act*, the provincial government is responsible for managing the province's water resources, which includes fresh and marine waters comprising all surface water, groundwater and coastal water. In addition, the government regulates centralized treatment facilities and on-site sewage disposal systems. About 50% of Nova Scotians are connected to centralized treatment facilities and about 45% rely on on-site sewage disposal systems. The provincial government also monitors the environmental effects of aquaculture on coastal systems. Since 2003, the Department of Fisheries and Aquaculture has administered an Environmental Monitoring Program which involves sampling the water and bottom sediment near aquaculture sites.



**Figure 4. Primary watersheds of Nova Scotia.** Source: Nova Scotia Environment

**Federal Government:** The federal government has jurisdiction over marine waters from the ordinary low water mark out to 200 nautical miles and therefore, has a mandate to address a range of issues related to coastal water quality including levels of toxins and contaminants in shellfish growing areas and fish habitat, pollution from vessels at sea and the release of pollutants into marine waters from land-based sources. A number of federal laws contain provisions dealing with pollution prevention and coastal water quality including the *Fisheries Act*, the *Canada Shipping Act*, the *Canadian Environmental Protection Act*, the *Navigable Waters Protection Act* and the *Canada Water Act*. Three federal departments; the Canadian Food Inspection Agency, Environment Canada, and Fisheries and Oceans Canada share responsibility for administering the Canadian Shellfish Sanitation Program (CSSP). The Canadian Food Inspection Agency is responsible for monitoring the processing of edible shellfish for compliance with federal standards and ensures they are safe for human consumption. Environment Canada is responsible for monitoring water quality in areas where shellfish are harvested. Fisheries and Oceans Canada is responsible for opening and closing shellfish harvesting areas on the recommendation of either Environment Canada or the Canadian Food Inspection Agency, and notifying all interested parties of the status of harvesting areas.

**Municipal Government:** Municipal governments have responsibilities associated with wastewater and stormwater management and associated infrastructure in their jurisdiction. Many municipalities address wastewater and stormwater issues in their municipal planning strategy and associated by-laws. Currently, there are 126 municipal wastewater treatment plants

operating in the province. Municipalities are also responsible for land-use planning in Nova Scotia. The application of domestic fertilizers and pesticides, use of road salt, the area of land covered by vegetation and impervious surfaces, riparian buffers and coastal setbacks, and development projects are all important considerations in designing municipal planning strategies that protect the province's water resources.

**Community Groups & Environmental NGOs:** There are a number of community groups and ENGOs in the province who are conducting research, monitoring and restoration work within their local watershed. These groups see good environmental stewardship and good water quality as being fundamental to the well-being of their community. Since 1991, Environment Canada's Atlantic Coastal Action Program (ACAP) has supported many of these community groups throughout Atlantic Canada.

**Tourism Industry:** Coastal tourism and recreation generates between \$270 and 300 million in annual expenditures (excluding expenditures by local residents) for Nova Scotia. Water pollution can leave visitors with a negative impression of Nova Scotia's coast, as evidenced by the many complaints over the water quality in Halifax Harbour in the summer of 2009. Poor water quality can also cause popular tourist attractions, such as Dominion Beach in Cape Breton, to be closed to visitors.

**Commercial Fishing & Aquaculture Industry:** Coastal water quality can affect the commercial fishing and aquaculture industry as well. As described above, poor water quality can force large areas to be closed to shellfish harvesting, costing the industry millions of dollars and impacting the livelihoods of those who depend on shellfish for their livelihood. Clam harvesters in the Annapolis Basin have been especially impacted by poor coastal water quality. In September 2008, the Annapolis Basin was closed to shellfish harvesting because a malfunctioning sewage treatment plant in Digby led to widespread bacteriological contamination. The closure was eventually lifted, but the Annapolis Basin was closed again to shellfish harvesting in July of 2009 due to increased levels of paralytic shellfish poisoning (PSP), also known as "red tide". These closures, combined with poor catches and low prices, had a large impact on the livelihoods of clam harvesters in the region.

Fish-processing plants and aquaculture sites can also be sources of pollution. There are approximately 260 fish-processing plants and 319 aquaculture sites in Nova Scotia. Public concerns over the pollution from these facilities could lead to tougher industry regulations in the future. For example, the Government of Nova Scotia placed an indefinite moratorium on the expansion of finfish aquaculture in Port Mouton Bay, along the province's South Shore in March of 2009 following repeated calls for a moratorium from the local community. An Atlantic salmon aquaculture operation is already underway in the Bay, but the community is opposed to further aquaculture development over concerns that the activity could decrease the water quality in the Bay and harm the local lobster fishery, tourism industry and protected areas. Clarity around these matters could minimize the potential for conflict among coastal stakeholders.

**Agriculture & Forestry:** Runoff from agricultural and forestry operations can carry chemicals, animal wastes and sediments into rivers and streams and eventually into coastal waters where they can affect water quality, thereby degrading coastal ecosystems and habitats. The nutrients in fertilizers and animal waste can accumulate in the water, causing a rapid increase in the population of algae. These algal blooms can harm or kill other marine organisms by lowering the concentration of oxygen in the water

column when they begin to decompose. Some species of algae even produce toxins that accumulate in shellfish and make them unsafe for human consumption. Addressing coastal water quality will therefore require managing the pollutants originating from agricultural and forestry operations.

**Marine Transportation Industry:** Shipping and marine transportation activities are another potential source of pollution in coastal waters. Oil and other toxic substances can be accidentally or intentionally released into the marine environment. The federal government regulates the marine transportation industry and uses aerial surveillance, patrol vessels, satellite imaging and port state control inspections to monitor vessel activities and minimize vessel-source marine pollution.

### **Policy Implications**

Good coastal water quality is integral to the social, ecological and economic well-being of Nova Scotia. Pollution can have adverse effects on human health and industries such as resource harvesting, aquaculture and tourism. Coastal water quality is perhaps one of the more challenging of the priority coastal issues to manage. The pollutants found in the province's coastal waters originate from many sources including point and non-point sources on land and in the water. Tracking pollutants to their point of origin can be difficult, even impossible. The vast network of lakes, rivers, streams and aquifers can transport pollutants from all over the province into coastal waters. Once these pollutants reach the coast, currents can carry them along the coastline or further offshore. Additionally, air-borne and marine transport of pollutants from areas outside of the province can affect the quality of Nova Scotia's coastal waters. Since there has not been a longstanding, comprehensive monitoring program for coastal water quality in the province, the task of identifying the type, source, quantity and effect of coastal water pollutants is a great challenge. All areas of the province could potentially have pollution sources, so there are many stakeholders with different interests and government agencies with overlapping, and sometimes opposing, mandates that must be involved in a strategy to protect coastal water quality.

There are already several initiatives underway in Nova Scotia involving multiple levels of government and stakeholders that should improve coastal water quality. For example, the Canadian Council of Ministers of the Environment recently endorsed a *Canada-wide Strategy for the Management of Municipal Wastewater Effluent*, which sets out a harmonized framework to manage discharges from more than 3,500 municipal, community and government wastewater facilities in Canada. The strategy will require that all wastewater facilities achieve minimum national performance standards, develop site-specific objectives to manage local effluent discharges, reduce or eliminate certain pollutants at source, and monitor and report their effluent discharge. Another example is the Environmental Farm Stewardship Program, which was initiated through a partnership between the agriculture industry and the federal and provincial governments. The program offers incentives to assist farmers in the mitigation of environmental impacts associated with agriculture including nutrient management, erosion and runoff control, and riparian area management. In addition to these programs and the Sustainable Coastal Development Strategy, the provincial government is currently developing several other resource management strategies that should help improve coastal water quality including a provincial water resources management strategy and a wetland conservation policy.

While a comprehensive management strategy for coastal water quality will require more research and monitoring to identify the type, source, concentration and effect of coastal water pollutants, there are some steps that can be taken in the short-term to improve the situation in the province using existing data and information. The CSSP has been successful at identifying areas with high levels of fecal coliforms and protecting the public from consuming the contaminated shellfish in these areas. The federal government recently enhanced the CSSP measures for the management of shellfish harvest areas adjacent to wastewater treatment plants in order to prevent shellfish contaminated by plant failures from reaching domestic and international markets. The measures include re-classification of harvesting areas, area-specific management plans and new Hazard Analysis Critical Control Point (HACCP) controls by processors. Despite these new measures, there has been inadequate focus on preventing contamination and remediating contaminated sites. Reducing or eliminating the release of fecal coliforms into coastal waters by raising sewage treatment standards and initiating complementary remediation projects should be made priorities under the province's coastal management program.

During a June 2008 workshop hosted by MAP, coastal management experts from the Atlantic region recommended using watersheds (Figure 4) as the unit for identifying the extent of coastal areas that would be adequate to address the issue of coastal water quality in Nova Scotia. Settlement patterns and human uses were also identified as important criteria when considering the spatial extent of the coastal zone required to adequately address this issue. Additionally, experts at the workshop offered the following advice:

- Participants recognized the influence of upstream activities on coastal water quality but also noted that the area designated for management under the proposed coastal management initiative could be limited to encompass those activities not currently being addressed by other initiatives provincially, such as the provincial Water Resources Management Strategy.
- The limits of salt water intrusion and tidal influence for areas with rivers was suggested as a potential determinant in setting the landward boundary.
- Setting boundaries needs to take account of current and future development impacts as settlement patterns, biological features such as wetlands, physical features such as cliffs and bays, and natural processes such as currents; as they can all affect the achievement of coastal water quality objectives.
- Standards need to be set for coastal water quality that considers both human and ecological health. This would require not only the determination of water quality targets but monitoring and reporting that would trigger actions to ensure objectives were being met.
- Participants suggested that a seaward boundary might be based on a fixed distance of 3 nautical miles, encompassing bays and other coastal features and natural processes that exert influence on the broader coastal areas and affect water and sediment quality.

A strategy for protecting Nova Scotia's coastal water quality should factor in linkages with the other coastal issues facing the province. Some examples of these linkages with coastal water quality are described here.

#### ***Coastal Hazards:***

- Certain types of commercial and industrial facilities located along the coast, such as oil refineries and container terminals store hazardous chemicals on-site. It is possible that storage infrastructure could be damaged in a storm and cause these

chemicals to be released into coastal waters. The storage of hazardous chemicals in flood and erosion risk areas should therefore be managed in a way to eliminate this potential from occurring.

- Future sea-level rise and storm surges could result in salt water intrusion (the mixing of salt water into freshwater aquifers) in some areas of the province, disrupting the local supply of freshwater for drinking and irrigation. Anticipating the consequences of such impacts is an important activity for municipal land-use planners and highlights the importance of coordinating the Sustainable Coastal Development strategy with a number of other provincial strategies, particularly the Water Resources Management Strategy.

#### ***Working Waterfronts:***

- Overcrowded, poorly maintained and aging harbour facilities can increase the risk of accidental spills which affect coastal water quality.
- Harbour Authorities, assisted by Fisheries and Oceans Canada's Small Craft Harbours Branch, are required to create and implement an Environmental Management Plan (EMP) to ensure that its activities are carried out in an environmentally friendly manner.

#### ***Sensitive Ecosystems and Habitats:***

- Many of the province's coastal ecosystems and habitats such as wetlands and eelgrass beds are negatively impacted by poor coastal water quality.
- Wetlands can filter nutrients, chemicals, organic wastes and sediment from contaminated water.

#### ***Coastal Development:***

- Coastal development and population growth puts pressure on coastal ecosystems and is a major source of pollution in coastal waters.
- Good land-use planning and management practices for coastal development such as the use of riparian buffers and setbacks can help reduce and eliminate pollution.
- The rate of coastal development and population growth should be linked with the capacity of local wastewater and sewage treatment facilities.

#### ***Concluding Comments***

The connection between Nova Scotia's watersheds and coast can no longer be ignored and strategies and management actions aimed at improving coastal water quality cannot be limited to land areas immediately adjacent to the shoreline. Addressing the issue of coastal water quality in Nova Scotia requires a province-wide, coordinated effort over the long-term - involving all Nova Scotians, stakeholders and levels of government. The process of integrated coastal zone management will be an essential tool in meeting this challenge and dealing with the complexity of the coastal water quality issue. The provincial government's Coastal Management Framework and forthcoming Sustainable Coastal Development Strategy represent important steps in initiating this process in Nova Scotia. Key questions surrounding the issue of coastal water quality that must be addressed include those relating to the setting of water quality standards acceptable to Nova Scotians; the process for ensuring these standards are achieved; and the costs and source of funds needed to achieve them.

This document is based on research undertaken by Christopher Burbidge and Lucia M. Fanning at the Marine Affairs Program, Dalhousie University. To enhance readability, references are not included but are available upon request to [marine.affairs@dal.ca](mailto:marine.affairs@dal.ca)