

Our Coast

Live. Work. Play. Protect.

THE 2009 STATE OF NOVA SCOTIA'S COAST TECHNICAL REPORT

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Acronyms

ACAP	Atlantic Coastal Action Program
ATV	all-terrain vehicle
AZMP	Atlantic Zone Monitoring Program
BOD	Biological Oxygen Demand
CAMP	Community Aquatic Monitoring Program
CARP	Clean Annapolis River Project
CBC	Canadian Broadcasting Corporation
CBRM	Cape Breton Regional Municipality
CCME	Canadian Council of Ministers of the Environment
CCN	Coastal Communities Network
<i>CEAA</i>	<i>Canadian Environmental Assessment Act</i>
<i>CEPA</i>	<i>Canadian Environmental Protection Act</i>
CFIA	Canadian Food Inspection Agency
CHS	Canadian Hydrographic Service
CPA	Canada Port Authority
CSSP	Canadian Shellfish Sanitation Program
CURA	Community University Research Alliance
DFAA	Disaster Financial Assistance Arrangements
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
DPSIR	Driving Forces-Pressures-State-Impact-Response
ESIP	Ecosystem Indicators Partnership
ESSIM	Eastern Scotian Shelf Integrated Management
FTE	Full Time Equivalent
GDP	Gross Domestic Product
GHG	greenhouse gases
GIS	Geographic Information Systems
GOMC	Gulf of Maine Council on the Marine Environment
GPS	Global Positioning System
HRM	Halifax Regional Municipality
IPCC	Intergovernmental Panel on Climate Change
IRM	Integrated Resource Management
LiDAR	Light Detection and Ranging remote sensing technology
MPAs	Marine Protected Areas
NGO	Non-Governmental Organization
NS	Nova Scotia
NSDFA	Nova Scotia Department of Fisheries and Aquaculture
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment (current department)
NSTIR	Nova Scotia Transportation and Infrastructure Renewal
<i>NWPA</i>	<i>Navigable Waters Protection Act</i>
PAHs	Polycyclic Aromatic Hydrocarbons

PCBs	Polychlorinated Biphenyls
PON	Provincial Oceans Network
PSP	Paralytic Shellfish Poison
<i>SARA</i>	<i>Species at Risk Act</i>
SCH	Small Craft Harbours, Fisheries and Oceans Canada
SMU	St. Mary's University
SNSMR	Service Nova Scotia Municipal Relations
TBT	Tributyltin
UNESCO	United Nations Educational, Scientific and Cultural Organization

Executive Summary

What is the *State of Nova Scotia's Coast Report*?

Coastal areas and resources have played an essential role in making Nova Scotia what it is today. It is vital to the character and way of life that is valued by Nova Scotians. If people want to pass this legacy on to their children and grandchildren, they must take action now to better understand the coast and to ensure its sustainability for future generations.

The provincial government recognized that it needed a better way to address complex coastal issues. To help do this, the province had to find a way to determine what the most important issues were and how Nova Scotians should tackle them. To start, it formed the Provincial Oceans Network (PON), an interdepartmental organization.

PON is housed with the Nova Scotia Department of Fisheries and Aquaculture (NSDFA), and is a joint effort of many provincial departments and agencies that have a particular stake in coastal issues. After significant work within the provincial government, PON established the *Coastal Management Framework*. This is a document that describes how the government will work to address these important issues. The ultimate goal is to ensure the sustainable development and conservation of Nova Scotia's valuable coastal areas and resources. The first step is to get a good idea of the current state of the coast.

The *State of Nova Scotia's Coast Report* gives an overview of the condition of coastal areas and resources. It describes physical, ecological, and socio-economic characteristics of the coasts, and examines in more detail six priority coastal issues. The report recognizes gaps in information that need to be filled if people want to manage the coasts more effectively. It also discusses several key factors that must be considered as they develop more unified approaches to coastal management. These include economic, social, and ecological aspects related to the six issues.

The report can be used as a source of material about the state of the coast to help develop a long-term management strategy. It is also meant to stimulate discussions between the government, stakeholders, groups and industries with an interest in the coast, and the general public to find the best way to manage the coast for the long-term.

Using this report and feedback from public consultations, the government will develop a blueprint called the *Sustainable Coastal Development Strategy*. Once completed, the strategy will act as the road map for addressing the coastal issues that matter most to Nova Scotians.

Overview of the Six Priority Issues

PON identified six priority issues that are important to Nova Scotians. The following sections are highlights and key findings related to those issues.

1. Coastal Development

The Issue

Most human development in Nova Scotia is focused along its coastlines. Within high-density urban areas, most development is strip-like. It extends along the shorelines of the coast, including bays, rivers, and estuaries. This type of development pattern has a high potential for affecting the coastal environment because it may interrupt natural connections between land and sea.

Facts and Figures

In Nova Scotia, the intensity of coastal development ranges widely. Overall, the province doesn't have a highly developed coastline. Eighty per cent of the 2 km-wide coastal land strip has little or no development, while 11 per cent has more intensely developed urban and industrial areas. Development in Nova Scotia tends to be clustered, with a higher intensity of residences along the coast.

Between 1950 and 2000, the rate of housing subdivision and registration increased dramatically. This rate seems to have peaked, mainly because most of the choice land has already been subdivided. The most densely developed coastal areas are associated with ports and harbours. These include service centres such as Halifax, Antigonish, Yarmouth, and the New Glasgow and Sydney areas. Inland, development is found along the commuter corridors between Halifax and Truro, and through the agricultural Annapolis Valley. Coastal development is thin on the northwestern and southeastern sides of Cape Breton, in Guysborough County, along Chignecto Bay in Cumberland County, and in Queens County.

Little information is available on categories of development, and statistics have not been kept on the type of development along 77 per cent of the coast. In the 23 per cent where records do exist, there are several kinds of land use.

These include

- residential land use at 76 per cent
- industrial use at 8.7 per cent
- protected areas at 6.2 per cent
- commercial lands at 5.7 per cent

Pressure from future development will likely continue to be greatest along the coast, but there is little control across most of the coastal areas. The province has delegated land-use, or zoning powers, to the municipalities through the Municipal Government Act and the Halifax Regional Municipality Charter. These powers allow municipalities to develop planning strategies and bylaws to regulate land use. In spite

of this, only about 45 per cent of provincial land has comprehensive municipal plans or land-use bylaws in place. Another factor affecting control over development is that approximately 86 per cent of the coastline is privately owned.

Currently, no centralized system exists that tracks and stores information on coastal development, such as changes in zoning, land subdivisions, land-use changes, areas being cleared, and areas of new construction. A database that records the development of infrastructure, such as major road improvements, new wharves, and power distribution systems would be useful.

The Future: Some ways Nova Scotians can make coastal development more sustainable

- Assessing current approaches to planning and development to reduce the affects of strip-like development along the coast
- Learning more about the changes taking place with privately owned coastal property and promoting ways to minimize impacts
- Integrating municipal planning strategies, an important tool for managing coastal development, along with other coastal management strategies

2. Working Waterfronts

The Issue

Working waterfronts are sites or facilities that provide physical access to the sea for ocean-dependent uses and businesses. Many working waterfronts are struggling. This is due to changes in the provincial economy, declines in the fisheries, changes in population characteristics, and changes in harbour management.

Facts and Figures

Three broad types of working waterfronts are found in Nova Scotia.

- Canada Port Authority ports
 - Halifax is the only one in the province. It is operated by Halifax Port Authority but is overseen by Transport Canada.
- Local and regional ports
 - There are 25 of these ports, such as Mulgrave Marine Terminal, Strait of Canso. They are managed by harbour authorities, which are either private corporations or municipalities.
- Small craft harbours
 - There are 247 small craft harbours, such as Clark's Harbour. They are managed mainly by community or private groups called Small Craft Harbour Authorities.

Over a period of 15 years, the federal government divested many of these facilities, either by selling them or by handing over their management to local organizations. The federal government sold some of the larger ports in the province outright, as well as some of the local ports. But it retained ownership of many of the smaller harbour facilities. While the federal government continues to own and fund many of these small craft harbours, it has given the day-to-day operations and maintenance of these facilities to municipalities, local community groups, and the private sector.

Local management of harbour facilities has its benefits. But it can also create major challenges for the local groups responsible for operating and maintaining the facilities. Significant changes are also taking place in many coastal communities across the province, which add more challenges. These include changes in demographics such as age and household income, and in population due to migration from rural to urban areas. These trends have had major social and economic effects on the communities and their ability to support their working waterfronts.

Statistics show changes that have occurred in some of the smaller rural waterfronts since 1991. The report examined social and economic statistics on income per household, housing repair, labour force participation, and population change. From this information, a simple classification system was developed to identify four types of working waterfront communities.

Types of working waterfront communities

1. Healthy These communities are well off and demographically strong, such as Musquodoboit Harbour, Halifax County in 2006.
2. Transitional These communities are moderately well off but show a significant decline in population. In 2006, no communities were in transition. For example, LaHave, Lunenburg County rose from transitional to healthy from 1991 to 2006.
3. Declining These communities are less well off and are showing a significant decline in population, such as Weymouth, Digby County in 2006.
4. Other Eskasoni, Cape Breton, is a community that doesn't fit in with the other classification types. It was not well off but showed a significant increase in population in 2006.

Overall, communities associated with small working waterfronts declined in well-being. This report examined 93 coastal communities that support the small craft harbours for the period between 1991 and 2006. It found the following:

- The number of communities in the healthy category remained almost the same, at approximately 30 per cent.
- The number of transitional communities declined from 29 per cent to almost zero.
- The number of declining communities increased to 65 per cent.

The Future: What Nova Scotians should consider

Society, the economy, and technology continue to change in the province. Nova Scotia must recognize these changes, and work at helping working waterfronts so that they can be used in a sustainable manner in the future.

Some ideas to consider:

- Capacity building is needed in communities where harbour and wharf facilities have been transferred from the federal government. Capacity building is helping local people improve their ability to effectively plan, organize, and manage their communities.
- Helping an area use working waterfronts in a variety of ways would allow for more stable livelihoods in these communities.
- Stronger marketing could help communities thrive if they have the location and resources that would make them attractive in the new provincial economy.

3. Coastal Access

The Issue

Public coastal access is about people's ability to view, reach, and move along the shoreline of the mainland and islands of Nova Scotia. Access to the coast has changed significantly over time, mostly because of shifting land-use patterns and property ownership. Many Nova Scotians believe that their ability to access the coast is decreasing.

Facts and Figures

Economic, legislative, or physical barriers can contribute to the loss of this ability. For example, barriers to access can be the high price of coastal property or laws that protect the rights of private property owners. Physical barriers can be created by weather, terrain, or structures.

No federal or provincial legislation currently exists that ensures universal access to the coast. Laws deal mainly with preventing trespassing, regulating economic activities, restricting the use of vehicles, and building infrastructure such as wharves and boat ramps. These laws can all contribute to restricting public access.

On the other hand, the government promotes coastal access in other ways, such as by having public wilderness trails, parks, protected areas, and tourist sites. Crown land, which is a public asset, may also provide access. But access to the coast is not always guaranteed because there are sometimes restrictions within these public areas.

With the information that exists right now, it isn't possible to determine the area or length of the Nova Scotia coast that the public can reach. Land ownership, however, is one way to tell how much land could provide access. Approximately 1500 km of coastal frontage is owned by the federal, provincial, or municipal governments — in other words, publicly owned. The rest is privately owned and isn't legally accessible to the public without permission from land owners.

The Future: What Nova Scotians should consider

The public's perception of access to the coast varies. However, people seem most concerned about the ownership of coastal frontage, the lack of good coastal planning, and the need to designate and maintain coastal frontage for public use. As a result, the purchase of land by government and other institutions is a good way to help achieve public access to the coast. For example, in the past five years, the provincial trail network has grown by approximately 1500 km. Although much of this network isn't located directly on the coast, some parts are strongly linked to it and provide access to ocean scenery and viewpoints.

4. Sea Level Rise and Storm Events

The Issue

Coastal hazards such as flooding and erosion will increase because sea levels are rising and storms are becoming more frequent and severe. The general rise in sea level means that the sea will gradually cover some low coastal regions in the province. Global warming is likely causing more powerful storms to strike the province more frequently.

Flooding and erosion are worse during tropical and winter storms. These storms can have storm surges, where massive waves driven by high winds and low pressure pile onshore. The likelihood for future coastal damage is high because more frequent, intense storms combined with higher sea levels will result in even larger storm surges.

Facts and Figures

In Nova Scotia the sea is rising for several reasons. These include a general global rise in average sea level since the last ice age, regional subsidence, or sinking of land relative to the sea, and global warming associated with climate change.

The present rate of sea level rise varies over the length of the Nova Scotian coast, because land isn't subsiding at the same rate across the province. In Halifax, water level readings already show a relative sea level increase of 32 cm per century, mainly due to land subsidence. This is a trend that is expected to continue at similar levels across the province for centuries to come. On top of this, however, is the predicted increase in global sea level, which means that Nova Scotia will see a total rise of 70 to 140 cm over the next century.

Scientists expect this rise in sea level to have many effects on the biological, physical, and human environment. Research shows that much of Nova Scotia's coast will feel the effects of sea level rise, with the Atlantic-facing shoreline being particularly sensitive.

Nova Scotia is subjected to a wide range of storms, including nor'easters and hurricanes. Such storms can cause enormous social and economic harm by damaging and destroying property and infrastructure, and even human life.

Much of the damage comes from storm surges. The highest storm surges tend to occur along the province's Northumberland Shore, along western Cape Breton, and at the head of the Bay of Fundy.

Projections by researchers show that because of climate change, tropical storms in the Northern Hemisphere will get more intense and track farther north than before. This result, combined with the rise in sea level, means that a storm's consequences to the coast will be much greater than before. Researchers can identify many potential effects on the land and communities, but there isn't enough information to measure the overall cost. These would include economic, social, and ecological costs. Estimates do show that one of the most recent major storms, Hurricane Juan, caused a total of \$130 million in losses to Nova Scotia.

Hazards to the coast include both biophysical and socio-economic effects. Biophysical effects include damage from flooding, land instability and erosion, changes to natural systems, and salt water seepage into freshwater aquifers. Socio-economic effects include damage to property, infrastructure, and human lives.

The greatest risks are to low-lying areas, especially those susceptible to high storm-surge levels, such as the Northumberland Shore, upper Bay of Fundy, and dykelands areas. Areas with coastal infrastructure and property, sensitive ecology, and rapid coastal erosion are also at high risk.

Generally, coastal hazards need to be dealt with at the municipal level, with support from the provincial and federal governments, particularly with research. Many programs are underway, such as weather forecasts that include storm surges. However, there are some gaps in information. For example, researchers can't determine an actual value to society and the economy of the natural systems and human structures at risk. Also lacking is more detailed information for better flood-risk mapping.

The Future: Some ways to plan for higher sea levels and more intense storms

Nova Scotians need to consider the hazards associated with sea level rise and more intense storm events when planning for the future. Planners and decision makers must be kept up-to-date with the latest scientific knowledge to make the best decisions.

To deal with these risks, they can use a combination of several methods, including protection, accommodation, and retreat.

- Protection can be building physical structures including dykes, seawalls, and breakwaters, or using natural wetlands and vegetation strips as buffers to erosion.
- Accommodation can be upgrading infrastructure, raising buildings, and improving emergency response systems.
- Retreat can be establishing setback limits for coastal development.

5. Coastal Water Quality

The Issue

Natural processes and human activities affect the quality of coastal water. Human threats to coastal water quality come from land, shoreline, and marine activities.

Deteriorating coastal 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. Some areas of the coast are prone to coastal water quality problems, particularly in estuaries, bays, and waters next to densely populated areas. The coastline is long with many activities, both land and marine, taking place close to shore.

But researchers haven't been able to determine an overall picture of coastal water quality in the province. Existing monitoring or reporting systems cover only specific geographic areas or sectors, such as harbours, aquaculture, shellfish zones, and recreational beaches. These localized monitoring results are useful, however, and can serve as important lessons for the current and future management of activities.

Facts and Figures

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.

Examples of human-created impacts to water quality can include

- municipal discharge from wastewater treatment plants
- domestic septic systems
- industrial discharge

- petroleum-refining wastes
- nutrient loading from fish processing plants, aquaculture operations, and farms
- sediments from land-based activities such as forestry and agriculture
- heat-generating wastes
- mining wastes
- dredging and ocean dumping
- ballast water discharged from ships
- activities by shipyards
- activities by the offshore oil and gas industry

Monitoring is carried out to ensure waters are safe to use or because the areas have known contamination or the potential for contamination. These include public beaches, shellfish harvesting regions, and waters showing increased algal blooms. Many of these areas are close to urban development. For example, several harbours and estuaries show high levels of contaminants, including organics and heavy metals. These are found in water, sediment, and biological material.

By examining the closures of public beaches, researchers can find evidence of poor water quality. For example, some public beaches have closed because of elevated levels of bacteria, which pose a health risk. Rain storms increase water flow from land, emptying high organic loads into coastal waters. This flow can cause contamination from bacteria. These closures are of particular concern in more highly developed areas where beaches are popular for recreational use.

Restricted harvesting in shellfish areas is an indicator of poor coastal water quality in Nova Scotia. Between 1985 and 2000, the number of closures has doubled. In 2000, there were 278 shellfish closures along 3314 kilometres of coastline, covering 939 square kilometres. This trend seems to have continued.

Another important water quality problem is the unwanted growth of algae. Land-based sources of nutrients, such as nitrogen released from failing or inadequate septic systems, encourages excessive growth of algal blooms in coastal waters. These blooms lower the oxygen content in water, which cause massive deaths of other marine organisms. Monitoring results show that coastal waters off parts of Cumberland, Pictou, Antigonish, Inverness, Colchester, Kings, Annapolis, and Digby counties may be at an increased risk for algal blooms.

Another concern is a lack of knowledge of the water quality and its effect on nearshore areas such as estuaries, salt marshes, intertidal zones between high and low tide, and open water areas.

The Future: How Nova Scotians can protect the water and use the coasts

Protecting and improving the quality of coastal water is critical to a healthy and productive coast. Nova Scotians must work together to fix current problems with the coastal water and ensure that future problems don't happen.

Some possible ways include

- effectively controlling point sources of pollution, such as municipal sewage outfalls or fish-processing plants
- integrating management of watersheds
- administering and enforcing 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

6. Sensitive Coastal Ecosystems and Habitats

The Issue

Nova Scotia's system of coastal ecosystems and habitats are complex because so many types cover a small area. The *State of Nova Scotia's Coast Report* reviews the province's coastal ecosystems in general terms. Most scientific studies have gathered data on aspects of individual ecosystems, not on how these ecosystems interact as a whole.

As a result, there is currently no way to determine their degree of sensitivity relative to each other. Several things about the levels of risk ecosystems face can be determined, but the way ecosystems are monitored and evaluated must be improved. Then researchers can understand the nature of the changes that are taking place in the coastal ecosystems, and how human development and activities contribute.

The main way that Nova Scotia conserves sensitive ecosystems and habitats today is by designating federal and provincial protected areas and parks. But only some of these designated protected areas are located on or near the coast, and are positioned to provide specific protection to coastal ecosystems.

Facts and Figures

Nova Scotia has 13 types of coastal ecosystems. Depending on the ecosystems' nature, range, or exposure to hazards, they can be categorized by risk level and type of potential threat, as shown in Table 1.

Table 1. Risk level and potential threat to each coastal ecosystem type in Nova Scotia.

Ecosystem type	Risk level and potential threat
<ul style="list-style-type: none"> • coastal islands 	moderate—sea level rise and shoreline development
<ul style="list-style-type: none"> • rocky shore • boulder/cobble shore 	low—human disturbance through residential and industrial development
<ul style="list-style-type: none"> • sandy shore • dune system 	high—sand and gravel extraction, recreational all-terrain vehicle (ATV) use and the construction of roads, buildings, and coastal structures
<ul style="list-style-type: none"> • coastal forest • coastal barrens 	low—forest harvesting, road building, ATV use, and the construction of buildings and coastal structures
<ul style="list-style-type: none"> • estuaries • mud flats 	high—industrial and commercial development, invasive species, and agriculture and forestry practices
<ul style="list-style-type: none"> • coastal wetlands • tidal marsh 	high—infilling and development, construction of dams, and changes to natural tidal influences
<ul style="list-style-type: none"> • dykelands 	low—climate change and sea level rise
<ul style="list-style-type: none"> • Bras d'Or Lakes 	high—large area subject to ecological, recreational, industrial, and cultural activities

In 2007, the provincial government created a goal for Nova Scotia to have one of the cleanest and most sustainable environments in the world by 2020. It also set a goal that 12 per cent of the province's land will be protected by 2015. These goals are legislated by the Environmental Goals and Sustainable Prosperity Act (EGSPA.)

The total area of provincial land currently protected is 8.2 per cent or 452 581 ha. Almost half of that protected land is within 2 km of the coastline. Plans exist to protect a further 0.5 per cent or 33 552 ha, in addition to the goals set by the EGSPA.

Several other federal and provincial acts also protect the coast. Municipal governments can influence protection of these ecosystems and habitats a great deal because they regulate local land use and zoning.

The Future: How Nova Scotians can protect coastal ecosystems

Conserving sensitive coastal ecosystems requires

- understanding and measuring long-term changes to each of the ecosystems
- ensuring that future protected areas in Nova Scotia include elements of coastal ecosystems where possible
- working to restore areas that have damaged habitats
- focusing on the most sensitive ecosystems, which may include sandy shores, sand dunes, estuaries, mudflats, coastal wetlands, and the Bras d'Or Lakes

Factors to consider when drafting the strategy

When PON and government staff draft the strategy to address each of the six priority issues, they must consider several important factors. These factors, which are briefly dealt with below, will play a strong role in the plan's development.

These factors include the following:

- A. Complexity of Nova Scotia's coast and its natural environment
- B. Balancing a service-based economy with a natural resources economy
- C. Zones of influence and zones of impact
- D. Demographic trends
- E. The importance of heritage and cultural resources
- F. Multiple and conflicting jurisdictions
- G. Appropriate land-use planning and management
- H. Management of knowledge and information
- I. Integrating coastal zone management and measuring its progress and effectiveness

A. Complexity of Nova Scotia's coast and its natural environment

Nova Scotia has a complex natural environment, even though the province is relatively small in comparison with the rest of Canada and North America. This complexity means that Nova Scotians must be willing to change some old ways of thinking and behaving to protect the natural environment. That way they can successfully establish and operate infrastructure, businesses, and economic activities that are affected by the environment. Some human occupations that may be influenced by the natural environment include municipal infrastructure, utilities, tourism, recreation, transport, fisheries, agriculture, and forestry.

B. Balancing a service-based economy with a natural resources economy

Nova Scotia's present economy is largely service based. Seventy-six per cent of its 2007 real GDP came from service industries while only eight per cent came from natural resource-based industries. Service industries continue to contribute more to the economy, while natural resources contribute less. If this trend continues, planners must ensure that natural resources are not neglected, because these are important economic drivers, especially in rural and coastal areas.

C. Zones of influence and zones of impact

When examining a specific issue in relation to a coastal zone, it is hard to define the specific physical boundaries of that zone. This is because each issue relates to a part of the coast that may change in size, depending on the issue.

A coastal section can be considered in terms of two zones, a zone of influence, based on where a problem originates, and a zone of impact, where the problem becomes noticeable. This means that a coastal zone will change in physical dimensions depending on the issue being examined.

The zone of influence is generally greater than the zone of impact. For example, the water quality of a small estuary may be impacted by any number of land-based activities occurring within the watershed that drains into the estuary. In this example, the zone of impact is the estuary and the zone of influence is the entire watershed.

It is much better to find and fix the problem's source rather than just treating the affected area. This is much like a doctor determining the cause of a person's allergies, rather than simply treating the symptoms.

Plan developers working on a particular issue must consider the physical dimensions of these two zones and how they interrelate. They will also have to figure out how the issue's zones of influence and impact interact with that region's natural and human characteristics.

D. Demographic trends

The total population of Nova Scotia hasn't changed very much over the last 10 years, but people have migrated to central Nova Scotia, especially HRM. Over 40 per cent of the province's population now lives in HRM, which is an 8.7 per cent increase. Population has also grown in Hants County, Colchester County, and Kings County, although at lower rates. Other counties in the province have decreased in population. For example, Lunenburg County lost 1 per cent of its population, while Guysborough County lost 17 per cent.

Another demographic change is the aging of the population. Forty- to sixty-year-olds form the largest age group, and about 15 per cent of Nova Scotians are older than 65. As the baby boomers get older, the population of seniors is expected to increase by 70 per cent within the next 20 years.

E. The importance of heritage and cultural resources

Modern Nova Scotia is a mix of many cultures. People's origins include Mi'kmaq, British, French, Acadian, Middle Eastern, European, and African. Each of these cultures has its own special history of colonization and development. Many coastal resources, areas, and sites have special importance to each of these cultures, as they represent their heritage in the province. Conservation of cultural heritage resources is an important part of comprehensive coastal management and will need to be included in the strategy development.

F. Multiple and conflicting jurisdictions

Nova Scotia has at least 45 pieces of international, federal, provincial, and municipal legislation that deal with its coastal resources. These multiple laws and mandates are needed by governments. However, they can be one of the biggest stumbling blocks to achieving an integrated plan for coastal management and sustainable development.

G. Appropriate land-use planning and management

Nova Scotian communities have tended to develop from settlements that were established along the coast. Over the years, development has mostly increased gradually in an add-on fashion, such as along existing roadways. On the coast especially, residential development has occurred in a strip-like fashion along shoreline roadways. Waterfront property has also become extremely desirable. This pattern of sprawling coastal development often harms the coast, and it may not be the best way to sustain an area's communities and resources over the long-term.

Planning and management of coastal land fall within different jurisdictions. They are subject to various community interests, policies, regulations, and laws. This situation does little to promote integrated management and can be confusing or conflicting. Looking at coastal management in a more comprehensive and cooperative way might be more effective. This could help people understand the various coastal issues and the policies and practices needed to effectively manage them.

H. Management of knowledge and information

Good management decisions are made when the involved parties are well informed about the issues. The *State of Nova Scotia's Coast Report* highlights the complex social, economic, and natural environment relating to the Nova Scotia coast. It also highlights the many unknowns and areas where decision makers don't have enough information. This means that current knowledge, opinions, and decision making often must be based on observations rather than hard facts. Because of these issues, knowledge management must be included when developing, planning, carrying out, and evaluating any future coastal strategy.

Knowledge management includes activities such as

- research and education
- inventory and stocktaking
- databases
- guidelines and standards, or accepted values
- monitoring and evaluation
- processing of information, including communication and reporting

I. Integrating coastal zone management and measuring its progress and effectiveness

Many people manage many different aspects of the coasts. Planners and managers need to find a way to combine or integrate all these individual methods and projects to make management more effective. But it is a complicated task. It means stakeholders from many government, non-government, industrial, academic, and community organizations must all work together.

Worldwide, many coastal management programs have had challenges getting various stakeholders to cooperate. One reason these programs have had problems is that the right governance systems didn't exist. Setting up good governance systems for government and stakeholder groups can help ensure the groups are accountable for the decisions and plans they make. A good system will also ensure that groups can monitor progress and performance.

Integrated management programs can't be effective without taking specific factors into account, including

- identifying agreed-upon goals for society
- defining workable and achievable goals
- identifying responsibilities and accountability
- dividing resources appropriately
- measuring and evaluating progress and performance

What happens next

The provincial government will hold public consultations to hear what Nova Scotians have to say about managing the priority coastal issues. Staff will take that feedback, along with the information in the *State of Nova Scotia's Coast Report*, and draft the *Sustainable Coastal Development Strategy*. Following additional feedback, the provincial cabinet will determine when a final strategy will be released. Using the strategy as a guide, the province's coastlines can be managed in a way that will protect this vital asset for future Nova Scotians.

Chapter 1 Introduction

It has long been recognized that the sustainable use of Nova Scotia's coastal and ocean resources is critical to the environmental, economic and social well-being of the province (Nova Scotia Land Use Committee, 1994). Nova Scotia is surrounded on all sides by the sea. It is bordered in the north by the Northumberland Strait and the Gulf of St Lawrence, in the east by the Atlantic Ocean and in the south and west by the Gulf of Maine and Bay of Fundy (Figure 1.1). Not surprisingly, Nova Scotia's history has evolved around the coast and its resources (Davis and Browne, 1997). Early Mi'kmaq peoples harvested most of their food along the shores of the ocean and from inland waterways. Later, when the European settlers arrived, the harbours and inlets provided protection, while resources from the land and the sea were harvested, e.g., forest materials, fish, whales. Today, Nova Scotia's identity is strongly linked to its coastal location, as indicated by statistics for Atlantic Canada, which show that more than 60% of the population lives within 20 km of the coastline (Manson, 2005).

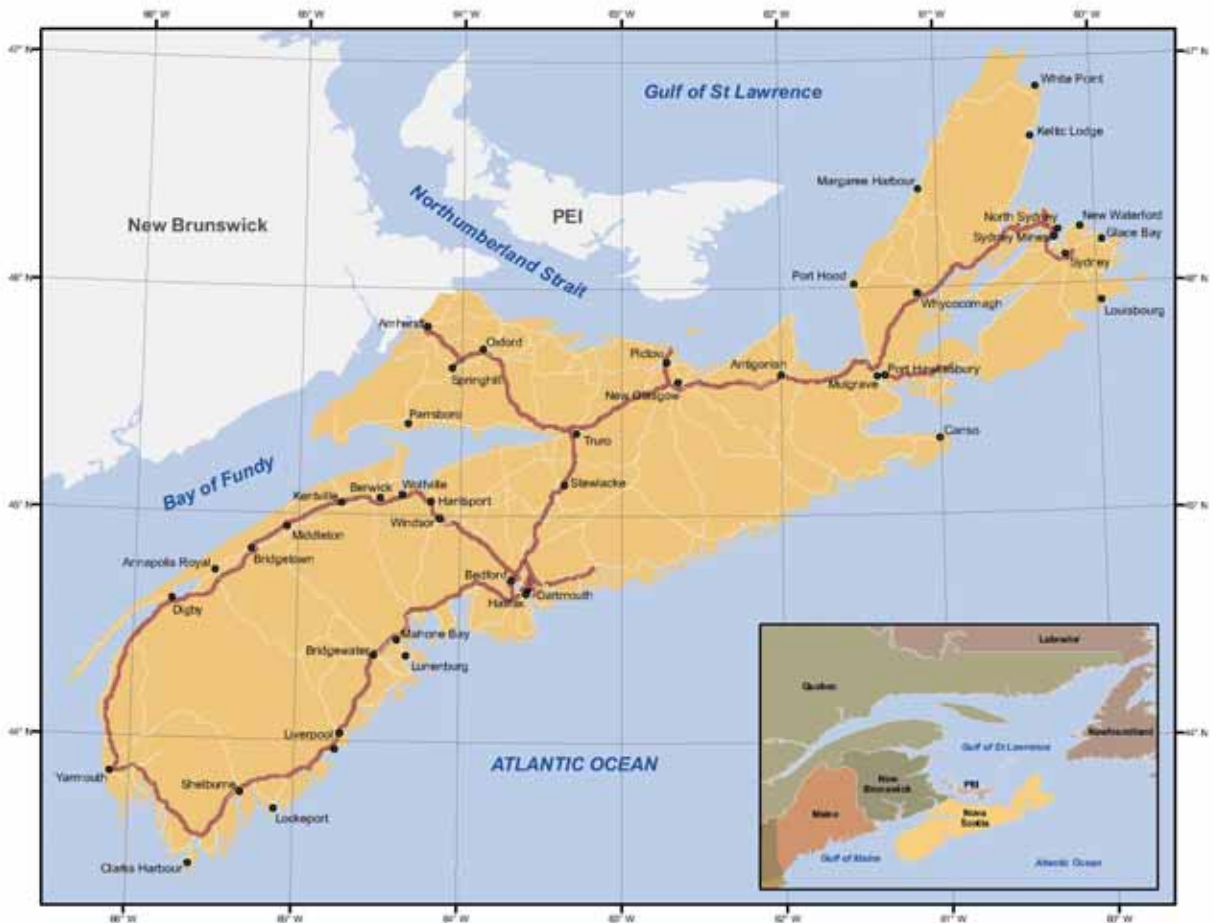


Figure 1.1 Map of Nova Scotia

The Coast Defined

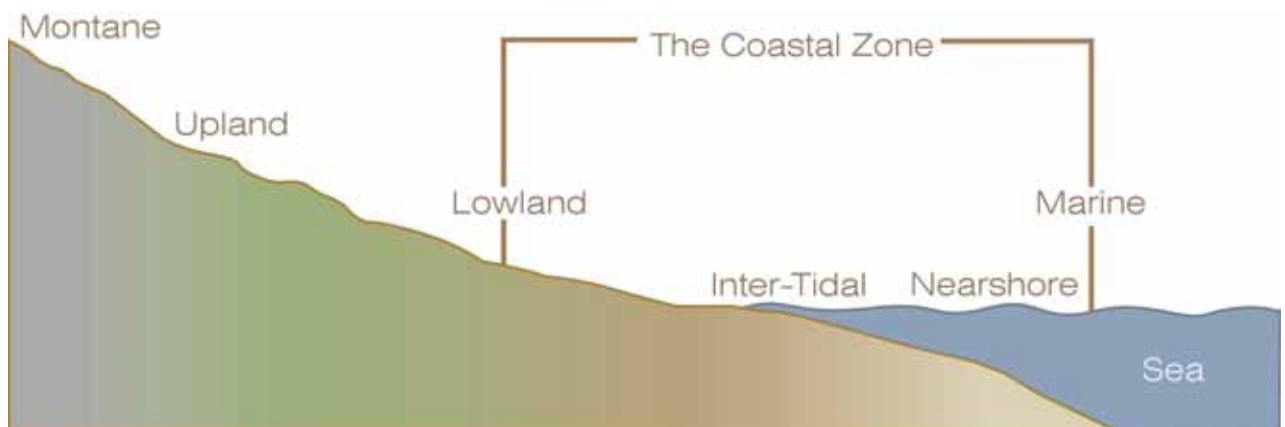
The term “coast” is defined by the Merriam Webster dictionary as the “*land near a shore*”. This simple definition does not give an adequate perspective of what has become a priority resource management topic throughout the world (Sorensen, 1997; Cicin-Sain *et al.*, 1998; European Commission, 2006; Australian Natural Resource Management Ministerial Council, 2006; Fanning, 2008). Some extended definitions include:

- “*That part of the land adjoining or near the ocean or its saltwater arms. A precise line that can be called a coastline cannot be determined due to the process of tides*” (Wikipedia, 2009)
- “*A strip of land of indefinite length and width (may be tens of kilometers) that extends from the seashore inland to the first major change in terrain features*” (Voight, 1998)

There are parts of the coast that have a clear interaction between the land and the sea, such as beaches, coastal marshes and rocky shores. Other parts of the coast are less well-defined, but equally important. There are also many sectors of society that have differing perspectives on what is understood by the term “coast”. Accepting a universal quantifiable definition of the term “coast” appears to be an ongoing problem (see Fanning, 2008). Confusion is further compounded by several other terms that are often used synonymously, e.g., coastal region, coastal area and coastal zone.

Essentially, the coast represents the area where the land meets the sea, that area of interface between terrestrial and marine environments, where both terrestrial and marine influences are important. Conceptually this can be depicted by a transect that includes areas of the marine and terrestrial environments (see figure below).

The “coastal zone” may be of indeterminate dimensions, depending on the issue being addressed, and the specification of rigid seaward and landward limits is completely arbitrary or impractical (Nova Scotia Land Use Committee, 1994). From a global and continental (North American) perspective, the whole of Nova Scotia can be regarded as a being a coastal zone. From an issues or sectoral perspective (e.g., coastal water quality, sensitive ecosystems, sea level rise, working waterfronts, public access), the physical dimensions of the coastal zone can be better defined, because they can be related to specific areas with measurable dimensions. This should be done bearing in mind that it is important to consider both zones of influence and zones of impact (Fanning, 2008). Further discussion on the concept of zones of influence and impact, as they relate to the focus areas of this report, is given in Section 10.3.3.



Over the last 20 years there has been increasing concern about the status of coastal areas throughout the world (United Nations, 1992; Sorensen, 1997; European Commission, 2006; Intergovernmental Oceanographic Commission, 2006). Relative to other parts of the world, Nova Scotia is fortunate to have a coastline that is largely unspoilt from industrial pollution and other human pressures (Nova Scotia Land Use Committee, 1994). Nevertheless, recent years have seen changes in coastal Nova Scotia that have led to articulated concerns about the use of coastal resources. Topics that have been raised include increased development and more intensive human use of land in coastal areas; degraded habitats and biodiversity loss; unsustainable harvesting of resources; increased land-based pollution; loss of traditional access to the coast; non-resident ownership of coastal properties; water quality issues; uncoordinated legislation,

and sea-level rise and flooding (Baccardax, 2008; Nova Scotia Department of Fisheries and Aquaculture, 2008). The need for a higher level of effort towards improved integrated coastal zone management at the provincial level is widely recognized (Nova Scotia Department of Fisheries and Aquaculture, 2008; Coastal Coalition of Nova Scotia, 2008).

1.1 Nova Scotia's Coastal Management Initiative

Nova Scotia was one of the first provinces in Canada to introduce coastal zone management through the establishment in 1976 of a coastal zone management issues group, with an executive director for coastal zone issues (Hildebrand, 2008). This was followed by an initiative in the early 1990s, *Coastal 2000* (Nova Scotia Land Use Committee, 1994), which was not pursued due to a lack of support. Reconsidering the importance of coastal issues, the Nova Scotia government launched a coordinated initiative in 2006 under the direction of an interdepartmental Provincial Oceans Network (PON). The objective is to develop an integrated approach to coastal zone management in the province (Nova Scotia Department of Fisheries and Aquaculture, 2008). The PON is comprised of representatives from provincial departments and agencies with responsibilities and/or interests in coastal and ocean management. Chaired by Nova Scotia Department of Fisheries and Aquaculture (NSDFA), PON serves two core functions:

- to facilitate coordination on coastal and ocean management issues and initiatives within the provincial government; and
- to provide advice and expertise in implementing the Coastal Management Framework and associated activities.

The departments participating in PON include: Aboriginal Affairs; Agriculture; Economic Development; Energy; Environment; Finance; Fisheries and Aquaculture; Service Nova Scotia Municipal Relations (SNSMR); GeoNOVA (a division of SNSMR); Intergovernmental Affairs; Natural Resources; Tourism Culture and Heritage; Transportation and Infrastructure Renewal; Treasury and Policy Board, and the Emergency Management Office.

The PON initiative is being implemented in a phased manner, with the first phase (2006-2008) already having produced a *Coastal Management Framework* (www.gov.ns.ca/fish/marine/coastalzone/framework.shtml) that is being used to guide the province's approach to coastal zone management. The current program represents a strengthened provincial commitment toward a coordinated and strategic approach to coastal management. It builds upon existing provincial and departmental commitments, mandates and capacities, while recognizing the importance of collaboration with other levels of government, stakeholders and interest groups. In particular, the objectives of the *Coastal Management Framework* are in harmony with the government of Nova Scotia's long-term vision and policy for economic and social development of the province.

The *Coastal Management Framework* has numerous short-term objectives and outcomes that are to be achieved through six key strategic activity areas (see Figure 1.2).

COASTAL MANAGEMENT FRAMEWORK

The Government of Nova Scotia has committed to developing a coordinated and strategic approach to coastal ocean management. The *Coastal Management Framework* will guide the Government of Nova Scotia in working towards achieving this task. Provincial priority coastal issues include: coastal development, public coastal access, sea-level rise and storm events, working waterfronts, coastal water quality, and sensitive coastal ecosystems and habitats.

THE WHAT: THE VISION

A healthy, safe and vibrant coast that sustains the highest quality of life for current and future generations.

THE VISION DESCRIBES THE GOVERNMENT OF NOVA SCOTIA'S LONG-TERM DESIRED OUTCOMES FOR COASTAL MANAGEMENT.

THE MISSION

To address coastal issues in Nova Scotia through effective leadership, coordination and collaboration.

THE MISSION DESCRIBES THE LONG-TERM ORGANIZATIONAL APPROACH FOR ACHIEVING THE VISION.

THE HOW: THE GOALS

1. Coastal and ocean issues in Nova Scotia are addressed through collaboration and integrated approaches.
2. Nova Scotia derives ongoing optimal benefit from its coastal and ocean areas and resources.
3. Nova Scotia's ecosystems are fully functioning now and in the future.

THE GOALS DESCRIBE WHAT IS REQUIRED TO ACHIEVE THE VISION.

THE STRATEGIC THRUSTS

1. Develop and maintain an ongoing understanding of Nova Scotia's coastal and ocean issues.
2. Facilitate the collection, research, management and exchange of coastal and ocean information.
3. Coordinate effective decision making on coastal and ocean issues.
4. Increase the opportunity and capacity of the public to engage in coastal and ocean issues.

STRATEGIC THRUSTS DESCRIBE THE OVERARCHING DIRECTION NEEDED TO ACHIEVE THE GOALS STATEMENTS, AND THUS THE VISION.

THE SHORT-TERM OBJECTIVES

1. Municipal, provincial and federal governments have a shared understanding of Nova Scotia's priority coastal and ocean issues
2. Relevant provincial stakeholders have a shared understanding of Nova Scotia's coastal and ocean issues

COASTAL MANAGEMENT FRAMEWORK *cont.*

3. A provincial mechanism exists to integrate emerging coastal and ocean issues and opportunities into coastal management processes
4. The majority of Nova Scotians are aware of and have an understanding of Nova Scotia's coastal and ocean issues
5. The Government of Nova Scotia is recognized locally, nationally and internationally as the most comprehensive source for coastal information related to Nova Scotia
6. Public and private research and monitoring programs are addressing Nova Scotia's coastal and ocean issues
7. The Provincial Oceans Network is the key provincial body for information exchange
8. The Provincial Oceans Network is the key provincial body for coordinating decision making on coastal and ocean management issues
9. The Government of Nova Scotia has a clear understanding of stakeholders' interests and concerns related to coastal and ocean issues
10. The Government of Nova Scotia has a clear understanding of the various roles, responsibilities and priorities of municipal, provincial, federal and aboriginal governments as they relate to coastal management
11. The Government of Nova Scotia is able to respond to public inquiries on coastal management through a multi-departmental frontline process
12. The Government of Nova Scotia is supporting community-based initiatives to address priority coastal and ocean issues
13. Emerging coastal and ocean management policies are shared proactively with key coastal stakeholders
14. The public has a clear understanding of the various roles, responsibilities and priorities of municipal, provincial, federal and aboriginal governments as they relate to coastal management

SHORT-TERM OBJECTIVES (1-6 YEARS) ARE SEEN AS NECESSARY TO ACHIEVE THE STRATEGIC THRUSTS.

THE PATH FORWARD:

STRATEGIC ACTIVITIES

- Assess the state of Nova Scotia's coast and establish a sustainable Coastal Development Strategy.
- Develop a coastal web portal.
- Establish a coastal research network.
- Sign a MOU with the Government of Canada to coordinate the coastal and ocean management efforts.
- Identify and expand public education and awareness related to priority coastal issues.
- Inventory and coordinate LIDAR mapping initiatives in Nova Scotia.
- Strengthen provincial leadership and coordination on integrated coastal management initiatives.

THE STRATEGIC ACTIVITIES DESCRIBE THE IMMEDIATE ACTIONS THAT THE GOVERNMENT OF NOVA SCOTIA WILL UNDERTAKE TO ACHIEVE THE SHORT-TERM OBJECTIVES.

Figure 1.2b: Nova Scotia's *Coastal Management Framework* (Source: Nova Scotia Department of Fisheries and Aquaculture 2008).

PON's envisioned program of activities for its second phase of action (2008-2010) includes the production of a State of the Coast Report, followed by public consultation and feedback on the future direction of the proposed Sustainable Coastal Development Strategy.

1.2 The State of the Coast Report

At the 1992 United Nations Earth Summit in Rio de Janeiro, an advocated program for global sustainable development, known as *Agenda 21*, was presented to participating countries (United Nations, 1992). *Agenda 21* made recommendations on a suite of themes and programs that countries could adopt to improve the sustainability of their ecological, economic and social resources. As part of its implementation, many countries introduced programs in the mid 1990s to produce state of the environment reports (describing social, economic and ecological environments), which documented progress towards achieving sustainable development. Such reports have five major uses, notably: public awareness, education, policy development, performance assessment and benchmarking of status. Canada and its provinces have been active participants and have considerable experience in the production of national, regional, provincial, sectoral and issue-based state of the environment reports, (see Environment Canada, 1996; Nova Scotia Department of the Environment, 1998; Bond *et al.*, 2005; Pesch and Wells, 2005). State of the environment reports can serve several purposes, including:

- Providing an analysis of environmental conditions and trends;
- Measuring progress towards sustainability;
- Contributing to informed and open decision-making;
- Contributing to public awareness about environmental health and what can be done about it; and
- Serving the public's right to know by providing information in an easily understandable form.

In achieving these objectives, reports have to deal with the following five basic questions: What are the main issues to be dealt with? What is happening and what is the rate of change? Why is it happening? Are the changes significant? What is, or could be, the response to manage it?

The intent of this State of the Coast Report is to provide a synthesis of relevant material that can be used to facilitate the further development of a long-term strategy and program on coastal zone management for the province. It is structured to provide both an overview of the current state and the expected future trends for Nova Scotia's coastal areas and resources. Since coastal management involves multiple government departments, jurisdictions and stakeholders, this report has the potential to serve as a resource for broad-based audiences. To this end, it was considered important that the report provide a comprehensive overview of the current state of, and expected future trends for, Nova Scotia's coastal areas and resources, thus contributing to a baseline of knowledge for development of the *Sustainable Coastal Development Strategy*.

The report has attempted to examine social, economic and natural resource aspects of land-based and near-shore activities. It has undergone a fairly rigorous process of planning and drafting (see Chapter 2) and has features that make it specific to Nova Scotia. In terms of its content, PON felt that it was important for the report to provide particular focus on issues that had been identified as being of priority concern (Nova Scotia Department of Fisheries and Agriculture, 2008). These included:

1. **Coastal Development** – to cover the status of coastal development both rural and urban with reference to types of infrastructure and their distribution (**Chapter 4**).
2. **Working Waterfronts** – to examine the status of sites and facilities that provide physical access to the sea for ocean-dependent uses and businesses, as well as related infrastructure and communities that use certain economic areas that border the shoreline (**Chapter 5**).

3. **Public Coastal Access** – to cover the topic of the ability of the public to reach, use, or view the shoreline of coastal waters or nearby inland areas adjacent to the ocean (**Chapter 6**);
4. **Sea Level Rise and Storm Events** - to provide an overview of the factors that determine sea level rise in Nova Scotia and the social, economic and ecological implications of sea level rise and storm events (**Chapter 7**).
5. **Coastal Water Quality** – to describe the factors that influence the physical, chemical, and biological characteristics of Nova Scotia’s coastal waters and the extent to which water quality conditions influence the uses of coastal waters (**Chapter 8**).
6. **Sensitive Coastal Ecosystems and Habitats** – to provide an overview of the range of coastal ecosystems and habitats that are sensitive to anthropogenic influences (**Chapter 9**).

Additionally, it was felt that the report should embrace the overall perspective of sustainable development, which emphasizes that economic, social and ecological aspects of development should be considered in an integrated and holistic fashion (World Commission on Environment and Development, 1987; United Nations, 1992). This stems from a need for Nova Scotia to find a balance between the economic and social requirements for, and demands on, coastal resources and the need to conserve the natural resources on which the economic and social systems depend. The report, therefore, includes information on the ecological, social and economic environments of Nova Scotia as related to the six focus areas.

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2.1 Introduction

There are many available guidelines on how to produce state of the environment reports (Canadian Council of Ministers of the Environment, 1995; European Environmental Agency, 1999; Bond *et al.*, 2005). State of the environment reports, however, do not all follow the same process in their drafting and production, mainly because of differing underlying objectives and situations (European Environmental Agency, 1999). It is important, therefore, to document the process by which this report has been produced. This section provides an overview of the approach that has been taken in planning, drafting and producing this State of the Coast Report. Distinct steps that can be identified include:

- Defining the objectives;
- Defining the content;
- The drafting process;
- Evaluation and review; and
- Presentation to stakeholders.

2.2 Defining the Objectives of this State of the Coast Report

The objectives of this report were developed by the PON through a discussion process involving its constituent governmental stakeholders (see Chapter 1, Section 1.1). As stated in Chapter 1 reports of this nature usually have multiple objectives; the principal ones are:

- Providing an analysis of environmental conditions and trends;
- Measuring progress towards sustainability;
- Contributing to informed and open decision-making;
- Contributing to public awareness about environmental health and what can be done about it; and
- Serving the public's right to know by providing information in an easily understandable form.

This report has been conceptualized with most of the above-mentioned objectives in mind. Its timing, however, has coincided with a longer-term objective of compiling relevant broad-based information on the social, economic and natural resource aspects of the Nova Scotia coast to facilitate the development of a coastal zone management strategy for the province. The intention is that this report is used as a resource by parties who wish to become involved in the process of developing the *Sustainable Coastal Development Strategy*.

2.3 Defining the Contents of the Report

Throughout the world, one of the major factors that has prevented the production of regular state of the environment reports is the fact that many have attempted to cover everything in the utmost detail. This has required a high level of resource input (human, financial, information and time), making them prohibitively complex to manage and complete. A more practical approach is to have focused reports on specific topics (e.g., Bond *et al.*, 2005; Nova Scotia Department of Natural Resources, 2008). The PON, through its ongoing deliberations, identified six coastal zone topics that it considers to be priority issues (Nova Scotia Department of Fisheries and Aquaculture, 2008a - see also Chapter 1, Section 1.2). It was

decided by PON that these topics (Coastal Development, Working Waterfronts, Public Coastal Access, Sea Level Rise and Storm Events, Coastal Water Quality, and Sensitive Coastal Ecosystems and Habitats) would form six focus chapters in the report. An initial report outline was generated by PON and presented to the drafting team (Nova Scotia Department of Fisheries and Aquaculture, 2008b).

The process of defining the detail of the report's contents was initiated through the generation of an initial table of contents by PON (Nova Scotia Department of Fisheries and Aquaculture, 2008b), which was then further developed by the drafting team. Further refinement of the contents was through an interactive process involving the drafting team, PON and other professionals from a variety of organizations (provincial government, federal government, academia and non government organizations – see Appendix 1). The drafting team, following research and consultation, prepared an annotated table of contents that was circulated for comment amongst PON and its participating departments. The purpose of preparing an annotated table of contents was for the drafting team to prepare a detailed outline of the report's intended content for review by PON. The review process was completed through a PON-drafting team workshop, which allowed the annotated table of contents to be discussed and agreed on. This process allowed for the PON committee and its participating departments to provide advice and guidance on the materials presented and to identify any areas or aspects that might have been overlooked. Through this, PON and the drafting team attained better agreement and understanding of the proposed structure and content of the State of the Coast Report.

2.4 Drafting Process

Drafting was carried out by a team of six key leads who, based on their professional background and expertise, were allocated respective sections of the report to complete (see details of drafting team, page ii). Each was responsible for the development and drafting of their allocated section according to the annotated table of contents, the general specifications for the State of the Coast Report, as well as feedback obtained from the PON-drafting team workshop. In addition, drafters were expected to:

- Carry out literature surveys on their topics;
- Consult with a wide variety of persons and institutions about ongoing coastal zone activities relevant to their topics, and
- Obtain and process data and information from a wide variety of sources.

There were several key challenges that had to be considered in the planning and drafting of this State of the Coast Report, including information availability, the level of detail required, conflict of opinion and perspective and structuring of the report's sections and indicators.

2.4.1 Information

Experience has shown that a serious limiting factor to the preparation of good state of the environment reports is the availability of data, its selection and its processing into useful information (European Environmental Agency, 1999). Many reports have been unable to fulfil expectations not only because of the absence of information, but also because the information is unavailable, or because its availability is in an incomplete form. In addition, time taken to process primary data can hamper progress and production dates.

Numerous challenges were encountered in the process of searching and acquiring information during the preparation of this report. Examples include:

- Economic data are generally only available for sectors identified using the North American Industrial Classification System, which does not entirely correspond to coastal industry sectors;
- There is no comprehensive inventory of certain resources, e.g., archaeological and heritage sites in Nova Scotia, coastal islands, etc.;
- There is considerable discrepancy and overlap of information based on the perspectives of the sector from which the information is generated, e.g., academic, commercial, non governmental organization (NGO), provincial and federal government;
- Collection and presentation of information for certain topics has been intermittent, making it difficult to assess or project trends;
- The availability of information which, although processed and published, is not considered to be authoritative either because of its source, its dating, or its perspectives;
- Certain information had not been fully processed or published at time of drafting, e.g., 2006 Census data;
- There is much information, that has been lost, discarded or never been published, i.e., grey literature. This is not accessible through conventional library or electronic systems, but resides in the memories of professionals who were involved in its production and are aware of its availability; and
- There are many information gaps for a wide variety of indicators that best describe the status of Nova Scotia's social, economic and natural environments. It would be a task in itself to identify and itemize all of these.

In view of these challenges, the drafting team adopted an approach based on the following principles and methodology:

- To pick and secure defensible, readily accessible sources of information, and to use the report preparation process as an opportunity to identify gaps in information;
- To concentrate on secondary research, i.e., a desktop research initiative, supported where appropriate by telephone interviews and personal contacts;
- To avoid the problem of having each issue become a major research project in which the pursuit and/or processing of information became the focus of the effort;
- To make use of PON-associated professional staff to identify and provide information; and
- To identify key information gaps and highlight these in each of the chapters.

2.4.2 Level of Detail

The production of highly detailed and comprehensive state of the environment reports requires a substantive level of resource input (human, financial, information and time), making them prohibitively complex to manage. It was important to ensure that there was a realistic and practical balance between value of the information in the report and the resources that were available. The selection of six focus areas assisted in achieving this balance. The inclusion of an overview section (Setting the Scene, Chapter 3) was considered to be useful in providing context and support for the more detailed analysis of the six focus areas (Chapters 4 to 9) and a concluding section was prepared to define the road ahead (Chapter 10).

2.4.3 Conflict of Opinion and Perspective

State of the environment reports invariably deliver perspectives that might differ from those of certain stakeholders and readers. The drafting team, therefore, endeavoured to deliver material based on facts rather than the opinions of either sectoral stakeholders or the individual drafters. To support this approach, it was considered important that the drafting process should allow enough opportunities for review and response of generated material by PON to ensure that perspectives were indeed balanced (see Section 2.5).

2.4.4 Indicators

Various structures have been used for state of the environment reports, including amongst others: the driving forces-pressures-state-impact-response framework, policy frameworks and logic framework analysis (European Environmental Agency, 1999; Bond *et al.*, 2005). All state of the environment reports are dependent on the use of indicators, qualitative and quantitative, for the presentation of information. The process of researching and selecting indicators is usually a precursor project carried out before status reports are produced, and are dependent on the objectives of the report. Ideally, sets of indicators are developed in consultation with stakeholders according to their information requirements, and the selection of indicators involves use of multiple criteria (Bond *et al.*, 2005). This report was not drafted according to accepted, predefined indicators, but the drafting team attempted to apply these criteria in the selection of the material presented. Consequently, for each of the special issue sections, the drafting team followed the approach in which the structure and indicators (qualitative and quantitative) used provided answers as best as possible to the following generic objectives:

- Describing the status of the issue in Nova Scotia;
- Explaining why this had happened;
- Describing changes over time – historic and projected;
- Describing its social and economic value;
- Describing what was being done to manage it; and
- Assessing whether the existing and projected pattern was sustainable.

Indicators were selected and used based on the availability of readily accessible and credible information from a variety of sources, including amongst others: peer reviewed journals, institutional literature; websites; conference and workshop reports; books, magazines and journals; and a variety of databases that carry primary and secondary data, as well as individuals and organizations involved in coastal management. A listing of indicators used in each of the sections is presented in Appendix 2. Each drafter also provided a preliminary list of information gaps that they felt were important for each of the priority issues. Consideration of these data gaps and the development of an appropriate indicator set for coastal zone management are possibly issues that need to be taken up during the PON process of developing the *Sustainable Coastal Development Strategy*.

Some Examples of Criteria for the Selection of Indicators (from Bond *et al.*, 2005)

- Measurable/quantitative;
- Sensitive;
- Resolution/discriminatory;
- Integrates effects/exposure;
- Validity/accuracy;
- Related or linked to an endpoint in an assessment process;
- Reproducible;
- Representative;
- Scope;
- Reference value;
- Data comparability;
- Anticipatory;
- Cost/cost effective;
- Level of difficulty;
- Easily detected;
- Generally accepted method available;
- Relevance to a program;
- Understandable;
- Policy related; and
- Depicts spatial or temporal trend.

2.5 Evaluation and Review

The production of any report of this nature requires that there be continual evaluation and review of the material being generated. In the case of this State of the Coast Report four main junctures were used to ensure that the report would meet expectations. These included:

- The production and evaluation of the annotated table of contents by PON achieved through a PON-drafting team workshop;
- The use of an editor and internal team reviewer to screen through first drafts to integrate the overall document and to ensure conformity of each of the sections with the agreed specifications;
- A preliminary evaluation of the first draft by members of the PON Secretariat to provide a high level opinion on the draft; and
- An evaluation and review of the complete first draft of the State of the Coast Report by PON and professional staff associated with participating government departments. Feedback was provided to the drafting team in the form of a written statement from PON with comments that had been integrated from all of the reviewing parties.

In each case the evaluation was intended to improve on the quality and content of the document.

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Chapter 3 **Setting the Scene**

There is an acknowledged need that the coastal zone of Nova Scotia be managed according to the concept of sustainable development (Nova Scotia Land Use Committee, 1994). This is defined as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*” (World Commission on Environment and Development, 1987). It refers to development that aims for equity within and between generations and adopts an approach where the economic, social and environmental aspects of development are considered in a holistic fashion. In other words, there is a need for Nova Scotia to find a balance between the economic and social demands on coastal resources and the conservation of the natural resources on which the economic and social systems depend.

This chapter provides an overview of the current natural, economic, social, cultural and built environments in Nova Scotia with respect to their importance to the coast and sets the context for the following chapters on the six focal areas. Although the focus is the coast, given the nature of the province, much of the data relate to the province as a whole. Unless specialised studies have been undertaken, it is often not possible to separate coastal information from provincial information, particularly in the socio-economic context. The chapter also provides a summary of the policy and legislation that currently relates to coastal management in the province.

3.1 Natural Environment

The natural environment encompasses all living and non-living things that occur naturally on Earth. It includes elements of natural systems, such as plants, animals, rocks and natural phenomena, as well as universal natural resources and physical phenomena that do not have clear cut boundaries, such as air, water and climate (Cowan, 2005).

The primary driving force determining Nova Scotia’s natural environment has been geological change that has altered its geographical position, elevation, landform and climate over hundreds of millions of years (Atlantic Geoscience Society, 2001). Today, the natural environment is highly influenced by the North American continental pressure systems (the North Atlantic and Arctic Oscillations), which drive wind and ocean currents associated with the Canadian Atlantic region (Davis and Browne, 1997). These forces determine the physical, chemical and biological characteristics of Nova Scotia’s landscape and, ultimately, the use and management of its natural resources.

3.1.1 Physical Geography

The geography of Nova Scotia has undergone considerable change over time, and the province’s current positioning represents the culmination of a long chain of geological events and processes (involving continental drift, plate tectonics, sea level changes, volcanic activity, glaciation and sedimentation) that have taken place over a period of more than a billion years (Atlantic Geoscience Society, 2001). Table 3.1 presents some basic geographical characteristics. Situated in the North Temperate Zone between the latitudes of 43 °N and 47 °N and longitudes of 59 °W and 66.5 °W, the province is a peninsula of the North American continental land mass. It is made up of two main land areas, known as mainland Nova Scotia (area of 3.43 million ha), and Cape Breton Island (area of 1.28 million ha) (see Figure 1.1, Chapter

1). Associated with these are about 5,490 islands of varying size that are dotted along the coastline. Most are extremely small (<1 ha), but there are more than 1,000 islands that are greater than 1 ha. Sable Island, also part of Nova Scotia, but situated almost 180 km off the mainland, is a special case and cannot be considered to represent a typical coastal island (see also Section 9.3).

Table 3-1: Basic geographical characteristics of Nova Scotia

<i>Characteristic</i>	<i>Descriptor</i>
Longitudinal range	59 - 66.5 ° W
Latitudinal range	43 - 47 ° N
Landmass area (<i>includes open freshwater, islands and not coastal rivers</i>)	5.53 million ha
Area of mainland Nova Scotia	3.43 million ha
Area of Cape Breton Island	1.28 million ha
Length of coastline (<i>includes coast, coastal islands, coastal rivers and coastal river islands</i>)	13,300 km
Length of coast (line across river and bay mouths)	8,000 km
Length of coast for coastal islands	3,150 km
Length of coast for coastal rivers	2,000 km
Length of coast for coastal river islands	150 km
Length (Seal Island to St Paul Island)	625 km
Breadth (New Brunswick border to Laybolt Island)	180 km
Perimeter to area ratio	0.135
Highest altitude	536m
Area of open fresh water	27,000 ha
Number of estuaries along the coast line	65
Area designated as wetland (Nova Scotia Environment, 2008a)	>400,000 ha

Notes: Data and analysis obtained from Wayne H. Burt, Nova Scotia Department of Natural Resources (NSDNR), Graphic and Mapping Services derived from the Nova Scotia Topographic Database, SNSMR, Nova Scotia Geomatics Centre (Amherst).

Definitive estimates of the length of coastlines are complicated by the fact that the measured length of a stretch of coastline depends on the scale of measurement that is used - the smaller the increment of measurement, the longer the measured length becomes (Mandelbrot, 1967). Because of this there are many different quoted values for the length of coast for Nova Scotia, a feature which is accentuated because of the highly corrugated nature of the coastline (Wayne Burt, NSDNR, pers. Comm., 2008). The province has a total perimeter to area ratio of 0.135, which is indicative of a highly corrugated coastline with many bays and estuaries. The complexity of the Nova Scotian coastline in relation to its land area is demonstrated by the fact that a circle of equivalent area would have a perimeter of approximately 831 km, as opposed to the 13,300 km for Nova Scotia. The landscape has no areas of high altitude; the highest elevation is 536 m above sea level (Cape Breton Highlands). The lowest lands in the province (on the coast off the Bay of Fundy) are below sea level and huge dykes have been constructed to hold back the sea, creating thousands of hectares of farmland.

There are thousands of lakes and wetland areas of varying size distributed throughout the province and about 65 coastal estuaries (see Tables 3.1 and 3.2), creating a mosaic-type landscape in which land consists of corridors of varying size between areas of water and wetland. The complexity of the Nova Scotian landscape is further demonstrated by the fact that there are 46 primary watersheds with distinct river systems all of which flow into the ocean and contribute to the characteristics of the coastline (see Figure 3.1).

Table 3-2: Areas of open fresh water in Nova Scotia

<i>Area range (ha)</i>	<i>Number of Areas of Open Water</i>
< .1	30,300
.1 – 1	15,200
1 – 10	6,300
10 – 100	2,650
100 – 1000	400
> 1000	19

Notes: Includes lakes, rivers, canals and reservoirs, but does not include coastal rivers or Bras d’Or Lakes

Source: Data and analysis obtained from Wayne H. Burt, NSDNR, Graphic and Mapping Services derived from the Nova Scotia Topographic Database, SNSMR, Nova Scotia Geomatics Centre (Amherst).

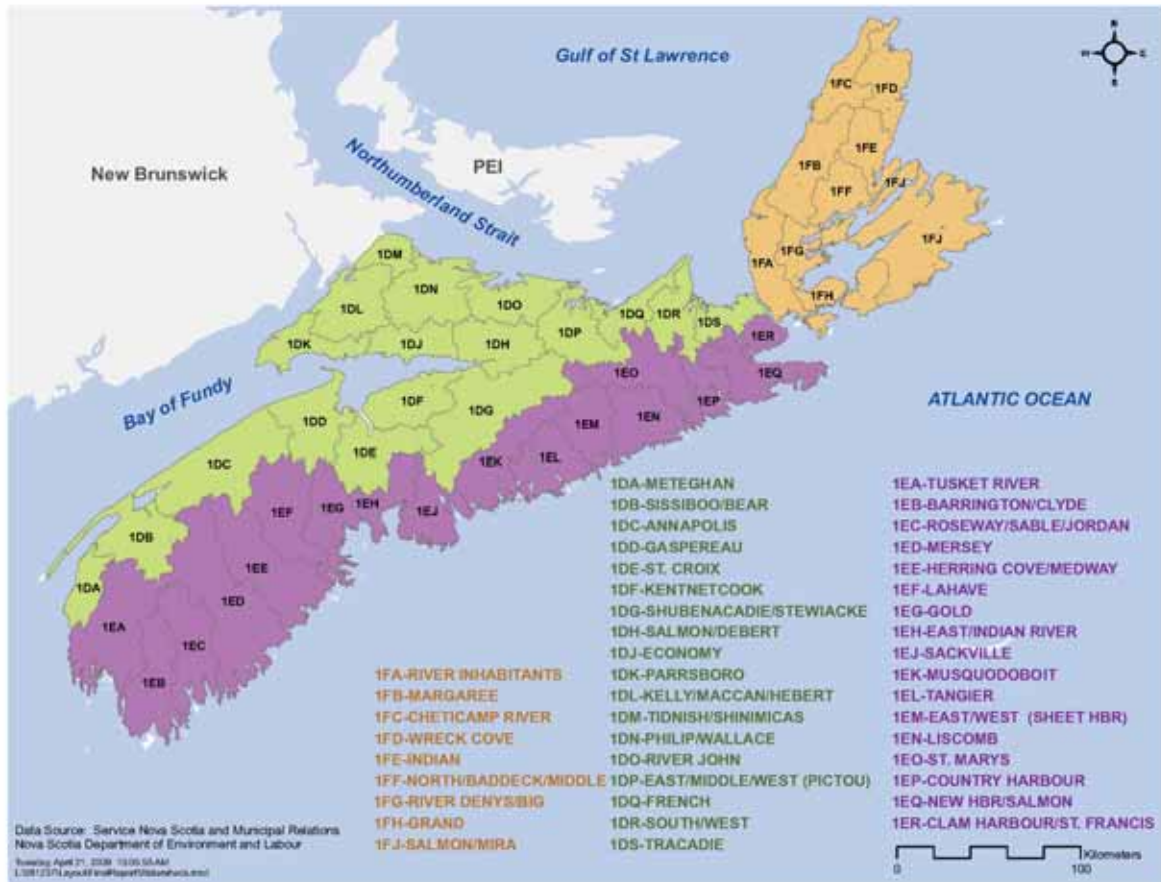


Figure 3.1: Watersheds of Nova Scotia

3.1.2 Geology

The province represents the merging of two ancient land masses, the Avalon and Meguma terranes which, through plate tectonic processes, became linked at the Cobequid-Chedabucto Fault system some 400 million years ago (see Figure 3.2). As a consequence, the province can be divided into two distinct geological regions north and south of the fault line extending between the Bay of Fundy in the west to Chedabucto Bay in the east.

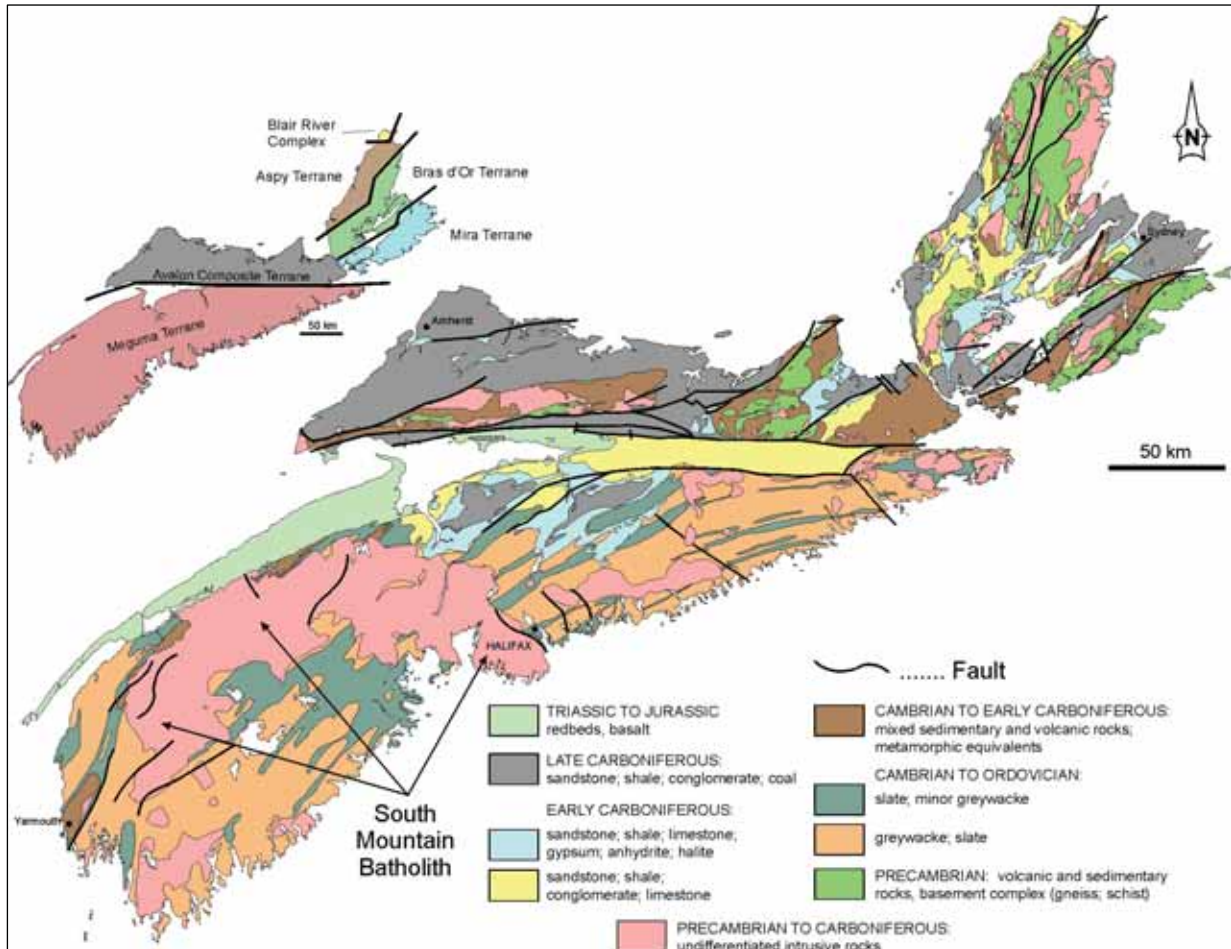


Figure 3.2: A simplified map of the geology of Nova Scotia (Source: Garth Demont, Geological Services Division, NSDNR)

The portion north of the fault line is dominated by Avalon basement uplands and Carboniferous sedimentary basin lowlands, the latter postdates the fault and straddles it (Lackey *et al.*, 2007). The Cobequid Hills represent an extension of the heavily eroded Appalachian Mountains, which along with the Pictou-Antigonish Highlands, comprise a highland across the northern portion of the province. Cape Breton is dominated by the resistant Avalon basement uplands and Carboniferous sedimentary basin lowlands.

The Carboniferous Lowlands also occur north of the Cobequid Hills, and south of the Minas Basin. Coal seams occur in the western and central areas of Cumberland County, in the basins of Joggins-River Hebert, Springhill, Debert and Pictou, and in the northern part of Cape Breton.

The southern mainland is dominated by the Meguma Terrane sedimentary rocks, which were intruded by large granitic plutons during the collision of the Meguma and Avalon Terranes. Triassic age volcanic and sedimentary rocks underlie an area along the north and south sides of the Bay of Fundy. These rocks, which were deposited in an aborted rift-basin, mark the development of the proto-Atlantic Ocean.

There has been considerable erosion over the millennia, and the Nova Scotia landform represents only a fraction of the landmass that was present 400 million years ago. The result is a land configuration with low elevation (500 m), where the South and Eastern shores have a highly corrugated shoreline (modified by glacial processes) and the northern and Northumberland Strait Shore have a relatively regular coastline. The landform is still changing as the upper layers of land mass on the North American Plate stabilize and cause minor fluctuations in sea level (see Section 7). Geology has produced distinct differences between the bedrock of the two regions in terms of topography, geochemistry, minerals and erodibility (Figure 3.3).

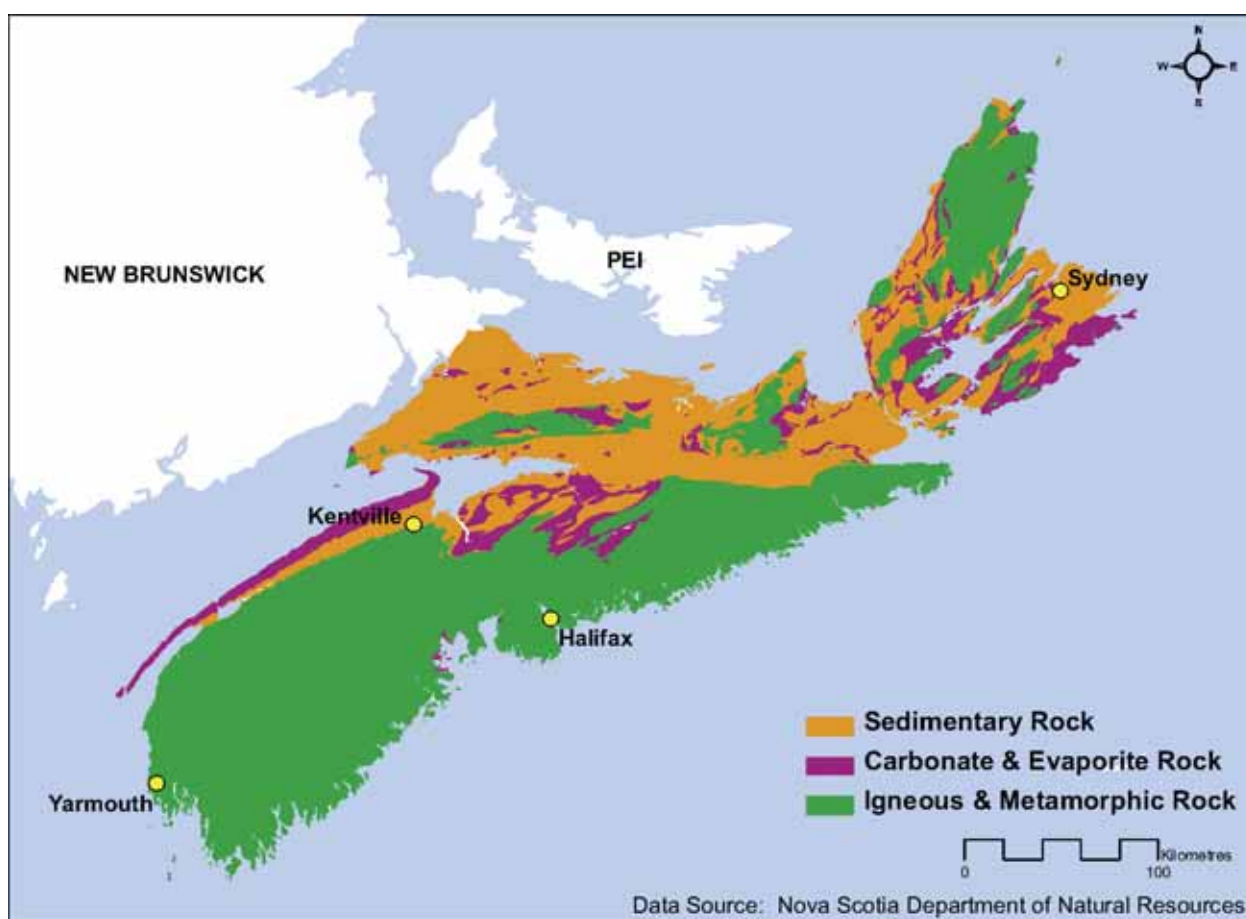


Figure 3.3 Distribution of bedrock types in Nova Scotia (Source: Kennedy and Drage, 2008)

The provincial landscape has been repeatedly scraped by multiple cycles of glaciation. The evidence indicates that there have been more than 16 glaciations, with each glaciation lasting about 100,000 years. The last, the Wisconsin Glaciation, ended about 15,000 years ago. The Wisconsin ice sheet was responsible for most of the glacial landform features, e.g., drumlins, till deposits, striations and other erosional phenomena, seen in Nova Scotia today (Atlantic Geoscience Society, 2001). In effect, until the end of the last glaciation about 15,000 years ago, climatic conditions and the ice rendered much of the land area inhospitable to the plants and animals we see today. Areas covered by ice were only fully colonized after the last glaciers retreated (Davis and Browne, 1997).

3.1.3 Climate

The underlying geology is important, but climatic characteristics play the single most dominant role in determining the ability for colonization, survival and sustainability of life for both plants and animals. The climate of Nova Scotia is influenced by large continental-scale air mass systems and ocean currents. The air mass systems move from “source regions” that define their basic characteristics, i.e., temperature, moisture, rate of movement, etc. The four principal source regions are polar (poleward of 60° north), continental (between 25°N and 60°N), maritime (over the oceans between 25°N and 60°N) and tropical latitudes (about 25° N to the equator). Five types of air mass affect Eastern Canada’s weather: continental arctic, maritime arctic, maritime polar, maritime tropical and continental tropical. These air masses, sometimes extending hundreds or thousands of kilometres in extent, have fairly uniform temperature and moisture conditions. The very cold, dry continental arctic air mass, the source of Canada’s winters, originates over the cold barrens in the north. By contrast, the maritime arctic air mass, travelling over large open bodies of water, is mild and moist. The maritime polar air masses bring rain, fog and snow. The Atlantic maritime tropical air mass moving north from the Gulf of Mexico, contributes to summer heat and humidity. Continental tropical air masses rarely reach Canada because their hot, dry characteristics disappear as they move north.

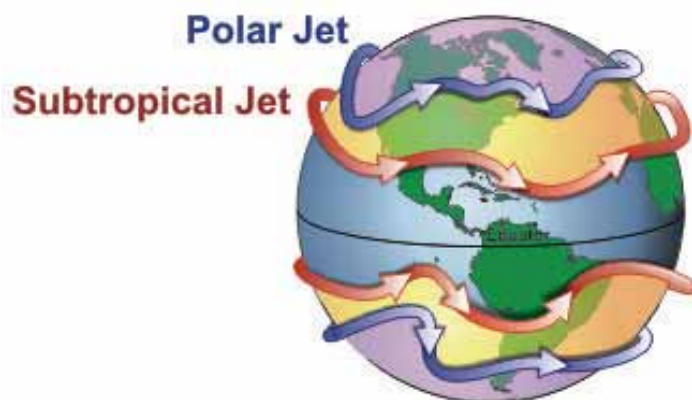


Figure 3.4 General configuration of the polar and subtropical jet streams that influence the climate of Nova Scotia (Source: Wikipedia, 2008)

All weather changes are related to the interaction of these air masses along “fronts”. The polar jet stream forms the biggest front, an ever-changing boundary where the cool winds from the north meet the warm winds from the south (Figure 3.4). By virtue of its geographical position close to the continually changing interface of the polar jet stream, Nova Scotia is exposed to the changing continental scale air mass systems that contribute to the dynamic and variable climate.

There are several ocean currents that, in association with the air mass systems, have an enormous impact on Nova Scotia's climate (Figure 3.5). These include (Biodiversity Institute of Ontario, 2008):

- The cold Labrador Current, which flows into the Gulf of St. Lawrence and travels in a counter-clockwise direction. It is deflected west by the north shore of Quebec, joins with the Gaspé current, continues south and finally moves out of the Cabot Strait where its name is changed to the Cape Breton Current;
- The Nova Scotia Current, which moves southwest over the Scotian Shelf and mixes with offshore waters as well as water from the Labrador Current and the Cape Breton Current. Once past the Gulf of Maine, it flows southward as the Coastal Current;
- The current in the Gulf of Maine moves counter-clockwise along the coast of New Brunswick all the way to Cape Cod. The stream then turns northward and returns to the Bay of Fundy; and
- The Gulf Stream flows north from the Gulf of Mexico, bringing warm water up the coast to just short of Nova Scotia. This current is of particular importance in warming the Maritime Provinces.

Bay of Fundy Tides

The greatest tidal amplitude in the world occurs in the Bay of Fundy, located between Nova Scotia and New Brunswick. The Minas Basin at the head of the Bay of Fundy regularly shows a tidal amplitude of 16 m between high and low spring tides. The reason for the extreme tides are the strong Atlantic winds that push water into the Bay of Fundy, causing a rocking movement. This oscillating movement occurs in synchrony with the lunar tides, driving the water higher into the Bay than along the coast.

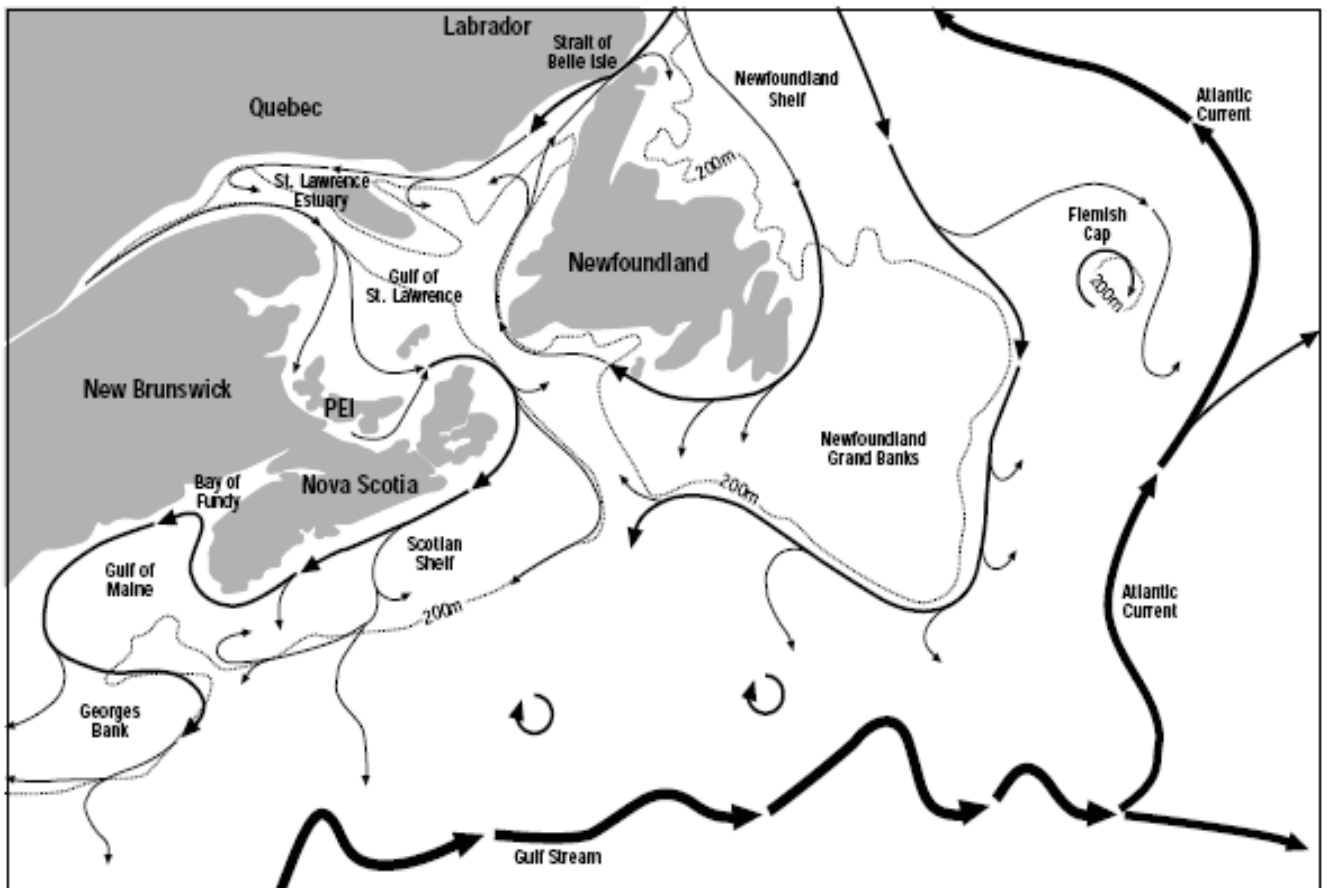


Figure 3.5: Schematic illustration of ocean currents that influence Nova Scotia's climate (Source: Davis and Browne, 1997)

Influenced by the air masses and ocean currents, Nova Scotia has a modified continental climate (Atlantic Climate Centre, 2008) with four distinct seasons:

- **Winters** are moderately cold with temperatures ranging from a low of -21°C to 5°C. Weather includes a mix of snow, freezing rain, hail and sunshine. Minimum temperatures are often intensified by high wind chill;
- **Spring** temperatures range from 6°C in early April to up to 20°C in mid-June;
- **Summers** are pleasant with temperatures that are warm, but not too hot, from 18°C to 25°C, and very occasionally reaching 30°C; and
- **Autumn** temperatures stay mild from 20°C in September to 6°C in early November.

There is considerable temporal and spatial climatic variation within the province due to the modifying influence of ocean currents and topography (Dzikowski *et al.*, 1985). Relevant features of the Nova Scotian climate include (Atlantic Climate Centre, 2008):

- Nine broad climatic regions, all of which have an influence on the distribution and nature of the province's ecoregions (see Section 3.1.4);
- Tropical storms and hurricanes in the summer and autumn - there have been 33 such storms, including 12 hurricanes, on record since 1871;
- The highlands of Cape Breton Island and the south coast receive over 1,600 mm and 1,500 mm of precipitation in an average year, whilst the Northumberland shore has less than 1,000 mm a year. Precipitation is slightly greater in the late fall and early winter, because of the more frequent and intense storm activity;
- The province is also very foggy in places: Halifax averages 196 foggy days per year and Yarmouth 191 days;
- Atlantic and Fundy waters are relatively cold (8-12 °C), keeping the air temperature over southwestern Nova Scotia on the cool side in spring and summer;
- Each year at least one or two 25 cm snowfalls occur in Nova Scotia. Some greater than 75 cm have been recorded;
- Only about 15% of Nova Scotia's total annual precipitation begins as snow. Near the Atlantic shore and close to the mouth of the Bay of Fundy, the amount of snowfall is light (less than 150 cm). Inland, the amount increases to 250 cm. Elevated areas receive the largest amounts and experience the longest snowfalls;
- Most agricultural areas experience 120 to 130 frost free days between late May and early October, which is the effective growing season for most crops. The Annapolis Valley has up to 140 frost-free days, but the higher highlands on Cape Breton Island have less than 100 days;
- The snow cover season, when there is at least 2.5 cm of snow on the ground, varies considerably. Usually its duration extends from about 110 days a year along the south coast to 140 days inland and in areas adjacent to the frozen seas;
- Storms frequently pass close to the Atlantic coast of Nova Scotia and cross the southern part of Newfoundland, producing highly changeable and generally stormy weather. This region has more storms over the year than any other region of Canada; and
- Winds blow predominantly from the south or southwest in the summer, with an average speed of 10 to 15 km/h. In the coldest months the predominant direction is from the west and northwest with an average speed of 22 km/h. Wind speeds associated with storm events can exceed 150 km/hr.

Such a variable and unpredictable climate can result in both extreme and hostile environmental conditions that require considerable adaptation by plants, animals and humans.

3.1.4 Ecoregions of Nova Scotia

The Province occupies a dynamic area at the interface between the “humid continental” and the “subarctic” climatic zones where southerly climatic and forest regions make a transition into the northerly boreal zones (Davis and Browne, 1997). Nova Scotia is situated in the Atlantic Maritime Ecozone (Acadian) of Canada and has nine distinct ecoregions, with 25 associated ecodistricts (Davis and Browne, 1997; Webb and Marshall, 1999; Neilly *et al.*, 2003) (Figure 3.6).

These areas are distinct because of differing characteristics related to landform, relief, geology, soils, water bodies, vegetation and land uses (Neilly *et al.*, 2003). The ecodistricts vary in size from 300 km² to 5,800 km², the smallest of which reflect the greatest contrasting features, i.e., the Cape Breton Barrens and North Mountain ecodistricts. The ecoregions of Nova Scotia, all of which can be regarded as being influenced by coastal processes to varying degrees (Neilly *et al.*, 2003), include:

- Cape Breton Taiga;
- Cape Breton Highlands;
- Nova Scotia Uplands;
- Eastern;
- Northumberland Bras d’Or Lowlands;
- Valley and Central Lowlands;
- Western Ecoregion;
- Atlantic Coast; and
- Fundy Shore.

The Atlantic Maritime Ecozone has a mixed-forest species composition consisting predominantly of conifers, especially on sites where drainage is impeded (Neilly *et al.*, 2003). The major conifers include red, white and black spruce, balsam fir, eastern white and red pine, and eastern hemlock (Neilly *et al.*, 2003). Common hardwoods include red and sugar maple, white and yellow birch, trembling and largetooth aspen, and beech. Nova Scotia is noted for its profusion of wildflowers, including the mayflower, wild rose and several species of violet (Neilly *et al.*, 2003). There are several important areas where wild berries are found, including blueberries and cranberries.

The wildlife associated with this ecozone consists principally of small animals such as fox, muskrat, mink, otter, groundhog, weasel, skunk and porcupine (Neilly *et al.*, 2003). Larger animals include white-tailed deer, black bear, moose and wildcat (Neilly *et al.*, 2003). The province has plentiful birdlife including partridge, duck, grouse, pheasant, heron, plover, loon, woodcock, eagles, hawks, owls, kingfishers and several species of woodpecker are also common.

3.1.5 Natural Resources

One of the key aspects of any landscape is its ability to provide resources that support both natural and anthropogenic activities in a compatible and balanced way. The protection and management of this ability to provide certain basics in a sustainable and secure way, e.g., shelter, food, water, energy and primary materials, is a fundamental aspect of sustainable development (United Nations, 1992). Renewable resources, e.g., soil, water, forests, grassland, fish populations, animals and tidal energy, are those that are able to continually replenish themselves as part of natural physical, chemical or biological cycles. Non-renewable resources are those that, when used, are consumed and cannot be regenerated unless they are recycled, e.g., oil and gas, minerals, etc.

Other landscape issues that are important include:

- The capacity to process, recycle and retain the wide variety of materials that are generated by anthropogenic activities, e.g., sewage, industrial effluents, chemical and physical emissions. This includes inherent ecological functions that contribute to the maintenance of public health;
- Maintenance of natural biodiversity, e.g., individual species, populations, habitats and ecosystems; and
- Maintenance of resources that contribute to other aspects of human well-being because of their psychological value, e.g., cultural land, heritage resources, valued aesthetic landscape features and views and active and passive recreational areas.

Figure 3.7 indicates some of the activities that are supported by the natural resources of Nova Scotia, within the context of a coastal watershed emphasizing the important linkage between upland and coastal aquatic ecosystems (Nova Scotia Environment, 2008a). These include forestry, agriculture, fisheries and aquaculture, recreation, water supply and waste removal, energy supply and conservation.

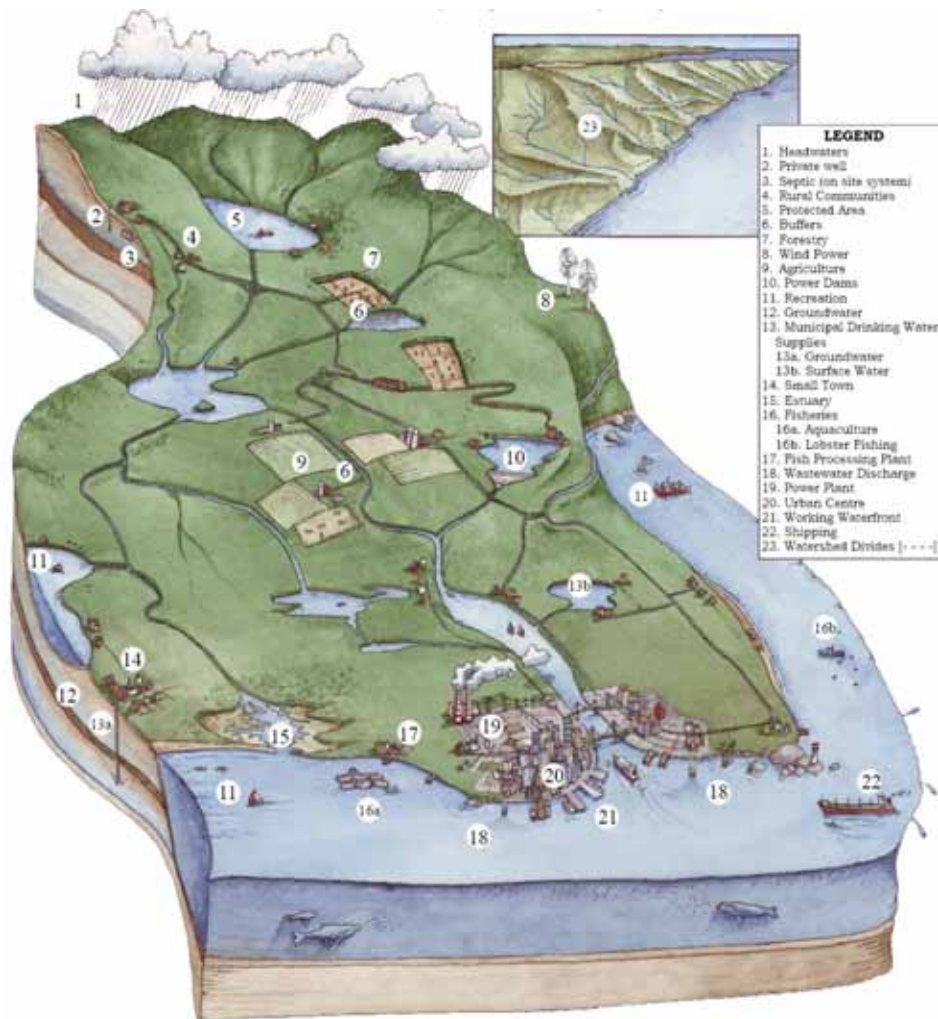


Figure 3.7: Schematic diagram of a coastal watershed depicting typical anthropogenic activities in the coastal zone. Source: Nova Scotia Environment 2008a)

3.1.5.1 FORESTRY

Approximately 77%, or 4.3 million hectares, of Nova Scotia is classed as being forested (Nova Scotia Department of Natural Resources, 2008a). Non-forested areas occupy approximately 4%, and a further 7.4% is devoted to agriculture (Scott and Cooper, 2002). This pattern is not surprising as forest species represent the dominant natural vegetation of the region (Davis and Browne, 1997). There is currently little information on the percentage of forests close to the coast, but all Nova Scotian forest is influenced by the maritime climate. Most of the forested land is privately owned, and there are many farm woodlots. The value of Nova Scotia's forests and the contribution of this industry to the province's economy are described in Section 3.2.1.3.

Threats to Nova Scotia's Forests

"The province's forests have experienced two major events that have had a significant impact over the last 10 years. In 1999 the brown spruce longhorn beetle was detected at Point Pleasant Park in Halifax. This introduced insect has been found to cause mortality in red spruce as well as other spruce species. A concentrated effort has been undertaken by the Canadian Food Inspection Agency and the department to contain and eradicate this introduced pest. The second major event to strike the province was Hurricane Juan in late September 2003.

Hurricane Juan severely damaged a 600,000 hectare area that included Halifax, Truro, and the central counties of Nova Scotia. In addition to extensive property damage, the forests of the hurricane-damage zone also suffered significant blow down damage and losses. For two years following the hurricane there has been an intensive effort to salvage downed and damaged timber before mortality rendered the wood un-useable. It has been estimated that in excess of two million cubic meters of wood was damaged and most of this has since been harvested."

(Source: Nova Scotia Department of Natural Resources, 2008a, p.9)

3.1.5.2 AGRICULTURE

The provincial area devoted to agriculture (7.4%) is relatively low primarily because most soils have high acidity, low soil organic matter and low nutrient content (Scott and Cooper, 2002). The risk of soil erosion on cultivated land is high, due to the nature of the soils and the topography, coupled with high rates of precipitation in the spring and fall. The variable climate and topography is not conducive to the large-scale production of many staple food crops, such as corn, wheat or rice; the main crop activity is devoted to vegetables and fruits. Livestock farming (cattle, dairy, poultry and hogs), that requires grazing and feed material, is the predominant agricultural activity (see also Section 3.2.1.2). There are areas, e.g., the Annapolis Valley, where farming activity (crop and livestock) is relatively high because of the more favourable topography, soils and climate. Coastal farming occurs mostly in the Acadian dykelands, which cover 17,519 hectares of the province (Nova Scotia Department of Natural Resources, 2009; see also Section 9.9). The value of agricultural resources to the Nova Scotian economy is described in Section 3.2.1.2.

3.1.5.3 FISHERIES AND AQUACULTURE

Nova Scotia has a long fishing tradition and the inland and coastal waters contain species that are of value for both commercial and recreational usage (Nova Scotia Department of Fisheries and Aquaculture, 2007a, b, c). From a coastal zone perspective both fresh- and salt-water species are of interest and, because of historic over-exploitation and population declines, the growth, harvesting, capture and marketing of most species have become increasingly regulated over the years. With few exceptions, the entire length of the coast is to some extent involved with securing products for commercial food purposes

from the marine environment. By contrast, most inland rivers, estuaries and lakes contain species that are captured primarily for recreational purposes. Species that provide greatest value to Nova Scotia include:

- Invertebrates, e.g., lobster, snow crab, shrimp, scallops, clams, bloodworms, rock and Jonah crab, and sea urchins;
- Groundfish, e.g., haddock, cod, halibut, redfish, pollock, silver hake, American plaice, yellowtail flounder, winter flounder, grey sole, white hake, turbot, cusk, catfish, Atlantic Wolffish and monkfish;
- Pelagics, e.g., herring, tuna, swordfish and mackerel;
- Marine plants such as rockweed (*Ascophyllum nodosum*), Irish moss (*Chondrus crispus*), dulce (*Palmaria palmate*) and kelp (*Laminaria sp.*); and
- Aquaculture species both marine and land-based, including Atlantic salmon, rainbow trout, brook trout, blue mussels, bay quahogs, American oysters and giant sea scallops.

An overview of the commercial fishing industry, including aquaculture, is provided in Sections 3.2.1.4 and 3.2.1.5.

3.1.5.4 MINING

There are numerous mining activities taking place throughout the province. This includes workings for coal, gold, salt, gypsum, sand, gravel, stone, clay, limestone, marble, slate, sandstone, peat, quartz and shale (MacDonald, 2008). Secondary processing of mineral products includes the manufacture of Portland cement products, ready mix concrete, brick products, clay products, building stone products (marble, slate, sandstone and granite), de-icing salt and consumable salt. In 2006 Nova Scotia had 22 registered active mines in operation and these are located throughout the province (Nova Scotia Department of Natural Resources, 2006). Not many of these are located directly adjacent to the coastline, but all of them have an influence on the coastal infrastructure that is required for processing and transportation of materials. Section 3.2.1.6 provides an overview of the economic value of mining to the province.

3.1.5.5 RECREATION

The natural environment of Nova Scotia provides a multiplicity of goods and services that contribute to providing people with high quality recreational opportunities. Some of the recreational activities associated with the coastal environment include: adventure tours; arts and culture (music/restaurants/seafood/waterfronts); beach activities; bird watching; camping; climbing; cycling; diving; fishing; geological sites; golfing; hiking; holiday cottages; kayaking; lighthouse tours; riding; river rafting; sailing and ship scenic tours; surfing; swimming; trails; whale watching, and wildlife and vista appreciation (landscape/seascape).

Every municipality in Nova Scotia is able to offer some form of access to most of these activities, and there are hundreds of businesses and organizations which facilitate their access (see <http://novascotia.com/en/home/default.aspx>). Many of these can be linked to the tourist industry (Economic Planning Group of Canada, 1997; ARA Consulting Inc., 1997; Gardner Pinfold, 1999), a relationship that emphasizes the important interrelationships that exist between the natural, social and economic environments in the province. Outdoor recreational usage, however, is seasonal and influenced by the unpredictability of the Nova Scotian weather.

3.1.5.6 FRESHWATER RESOURCES

Nova Scotia, with an average annual rainfall greater than 1,000 mm, has a landscape with abundant surface and groundwater (Nova Scotia Environment, 2008b, c). Sixty percent of Nova Scotians rely on a municipal water system for their drinking water, while 40% get their water privately. Of the 82 municipal water supplies in Nova Scotia, approximately 34% obtain their water from groundwater sources and 12% use a combination of groundwater and surface water. Nova Scotia has one of the highest percentages of households in Canada relying on groundwater sources for their water (Nova Scotia Department of Environment and Labour, 2008). In addition, groundwater supplies are used by most of the small registered public water systems in Nova Scotia; these provide water to facilities such as rural schools, day cares, nursing homes, restaurants and campgrounds.

Water resources are not only important for the provision of water, but also for the disposal, processing and transport of wastes. Most anthropogenic activities release material into water, which then acts as the medium by which wastes are transported away from their source, e.g., factory, home, septic tank, farmland, feed lot. The rivers, wetlands and lakes not only accommodate and transport the wastes, but have the capacity to act as purifiers and, as such, play an important role in public health (Nova Scotia Department of Environment and Labour, 2008). In cases where contaminants are not completely removed from the water, rivers act as point sources of pollution into the marine environment.

Nova Scotia's freshwater resources are of inestimable value in terms of the goods and services they provide. Wilson (2000) has presented preliminary figures for data up to 1997 that indicate:

- Nova Scotia's wetlands contribute at least \$7.9 billion in valuable ecological services each year, plus up to \$22.8 million, or an average of at least \$12.5 million each year, in additional economic value. The province's lakes and rivers contribute at least \$3.1 billion per year more in ecosystem services;
- The total direct expenditures plus the economic value that is placed on the enjoyment of participating in water-based recreation by Canadians is estimated at \$150 million per year in Nova Scotia; and
- Total water ecosystem values are of the order of \$11.2 billion per year.

As in most countries, there has been a conversion of natural wetland areas to a wide variety of uses, mainly agriculture and urbanization. It is estimated that approximately 20.5% of the original area covered by freshwater and saltwater wetlands has been lost since colonization in Nova Scotia; a loss of about 75,000 hectares (Wilson, 2000). Of this, approximately 17% of Nova Scotia's freshwater wetlands and 62% of the province's saltwater wetlands, have disappeared.

3.1.5.7 ENERGY

Most of Nova Scotia's energy demands (>90%) are met through the use of imported petroleum and coal; very little demand is being sourced

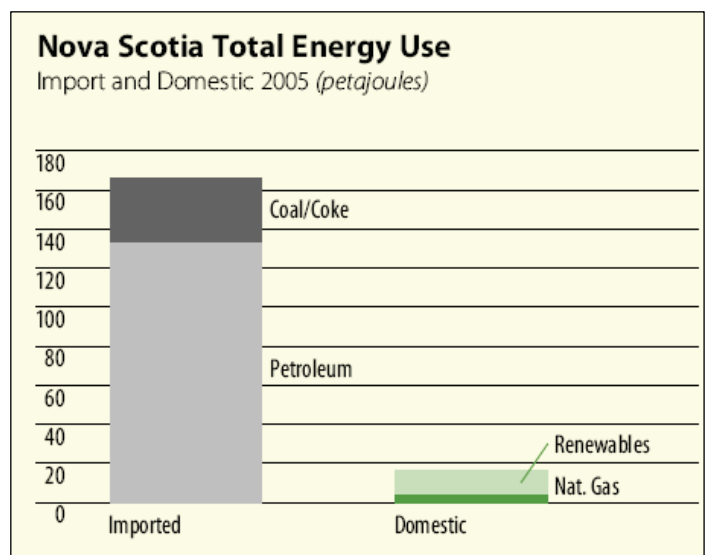


Figure 3.8 Nova Scotia's energy use in 2005
(Source: Nova Scotia Department of Energy, 2007)

from local or renewable energy sources (Figure 3.8). Two elements of the province's energy strategy include the objectives of decreasing the use of green-house gas generating fuels and more diversification of fuel sources (Nova Scotia Department of Energy, 2007, 2009).

To attain these objectives it will be necessary to seek a more diverse supply of non-renewable (coal and natural gas) and renewable (hydro, tidal, wind, biomass) fuel and energy from both local and imported sources. To reduce greenhouse gas (GHG) and other emissions, the Province created a set of regulations in 2007 called the Renewable Energy Standard. These require Nova Scotia Power to increase its use of renewable power from 8.5% to 18.5% by 2013. There are currently 41 wind turbines in Nova Scotia with an installed capacity of 60 megawatts. As capacity is added to meet the 2013 target, the Province intends to increase the requirement for renewable power to 25% by 2015. This target goal, plus the potential development of in-stream tidal power in Fundy region, will have implications for coastal zone management. It is envisaged that increases in renewable energy from both wind and tidal sources will pose numerous technical, environmental and planning challenges for the province.

3.1.5.8 SPECIAL AREAS AND THE PROTECTION OF BIODIVERSITY

A widely-used strategy for achieving sustainability of the natural environment and protection of biodiversity is that of designating levels of protection to specific areas (Nova Scotia Department of Environment and Labour, 2001). Along the coast of Nova Scotia several provincial and federal protected areas have been established to conserve ecosystems and protect wildlife (Figure 3.9; see also Appendix 3). Within these areas, commercial and residential developments are generally prohibited, but varying levels of wilderness recreation, hunting, fishing and industrial activity such as forestry may be permitted.

Protected beaches, nature reserves and wilderness areas have been established to conserve ecologically significant, sensitive or representative areas. Wildlife management areas and game sanctuaries have been created to protect specific wild species, and provincial parks provide for a mix of recreation and tourism purposes as well as for conservation. The current legally protected land area in Nova Scotia amounts to 8.2% or 452,581 ha (John Leduc, Protected Areas Branch, Nova Scotia Department of Environment, pers. comm., 2008). This is made up of:

- Wilderness areas (296,371 ha);
- Nature reserves (4,915 ha);
- Larger provincial parks (10,544 ha);
- National parks (134,978 ha);
- National wildlife areas (2,397 ha); and
- Land trust areas (3,376 ha).

There are currently 96 designated provincial parks (see Appendix 3). Of the 34 wilderness areas designated under the *Wilderness Areas Protection Act*, only six are on the coastline (see Figure 3.9); 92 beaches are protected under the *Beaches Act* (see Appendix 3). One of the 21 nature reserves is situated on the coast. In addition, there are numerous government and private sector initiatives being undertaken throughout the province to support research, conservation and the wise use of the province's natural coastal resources; these are referenced as appropriate in Chapters 4 to 9.

3.2 Socio-Economic Environment

The socio-economic environment refers to a wide range of interrelated and economic factors that influence the well-being and prosperity of human society (Intergovernmental Oceanographic Commission, 2006). These include demographic and economic considerations, public health and safety, culture and aesthetic factors. The following sections provide an overview of the socio-economic environment by presenting some relevant indicators which describe each of these dimensions.

3.2.1 Nova Scotia's Coastal Economy

3.2.1.1 OVERVIEW

Nova Scotia's economy, with a gross domestic product (GDP) of \$28.8 billion in 2007, is the largest in Atlantic Canada and accounts for 2.2% of the Canadian economy (Table 3.3). Between 2003 and 2007, the economy of the province grew by 4.9%.

Table 3-3: Real GDP, expenditure-based, by province and territory (\$ millions, chained 2002 dollars)

	2003	2004	2005	2006	2007
Canada	1,174,592	1,211,239	1,246,064	1,284,819	1,319,681
Newfoundland and Labrador	17,419	17,209	17,531	18,058	19,696
Prince Edward Island	3,778	3,877	3,955	4,051	4,149
Nova Scotia	27,464	27,710	28,069	28,328	28,803
New Brunswick	21,765	22,366	22,727	23,280	23,669
Quebec	244,422	251,028	254,708	259,032	265,888
Ontario	484,341	496,780	510,626	524,105	536,340
Manitoba	37,059	37,861	38,783	40,344	41,662
Saskatchewan	35,921	37,741	38,970	38,860	39,834
Alberta	155,359	163,564	171,416	181,791	187,493
British Columbia	141,435	146,541	152,998	159,733	164,583
Yukon	1,231	1,293	1,354	1,401	1,452
Northwest Territories	3,440	3,543	3,532	3,711	4,138
Nunavut	950	989	1,001	1,023	1,115

Notes:

Source: Statistics Canada 2008a, Cat. No. 13-213-PPB, updated November 2008.

GDP figures are estimates that are continually updated by statistical agencies. The figures provided in this table are correct at the time of writing.

Nova Scotia's economy is largely service-based (Figure 3.10), with 76% of its GDP generated by service industries and only 8 % arising from natural resource-based industries, i.e., agriculture, forestry, fishing, hunting, mining, oil and gas extraction and utilities. The GDP by industry for 2003 to 2007 is provided in Table 3.4. Next to the finance sector,

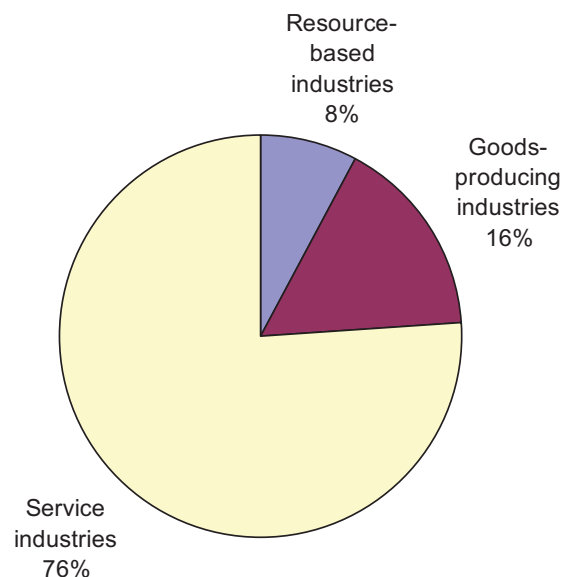


Figure 3.10: Nova Scotia's GDP by industry type

with a GDP of \$5,562 million, the largest industries in Nova Scotia are public administration (\$2,788 million), health care and social assistance (\$2,258 million) and manufacturing (\$2,589 million). Between 2003 and 2007, GDP from natural resource-based industries decreased by 12.1%, while the goods-producing industries and service industries increased by 3.2 % and 9.1% respectively.

Table 3-4: Nova Scotia GDP by industry (\$ millions, chained 2002 dollars)

<i>Industry</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>	<i>2007</i>
Total for Nova Scotia	24,978.8	25,387.9	25,771.9	26,080.3	26,514.1
Resource Industries	2,336.9	2,158.4	2,125.3	1,945.9	2,055.0
Agriculture, forestry, fishing and hunting	800.4	750.1	724.9	684.4	698.7
Mining and oil and gas extraction	893.6	789.5	782.7	704.2	762.1
Utilities	642.9	618.8	617.7	557.3	594.2
Goods-Producing Industries	4,112.1	4,377.2	4,324.7	4,302.9	4,242.9
Construction	1,482.6	1,552.8	1,549.3	1,686.6	1,644.9
Manufacturing	2,629.5	2,824.4	2,775.4	2,616.3	2,598.0
Service Industries	18,529.8	18,852.3	19,321.9	19,831.5	20,216.2
Wholesale trade	1,113.0	1,116.6	1,154.6	1,160.0	1,191.4
Retail trade	1,651.9	1,661.1	1,681.3	1,756.3	1,806.6
Transportation and warehousing	1,053.0	1,016.8	1,040.2	1,086.1	1,103.3
Information and cultural industries	896	886.7	911.0	936.3	947.5
Finance and insurance, real estate and renting and leasing and management of companies and enterprises	4,902.6	5,077.8	5,240.6	5,399.4	5,562.1
Professional, scientific and technical	790.6	811.5	835.2	858.1	881.0
Administrative and support, waste management and remediation services	502.2	572.1	589.1	622.8	641.7
Educational services	1,421.7	1,463.1	1,531.2	1,547.9	1,555.2
Health care and social assistance	2,070.7	2,096.6	2,148.0	2,236.3	2,258.8
Arts, entertainment and recreation	179.7	185.9	183.4	183	183.6
Accommodation and food services	642.3	637.2	643.4	665.6	673.9
Public administration	616.6	617.7	612.0	622.2	623.1
Other services	2,689.5	2,709.2	2,751.9	2,757.5	2,788.0

Notes:

Source: Statistics Canada, 2008a, Table 379-0025, updated July 2008

GDP figures are estimates that are continually updated by statistical agencies. The figures provided in this table are correct at the time of writing.

Although many industries are dependent on their coastal location to ensure the success of their business, not all of them rely on the coast as a resource. There are, however, several industries that rely on coastal resources, including those that rely on renewable resources, e.g., agriculture, forestry, fisheries and

aquaculture; non-renewable resources, e.g., mining and oil and gas extraction; coastal and ocean space, e.g., shipping; ship- and boatbuilding, tourism. These industries need to be supported by infrastructure, including utilities (electrical power, natural gas, water, sewage, etc.) and transportation networks. A summary of each sector and their contribution to the economy of Nova Scotia is provided below.

3.2.1.2 AGRICULTURE

There are currently about 3,795 farms in Nova Scotia with a gross income over \$10,000 per year, covering approximately 403,044 hectares of land (7.3 % of Nova Scotia); this number has decreased significantly since the late 1800s (Figure 3.11). The average farm size is small, i.e., 106 hectares per farm (Statistics Canada, 2006a). The main types of farming include: fruit and tree nut farming (23.9%), beef cattle ranching and associated activities including feedlots (18.8%); nursery and tree production (10.9%); and dairy cattle (7.8%).

The total value of farm production in Nova Scotia in 2007 was \$ 543.5 million (Statistics Canada, 2008b, Table 002-0004). Farm receipts for 2007 equalled about \$454.2 million, about 1% of Canada’s total production (Nova Scotia Department of Agriculture, 2008). In 2005, 22.3% of farms in Nova Scotia reported farm gate sales of over \$100,000 (Nova Scotia Department of Agriculture, 2008).

In November 2008, the agricultural sector in Nova Scotia provided about 6,900 full-time jobs (Statistics Canada, 2008b, Table 282-0088). Thousands of additional jobs are provided by the food manufacturing and processing sector that supports the agriculture sector (Devanney, 2007).

Quick Facts – Agriculture in Nova Scotia

- Nova Scotia exports more than 30 agricultural products to over 60 countries around the world;
- Nova Scotia produces enough blueberries to make 26 million pies each year;
- Nova Scotia's wine making history can be traced back to the 1600s. Currently valued at approximately \$12 million, the wine industry has tripled commercial grape production since 2000 and continues to grow;
- Canada makes more than 80 % of the world's maple syrup. Farm cash receipts for Nova Scotia's industry in 2007 were over \$11 million;
- Nova Scotians grow over 3 million bushels of apples every year;
- More than 50 different kinds of vegetable crops are grown in Nova Scotia;
- Nova Scotians enjoy one of the safest food supplies in the world;
- Almost 50% of Nova Scotian agri-food exports go to the United States; and
- 4% of farmland in Nova Scotia is dykeland, supporting the production of hay, dairy products, beef, hogs, grain and vegetables.

Source: Nova Scotia Department of Agriculture, <http://www.gov.ns.ca/agri/agaware/quickfacts.shtml>

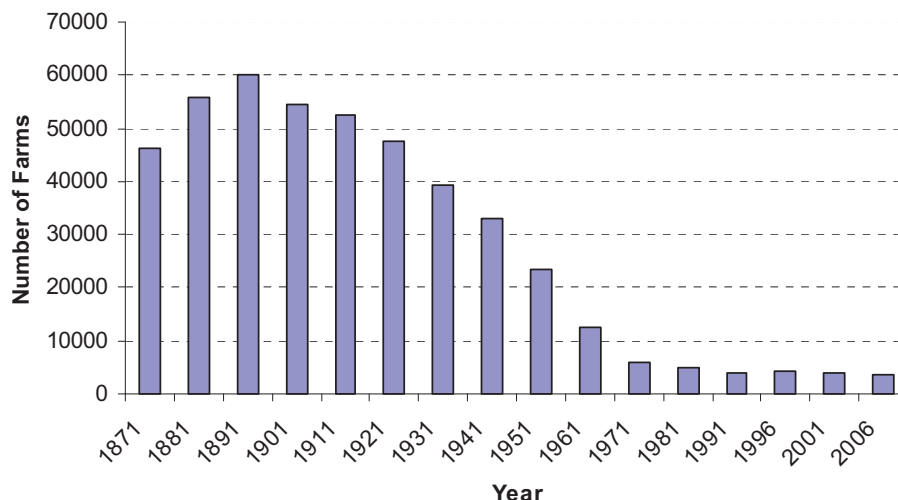


Figure 3.11: Number of farms in Nova Scotia. Source: Statistics

3.2.1.3 FORESTRY

Forestry is included as part of the coastal economy as the forestry resources are strongly influenced by Nova Scotia's maritime climate. Forestry has been important to the provincial economy since the early 18th century when forestry materials provided timber for wooden ships and planking. The *State-of-the-Forest Report 1995-2005* (Nova Scotia Department of Natural Resources, 2008a), provides an overview of the current status of provincial forests and their contribution to the economy. About 4.3 million hectares, or 77% of the total land area of the province, is classed as being forested (Nova Scotia Department of Natural Resources, 2008a). This includes land covered in trees, abandoned fields that have regenerated as forest, or areas with trees visible on aerial photography. Forest land also includes harvested areas that are regenerating, or for which there is no sign of conversion to non-forest use such as agriculture or urban development. The merchantable volume of forests was estimated at about 404.4 million m³ in 2003, of which about 35% is hardwood and 65% is softwood (Nova Scotia Department of Natural Resources, 2008a).

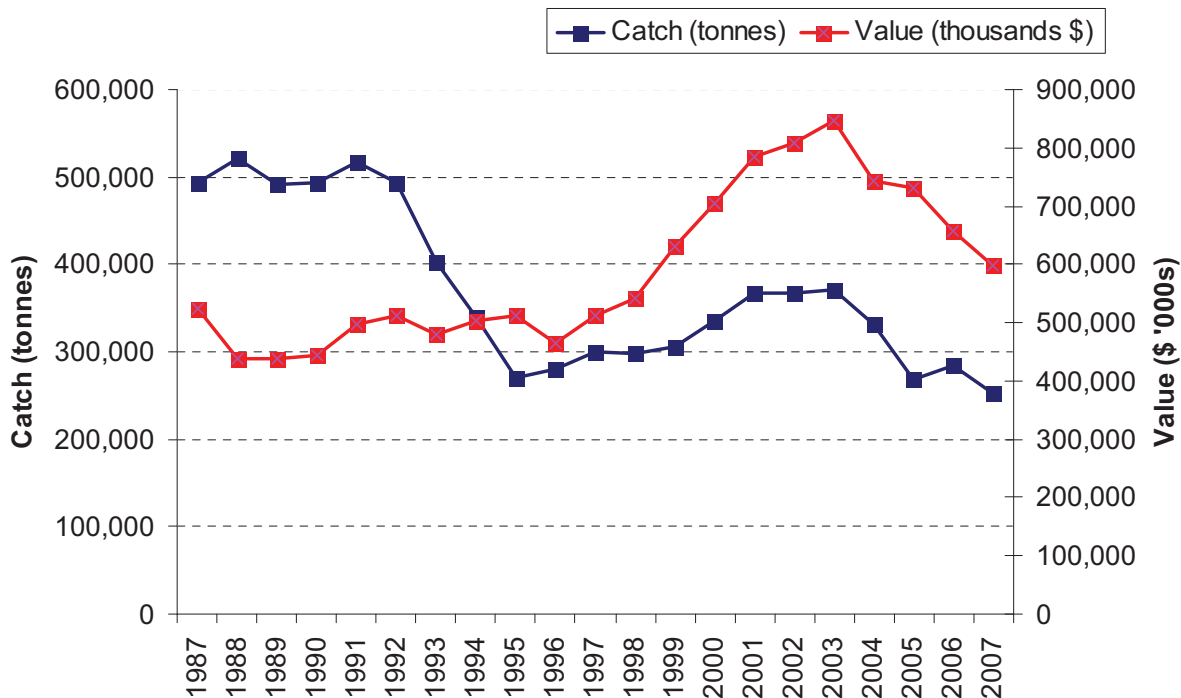
In 2007, the total provincial harvest was reported to be 5.25 million m³ of solid wood, of which 88% or 4.6 million m³ were softwood species. In 2005, 5.6 million m³ of soft wood and 0.83 million m³ of hardwood were harvested (Nova Scotia Department of Natural Resources, 2008b). Hardwood harvest levels have increased dramatically from 0.35 million m³ in 1995. This can be attributed primarily to an increase in demand from the export market for hardwood chips. Production of lumber products expanded between 1995 and 2005 from 353 million foot board measure (fbm) to 751 million fbm. At the same time, the number of sawmill businesses dropped from 322 in 1995 to 218 in 2007 (Nova Scotia Department of Natural Resources, 2008b). Nova Scotia currently has more than 2,500 tree growers who sell about 1.7 million Christmas trees each year mainly to the United States (Christmas Tree Council of Nova Scotia, 2008).

In 2004, the contribution of the forest industry to the Nova Scotia economy was about 2.6% of provincial GDP (about \$665 million) (Atlantic Provinces Economic Council, 2005). It provided employment to approximately 11,000 people and generated exports exceeding \$1 billion, or 17.7% of Nova Scotia export trade (Atlantic Provinces Economic Council, 2005; Nova Scotia Department of Natural Resources, 2008a). Since 1994, exports of forest products have doubled, with newsprint being Nova Scotia's largest international forest product export in 2004 (\$259 million), followed by uncoated paper (\$236 million), lumber (\$228 million) and wood pulp (\$218 million) (Atlantic Provinces Economic Council, 2005).

3.2.1.4 FISHERIES AND SEAFOOD PROCESSING

Commercial Fisheries

The Nova Scotia fishing industry (harvesting and processing) is a major source of direct and indirect employment and income for the province and is a leading source of export earnings (Gardner Pinfold, 2005). It is also the economic mainstay of many rural communities (see Chapter 5). After the collapse of the cod fishery in the early 1990s, the fishing industry recovered somewhat until 2003. Since 2003, however, there has been a 32% decrease in catch and a 29% drop in value (real Dollars) (Figure 3.12). Table 3.5 provides a summary of the value of fish landings by type of fish harvested for the period 2002 to 2007. This shows that shellfish, including lobster, crab, shrimp, scallops and clams, have been the most lucrative fisheries over the last five years.



Source: Fisheries and Oceans Canada, Statistical Services, http://www.dfo-mpo.gc.ca/communic/statistics/commercial/landings/seafisheries/index_e.htm

Figure 3.12: Commercial fishery landings in Nova Scotia, quantity (tonnes) and value (real Dollars)

Table 3-5: Value (thousands \$) of Nova Scotian commercial fish landings by type

Species Type	2002	2003	2004	2005	2006	2007
Groundfish	90,173	85,487	74,825	80,573	81,493	84,433
Pelagic and Estuarial	38,873	44,792	38,766	39,969	39,976	34,806
Shellfish	677,762	714,884	627,223	609,957	517,474	479,944
Other	1,970	1,989	2,715	1,182	108	14

Gardner Pinfold (2009) has undertaken a substantive analysis of the economic contribution of the marine fishery to the Nova Scotia economy. This work indicates that the contribution of the fishery to GDP in 2006 was \$536 million (\$332 million in direct contributions and \$204 million in spinoffs). There has been a 5% decrease in fisheries-generated GDP since 2002. Employment has increased since 2002, with an estimated 9,507 people employed in the industry in 2006 (Gardner Pinfold, 2009).

Rockweed Harvesting

Although not technically a fishery, rockweed (*Ascophyllum nodosum*) harvesting is a growing industry in Nova Scotia. Rockweed is found sub-tidally along the shore, with commercial harvesting focused in south-western Nova, primarily within Shelburne and Yarmouth counties. It is processed for use both as a fertilizer and as a feed supplement for livestock. In 2007 approximately 27,000 metric tonne of rockweed were harvested, an approximate 50% increase over 2001 landings (Justin Huston, Department of Fisheries and Aquaculture, pers. comm., 2009).

To encourage resource stewardship, the province gives lease holders exclusive commercial access to rockweed within their lease areas. Leases are issued for 15 year periods, renewable based on the performance of the leaseholder. There are currently 19 leases held by five different leaseholders. Outside of leased areas, any licensed harvester can harvest rockweed commercially. At present, no major commercial harvest occurs outside of leased areas. There is currently no information available on the impact of the rockweed industry on Nova Scotia's GDP. There are presently 100-150 harvesters employed seasonally.

Seafood Processing

The fish processing sector involves 285 enterprises of varying types, with just over 180 in operation in 2006 (Gardner Pinfold, 2009). These enterprises range in size from under five to several hundred employees. The sector utilizes 100 % of the landed catch in the province, producing a wide range of fresh, frozen and value-added products. It has declined over the past 20 years, with the number of licensed facilities falling from just over 370 in the late 1980s to current levels (Gardner Pinfold and Rogers Consulting, 2007). Many plants have ceased to operate, and others have combined their operations to gain strength through consolidation. Currently, plants are concentrated in southwest Nova Scotia and Cape Breton, with a handful of others along the eastern shore and the Northumberland Strait (Gardner Pinfold and Rogers Consulting, 2007).

The economic importance of fish processing to the province increased during the second half of the 1990s, but has since stabilized (Gardner Pinfold, 2005). The value of production was estimated at \$903 million in 2006, with total exports of about \$513.8 million (Gardner Pinfold, 2009). The contribution to GDP in 2006 was \$577 million (Gardner Pinfold 2009). Employment varies seasonally in response to fishing activity and landings, ranging from a low of 2,900 people in winter to a peak of 4,850 in summer (Gardner Pinfold and Rogers Consulting 2007).

3.2.1.5 AQUACULTURE

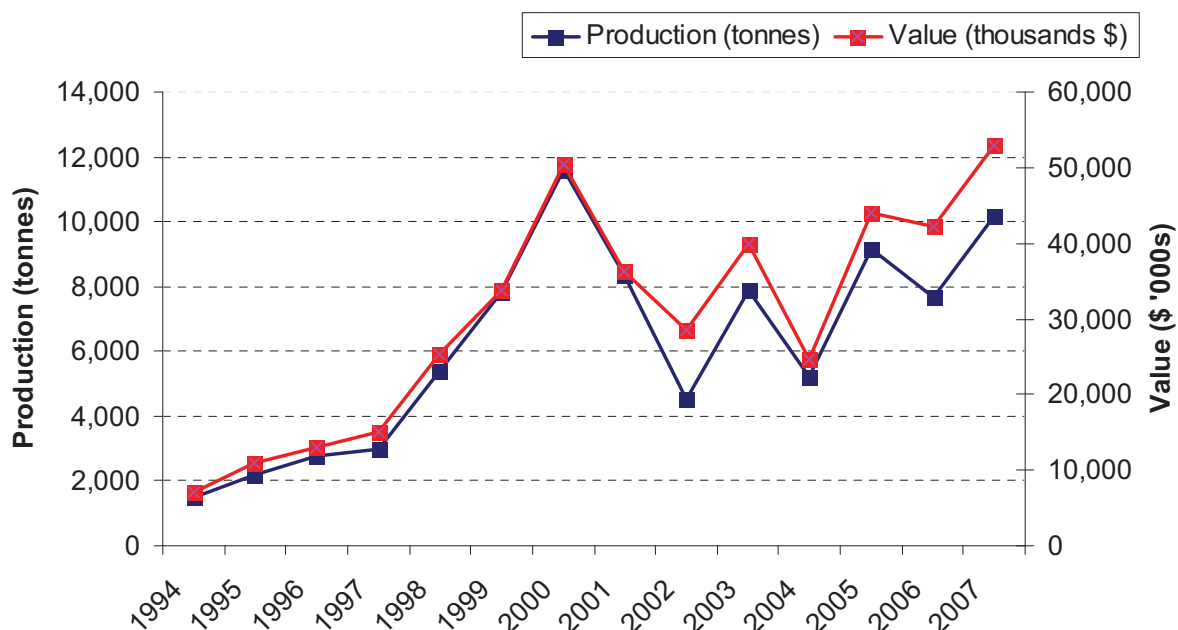
Provincial coastal waters provide the location for about 350 aquaculture sites, not all of which are in production (Gardner Pinfold, 2009). The main species farmed by value are salmon, which accounted for 74% of the total value in 2007, blue mussel (6.5%), trout (2%) and American oyster (1.6%) (Nova Scotia Department of Fisheries and Aquaculture, 2008).

Output from Nova Scotian aquaculture continues to be moderate in comparison to other Canadian provinces, despite being initiated in the mid-1970s. This is reflected in production data (Figure 3.13), which indicate a sharp growth between 1994 and 2000 and subsequent erratic fluctuations. Production tends to be concentrated in few farms, and provincial aquaculture officials estimate that fewer than 20% of farms account for over 80% of production (Gardner Pinfold, 2005).

Quick Facts about Aquaculture

- Half of all seafood eaten by people around the world is farmed;
- 62% of Canadian consumers have purchased farmed salmon in the last year;
- More than 85% of Canada's aquaculture products are exported, mostly to the US;
- Coastal waters of Nova Scotia support about 350 aquaculture sites;
- The main aquaculture species in Nova Scotia are salmon, blue mussels and American oyster; and
- Developing species include Arctic char, scallop, striped bass, quahog and European oyster.

Source: Nova Scotia Department of Fisheries and Aquaculture



Source: Nova Scotia Fisheries and Aquaculture, <http://www.gov.ns.ca/fish/aquaculture/stats/>

Figure 3.13 Production (tonnes) and value (real dollars) of Nova Scotia's aquaculture industry

In 2007, 10,181 tonnes of product were shipped, with a total value of about \$53 million (including hatchery output). The contribution of this sector to GDP has followed the trends observed in Figure 3.13, with a contribution to the GDP in 2006 of \$33.5 million (Gardner Pinfold, 2009). In 2007 there were 741 people employed in the industry, of which 28% were employed full-time (Nova Scotia Department of Fisheries and Aquaculture, 2008).

3.2.1.6 MINING

The wealth and variety of Nova Scotia's mineral resources reflect the province's geological complexity (see Section 3.1). From the mid-1700s, when coal was first mined on the coast of Cape Breton, to the present, Nova Scotians have discovered and developed a wealth of mineral resources that have made a significant contribution to the province's economic and social development (Nova Scotia Department of Natural Resources, 1996). Most mineral resources produced in Nova Scotia are mined in inland areas, but they are transported to the coast and shipped out on bulk carriers to ports around the world.

Coal has long been the foremost mineral product, accounting for nearly 50% of the province's annual gross value output for mineral resources. Industrial minerals have been consistent contributors to the province's mineral production for over 200 years. These include gypsum, salt, limestone, anhydrite, dolomite, barite, celestite, silica, clay, shale, slate, marble, building stone, sand and gravel and crushed rock. Nova Scotia is a major world producer of raw gypsum producing 75% of Canada's total value output. Metallic minerals, such as gold, silver, iron, copper, lead, zinc and tin have also been mined. Figure 3.14 shows the value of primary production (extraction) of minerals in the province since 1987. The value of production fell from \$410 million in 1995 to \$377 million in 2007, mainly due to the drop in coal production.

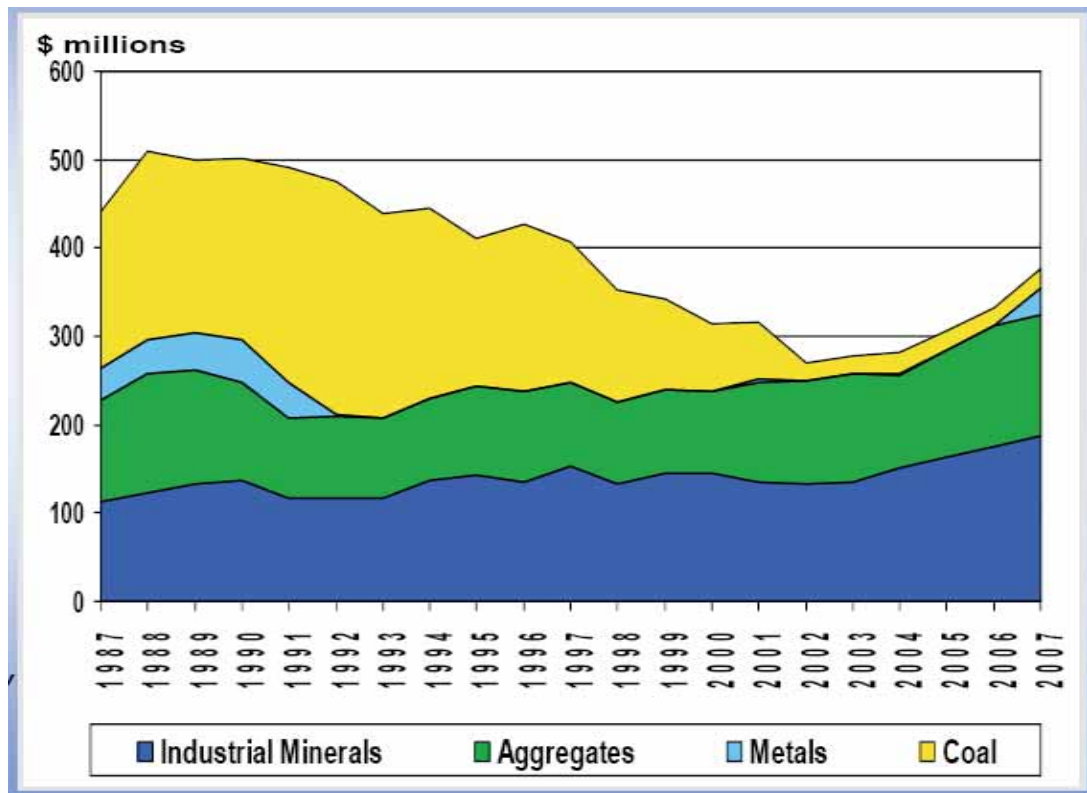


Figure 3.14: Value of mining primary production 1987 – 2007 (Source: Gardner Pinfold and Conestoga-Rovers and Associates, 2008)

Levels of mineral exploration in the province are estimated to be the highest in 20 years with estimated reported expenditures in 2008 of \$13 million (MacDonald, 2008). In November 2008, approximately two million acres (with a focus on gold and base-metal deposits) were under exploration licence; an estimated total of 36,000 m of diamond drilling was conducted in 2008.

Gardner Pinfold and Conestoga-Rovers and Associates (2008) undertook an analysis of the economic impact of the mining industry in Nova Scotia, including exploration, discovery, development, production and the reclamation of mineral resources. The analysis indicated that the GDP associated with the direct economic impacts of mining (including those attributable to mine operators, exploration companies and secondary processors) was \$283.4 million in 2006. GDP associated with spin-offs from the industry through the multiplier effect were \$205.2 million. The direct employment of people was calculated as 3,075 person-years, and the employment from spin-offs was 3,265 person-years (Gardner Pinfold and Conestoga-Rovers and Associates, 2008).

Mining industry productivity has increased by 28% in the twelve year period from 1994 to 2006 (Gardner Pinfold and Conestoga-Rovers and Associates, 2008). In 1994, the average output of the industry was \$142,000 per employee; by 2006, this average had increased to \$182,000.

3.2.1.7 OIL AND GAS

Oil and gas exploration and production take place mainly on the Scotian Shelf, offshore of Nova Scotia, although there is some ongoing exploration for coal-bed methane onshore in the Cumberland Basin, Springhill. Through the *Canada-Nova Scotia Offshore Petroleum Accord Implementation Act*, economic benefits from offshore development are provided in the form of revenue sharing between the federal and provincial governments and through the preferential supply of goods and services by Nova Scotians. Nevertheless, offshore oil and gas projects tend to be international in scope, and a proportion of necessary spending occurs outside the national economies where the development occurs. This proportion varies depending on the capabilities and competitiveness of the domestic versus international suppliers (Gardner Pinfold, 2005).

Offshore oil and gas operations can be split into three economic activities: exploration, development and production. Exploration consists of the seismic surveys and exploration drilling that is undertaken to determine the existence of commercial reserves. Field development occurs once a field has been identified as commercially viable and includes the design, construction and installation of production equipment. During the production phase, the hydrocarbons are extracted, processed and transported to onshore facilities (Gardner Pinfold, 2005).

Exploration activities between 1960 and 2007 identified 23 significant discoveries, estimated to contain recoverable reserves of over 170 million m³ of natural gas and 35 million m³ of oil and condensate. Deep water reserves are estimated at between 425 and 1,160 million m³ of natural gas (Canada Nova Scotia Offshore Petroleum Board, 2008). The Nova Scotia Department of Energy estimates total undiscovered gas resources to be approximately 62 million m³ and undiscovered oil resources to be about 0.2 billion barrels (Canada Nova Scotia Offshore Petroleum Board, 2008).

Petroleum production in offshore Nova Scotia has included three projects:

- The Cohasset-Panuke project produced oil from 1992-1999 and is now decommissioned. Project operators were Pan Canadian (now EnCana) and Lasmo;
- The Sable Offshore Energy Project, operated by Exxon Mobil and partners, which has been producing natural gas since 1999; and
- The Deep Panuke Offshore Gas Development Project, operated by EnCana Corporation and partners, which is currently under development and expecting first gas to be brought ashore in 2010.

Although in many respects not a coastal activity, the development of the offshore oil and gas sector in Nova Scotia has brought both business to marine service providers in the province and necessitated the building of supporting onshore infrastructure. The latter include the pipelines that transport the product to shore based facilities, the gas plant and wharf at Goldboro and the fractionation plant at Point Tupper. The industrial node that has developed at Goldboro is a direct response to this sector's requirements. Such demands could be replicated elsewhere in the province should commercial finds be found either to the north or south of the current producing area. The operation of such infrastructure generates both valued local employment and industrial property taxes which are of relevance to the operating budget of rural municipalities such as the District of Guysborough.

The contribution made by the oil and gas sector to provincial GDP in 2006 was estimated at \$952 million (Gardner Pinfold, 2009). The industry generates high direct revenues, most of which accrue as returns to and of capital. In addition, the development work for the Sable offshore gas project (and soon the Deep Panuke project) makes a substantial impact through marine construction activities in the province (Gardner Pinfold, 2009). The offshore industry also makes important contributions to employment and income, especially through its indirect activities, though these are relatively low compared with the GDP impact because of the capital intensiveness of the industry. Oil and gas projects make a major contribution to provincial government revenues, with royalties and related revenues of \$331 million in fiscal 2006/07, up from \$10 million in 2001 (Gardner Pinfold, 2009).

3.2.1.8 PORTS AND SHIPPING

The marine transportation sector is an important component of the Nova Scotia coastal economy. It is made up predominantly of cargo vessels that make use of the large ports of Halifax, Sydney and the Strait of Canso. Marine transportation also includes ferries, cruise ships, support services, including marine towing, ship chartering, cargo handling, harbour and port operations, pilotage and shipping agencies. The size of the cargo industry is indicated in Table 3.6. The most recent statistics available from Statistics Canada are from 2005. The total number of vessels making use of Nova Scotia's ports was 4,249 in 2005, 32% more than in 2001. Tonnage handled in Nova Scotia's ports also increased over the same period from ~41 million tonnes to ~52 million tonnes.

Table 3-6: Number of vessels and tonnage of cargo for Nova Scotia ports

<i>Port</i>	<i>Vessel Movements</i>		<i>Cargo Tonnage Handled (Tonnes '000)</i>	
	<i>2001</i>	<i>2005</i>	<i>2001</i>	<i>2005</i>
Halifax	2,073	1,896	13,943.5	14,156.2
Port Hawkesbury	342	461	21,528.3	30,661.2
Sydney	75	100	2,008.6	2,589.3
Hantsport	111	98	1,658.2	1,833.0
Shelburne	76	61	31.4	52.2
Pugwash	41	41	341.3	330.8
Little Narrows	45	43	939.7	1,236.5
Liverpool	36	28	156.7	124.0
Weymouth	16	-	37.5	-
Mulgrave	16	24	187.3	275.4
Lunenburg	3	0	0.3	0
Pictou	20	15	84.0	68.7
Baddeck	0	0	0	-
Sheet Harbour	9	4	164.9	40.3
Louisburg	0	0	0	-
Yarmouth	13	0	61.7	0
North Sydney	267	1,405	80.1	223.6
Unspecified	76	73	174.4	151.8
Total	3,219	4,249	41,397.1	51,743.1

Source: Statistics Canada 2001, 2005

Ferry services run between Nova Scotia and Newfoundland, Prince Edward Island, New Brunswick and the United States. The ferry between Nova Scotia and Newfoundland is estimated to carry about 500,000 people and 235,000 vehicles annually and employs approximately 895 people (Gardner Pinfold, 2005). Ferries that run between Prince Edward Island/New Brunswick/Maine and Nova Scotia carry about 800,000 passengers and 265,000 vehicles and employ approximately 310 people (Gardner Pinfold, 2005).

The two major ports of call for cruise ships are Halifax and Sydney. The number of cruise ships per year has been increasing steadily in Halifax from 39 in 1995 to 125 in 2008 (Gardner Pinfold, 2005; Halifax Port Authority, 2008), and in Sydney from 26 in 1999 to 50 in 2008 (Gardner Pinfold, 2005; Bernadette MacNeil, Sydney Ports Corporation, pers. comm., 2008).

The economic contribution of the marine transportation sector arises mainly from spending by shipping lines and ferries on port services. In 2006, the sector contributed \$471.6 million to the GDP of the province and created about 8,000 full-time equivalent jobs (Gardner Pinfold, 2009).

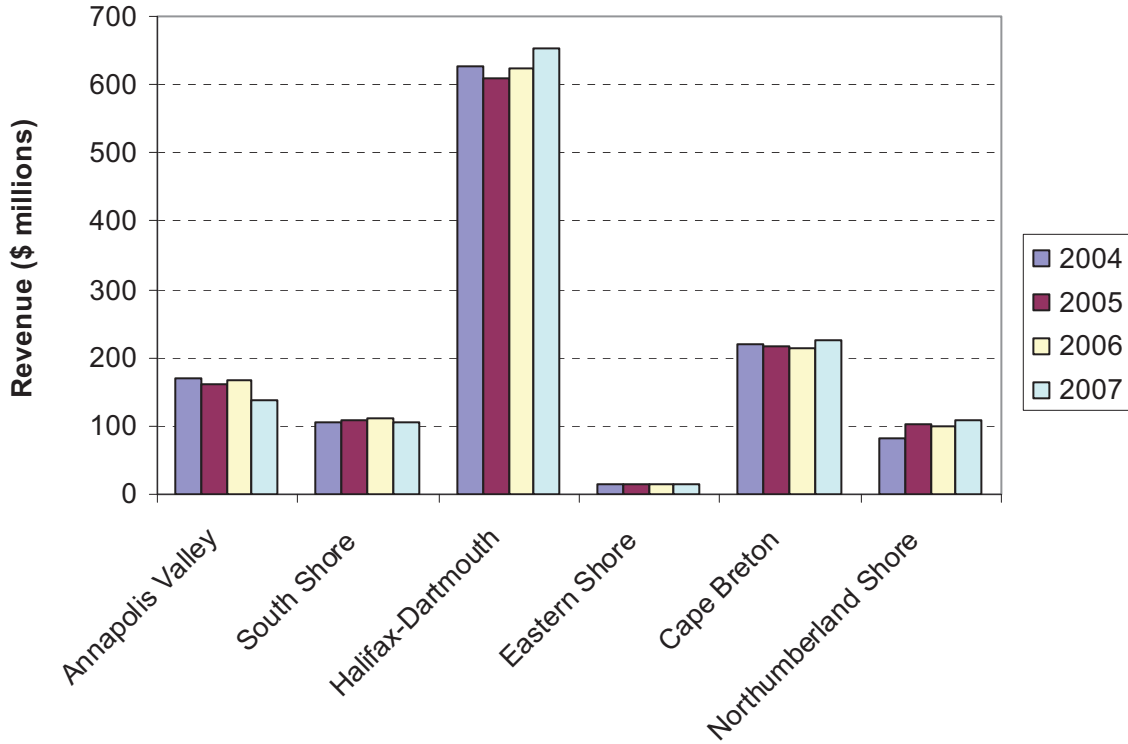
3.2.1.9 SHIP- AND BOATBUILDING AND REPAIR

The ship- and boat-building industry in Nova Scotia generated \$145 million in GDP in 2006 and employed approximately 1,680 people (Gardner Pinfold, 2009). Up to the 1960s and even into the 1970s, the shipbuilding industry was a mainstay in several coastal communities, including Halifax, Dartmouth, Pictou, Lunenburg, North Sydney and Shelburne (Gardner Pinfold, 2005). The sector faced challenging market conditions in the late 1980s and early 1990s. Declining domestic demand coupled with highly subsidized international competition caused several yards to close (Gardner Pinfold, 2005). The Halifax Shipyard, the only one now operating, has been building and repairing commercial and naval vessels for over 110 years; it is currently owned by Irving Shipbuilding Inc.

The boatbuilding sector consists of about 65 yards around the province (Gardner Pinfold, 2009). Another 45 or so firms provide support services. The sector serves mainly the fishing industry, but in recent years has diversified into pleasure craft (both sail and motorized). These yards and support services form an important element in the economies of many coastal communities (see Chapter 5).

3.2.1.10 TOURISM

Nova Scotia's location as a coastal province plays an important role in its success as a tourist destination; the majority of the tourist trade is directly related to coastal tourist resources, e.g., natural landscapes, biodiversity, waterfront developments, cultural landscapes, charismatic fauna, forests, Bay of Fundy tides, fossils, etc. As an industry, tourism contributes over \$1 billion to the provincial economy, ranging from \$1.27 in 2003 to \$1.33 billion in 2008 (Nova Scotia Tourism, Culture and Heritage, 2009). Regional tourism revenues are shown in Figure 3.15. The industry supported about 14,900 full time equivalent jobs in 2008 (Nova Scotia Tourism, Culture and Heritage, 2009). In the same year, there were 2.08 million overnight, non-resident visitors to the province. The average occupancy rate was 49%. The largest share of tourism-generated economic activity accrued to Halifax (\$655 million), followed by Cape Breton (\$208 million).



Source: NS Tourism, Culture and Heritage, Tourism Insights, <http://www.gov.ns.ca/tch/pubs/insights/>

Figure 3.15: Tourism revenues by region, 2004-2007

Visitors come mainly from within Canada; only 13% are international (9% from the United States and 4% from elsewhere). The majority of visitors are from other areas of Atlantic Canada (55%), Ontario (20%) and other parts of Canada (13%).

The industry can be broken into three expenditure-driven areas: cruise ship activity, marine recreational fishing and water-based recreational activities (Gardner Pinfold, 2009). As indicated in Section 3.2.1.8, the cruise sector is significant. In 2008, 125 cruise ships docked at the Port of Halifax, providing the province with 228,000 visitors through the summer season, and 50 cruise ships docked in Sydney, with 76,000 visitors. The contribution of the cruise ship industry to the Nova Scotia economy in 2008 was about \$38 million.

Recreational fishing includes salt-water and estuarine fishing from both chartered and privately owned vessels and generates approximately \$20 million in expenditures. Water-based recreational activities include ocean touring, e.g., whale watching, sightseeing, coastal hiking, diving, kayaking, as well as sailing, cruising and visiting beaches and other coastal/marine locations. These activities generate about \$270 to \$300 million in annual expenditures (Gardner Pinfold, 2009).

3.2.1.11 UTILITIES

Utilities include those entities that are engaged in: electrical power generation, transmission and distribution (including hydro, steam and internal combustion); natural gas distribution; water supply and sewerage, and other infrastructure services.

Nova Scotia Power Inc., a subsidiary of Emera Inc., currently supplies 470,000 customers with over 95% of the electricity in the province (Nova Scotia Department of Finance, 2007a). The company has a generating capacity of about 2,203 megawatts from five thermal plants, one large and 32 small hydroelectric plants, one tidal plant, three combustion turbines and several small privately run wind farms. The transmission system includes 5,000 km of transmission lines, 25,000 km of distribution lines and 200 substations. There are also five municipal electrical utilities in Antigonish, Berwick, Canso, Lunenburg and Mahone Bay that produce the other 5% of electricity used in the province (Service Nova Scotia and Municipal Relations, 2007).

Heritage Gas is developing the distribution of natural gas in the Halifax, Hants, Cumberland, Pictou and Colchester counties (Nova Scotia Department of Finance, 2007a). It currently services clients in Amherst, Dartmouth, Halifax, the Aerotech Park at the Robert Stanfield International Airport. The plan is to spend \$120 million in capital over five years to bring natural gas to 20,000 households and businesses in Nova Scotia (Heritage Gas, 2008).

Sixty per cent of Nova Scotians rely on a municipal water system for their drinking water, while the other 40% obtain their water privately (Nova Scotia Department of Environment and Labour, 2008). Municipal water supply is primarily for residential use (59% of users), while 25% is used for commercial, industrial or agricultural purposes and 16% is lost due to leakage (Nova Scotia Department of Environment and Labour, 2008). The sewerage system in Nova Scotia is not as extensive as the water distribution system, with only 25% of the population having access to central sewage collection and treatment facilities. The majority of sewage is disposed of through home septic systems (45%) and untreated discharge (30%). The Halifax Regional Municipality's (HRM's) Harbour Solutions Project is expected to reduce the untreated sewage discharge in the province by 20%.

GDP in Nova Scotia's utilities industry was \$594.2 million in 2007 (2002 chained Dollars; Nova Scotia Department of Finance, 2007a), representing 2.2% of the provincial GDP. During 2006, employment in Nova Scotia's utilities industry was 1,800, a decrease of 25% from 2005. Total wages and salaries in the industry was \$139.4 million in 2006 (Nova Scotia Department of Finance, 2007a), an increase of 1.6 % since 2005.

3.2.1.12 ROAD AND RAIL TRANSPORTATION

Historically, road networks were located around the coastline connecting coastal communities. In 1933 there was only about 32 km of paved road; by 1940 this had increased to 1,600 km (Library and Archives Canada, 2006). Today there is approximately 23,000 km of highway and 850 km of mainline train track in the province. Statistics Canada does not provide data specifically on road and rail transportation, but provides conglomerate data for the transportation and warehousing industry, which include road, rail, water, air and pipeline transportation of goods, and the warehousing and storage of goods. In 2007, transportation and warehousing contributed \$1,103 million (2002 chained Dollars) to the GDP of Nova

Scotia, which is 4.2% of the total GDP of the province. About 24% of the transportation and warehousing GDP of the province can be attributed to truck transportation by road.

Total capital expenditures in the transportation and warehousing industries were \$361.6 million in 2006 (Nova Scotia Department of Finance, 2007a). During the fiscal year 2006-7, the Province budgeted \$176.2 million in capital highway spending. An additional \$175 million was budgeted for road maintenance. In 2006, overall employment in this sector was 18,700 people.

3.2.2 Social Trends and Demographics

The Nova Scotia Department of Finance has developed a comprehensive social profile of Nova Scotia documented in *Nova Scotia Social Profile 2001-2006* (Nova Scotia Department of Finance, 2007b). This section highlights some of the more important social trends and demographics pertaining to human capital. Chapter 5.0 provides a more in depth analysis of the types of rural coastal communities found in Nova Scotia and their socio-economic characteristics.

3.2.2.1 DEMOGRAPHICS

In 2007, Nova Scotia's population was estimated as 934,100 people (Statistics Canada, 2008a, CANSIM Table 051-0001). All are affected by their proximity to the coast, and about 70% live in coastal communities (see Coastal Communities Network, 2004, 2009). The population in Nova Scotia remained static between the 1996 Census and the 2006 Census, growing by only 0.0005% per annum (Nova Scotia Community Counts, 2008), as opposed to the national average of 1%.

Table 3.7 provides data for Nova Scotia counties from the 1996, 2001 and 2006 censuses. Although the overall provincial population remains steady, one of the major trends is migration towards the urban core of HRM. According to the 2006 Census, over 40% of the province's population lives within this municipality (372,855 people). The next most highly populated urban area is the Cape Breton Regional Municipality (CBRM) in and around Sydney, which has a population of 105,930 (11.6% of Nova Scotia's population). Table 3.7 indicates the percentage population change at county level between 1996 and 2006. The only counties that experienced population growth were Halifax County (8.7%), Hants County (4.3%), Colchester County (1.5%) and Kings County (1.4%). Other counties decreased by as little as 0.9% (Lunenburg County) to as much as 17.1% (Guysborough County). Figure 3.16 shows the population density in each county for 2006.

Table 3-7: Population of Nova Scotia by county

<i>County</i>	<i>1996</i>	<i>2001</i>	<i>2006</i>	<i>% Change 1996-2006</i>
Total Nova Scotia	909,280	908,005	913,465	0.5
Central Core				
Halifax County	342,966	359,183	372,855	8.7
Hants County	39,483	40,513	41,180	4.3
Kings County	59,193	58,866	60,035	1.4
Colchester County	49,260	49,305	50,020	1.5
Southwest-Valley				
Lunenburg County	47,560	47,595	47,150	-0.9

<i>County</i>	<i>1996</i>	<i>2001</i>	<i>2006</i>	<i>% Change 1996-2006</i>
Yarmouth County	27,310	26,843	26,275	-3.8
Shelburne County	17,002	16,231	15,540	-8.6
Annapolis County	22,325	21,775	21,440	-4.0
Digby County	20,500	19,545	18,995	-7.3
Queens County	12,420	11,725	11,215	-9.7
Mainland Northeast				
Antigonish County	19,550	19,580	18,835	-3.5
Cumberland County	33,805	32,605	32,045	-5.2
Pictou County	48,720	46,965	46,510	-4.5
Guysborough County	10,920	9,825	9,055	-17.1
Cape Breton				
Inverness County	20,915	19,935	19,035	-9.0
Victoria County	8,485	7,960	7,595	-10.5
Cape Breton County	117,849	109,330	105,930	-10.1
Richmond County	11,022	10,225	9,740	-11.6

Source: Nova Scotia Community Counts, 2008

This demographic shift is attributable to the greater economic opportunities available in HRM. Factors such as the fisheries crisis in the 1980s and the closure of the steel and coal industries in Cape Breton contributed to making areas outside of HRM less economically attractive (Coastal Communities Network, 2004). In addition, higher proportions of youth are finishing high school and going on to post-secondary training, forcing them to migrate from rural areas.

Another important demographic shift is the aging population. Figure 3.17 shows the population pyramid for Nova Scotia, indicating that the largest number of people are found in the age groups from 40 to 60 years. About 15.1% of Nova Scotians are older than 65, and the population of seniors is expected to increase by 70 % within the next 20 years (Nova Scotia Community Services, no date). The birth rate in the province has dropped from 0.93 % in 2003/04 to 0.90 % in 2007/08, which will exacerbate the current trend. In 2007/08, the number of births was 8,372, while the number of deaths was 8,333, almost equalling the birth rate. Although still apparent, this trend is less obvious in Halifax County, where the proportion of younger people is greater, in contrast to rural coastal communities such as Digby and Glace Bay (Figure 3.17).

3.2.2.2 EDUCATION

In general, Nova Scotians are well-educated and becoming more so. Without a specialist study, it is not possible to determine the education status of coastal communities; information for the whole of Nova Scotia is presented as representative. In 2001, 15% of Nova Scotians had a Bachelor's degree or higher and 33.9% had a post-secondary diploma or certificate, as opposed to 11.5% and 29.7% in 1991 (Table 3.8). In 2006, the high school graduation rate was 85%, up 6% from 2001 (Nova Scotia Department of Finance, 2007b). The number of Nova Scotians without a high school diploma is dropping. In 1991, 39.4 % of Nova Scotians did not have a high school diploma; by 2001, this had dropped to 31.7%. This may

be a reflection of the growing trend in Nova Scotia toward a service-oriented, knowledge-based economy (see Section 3.2.1.1).

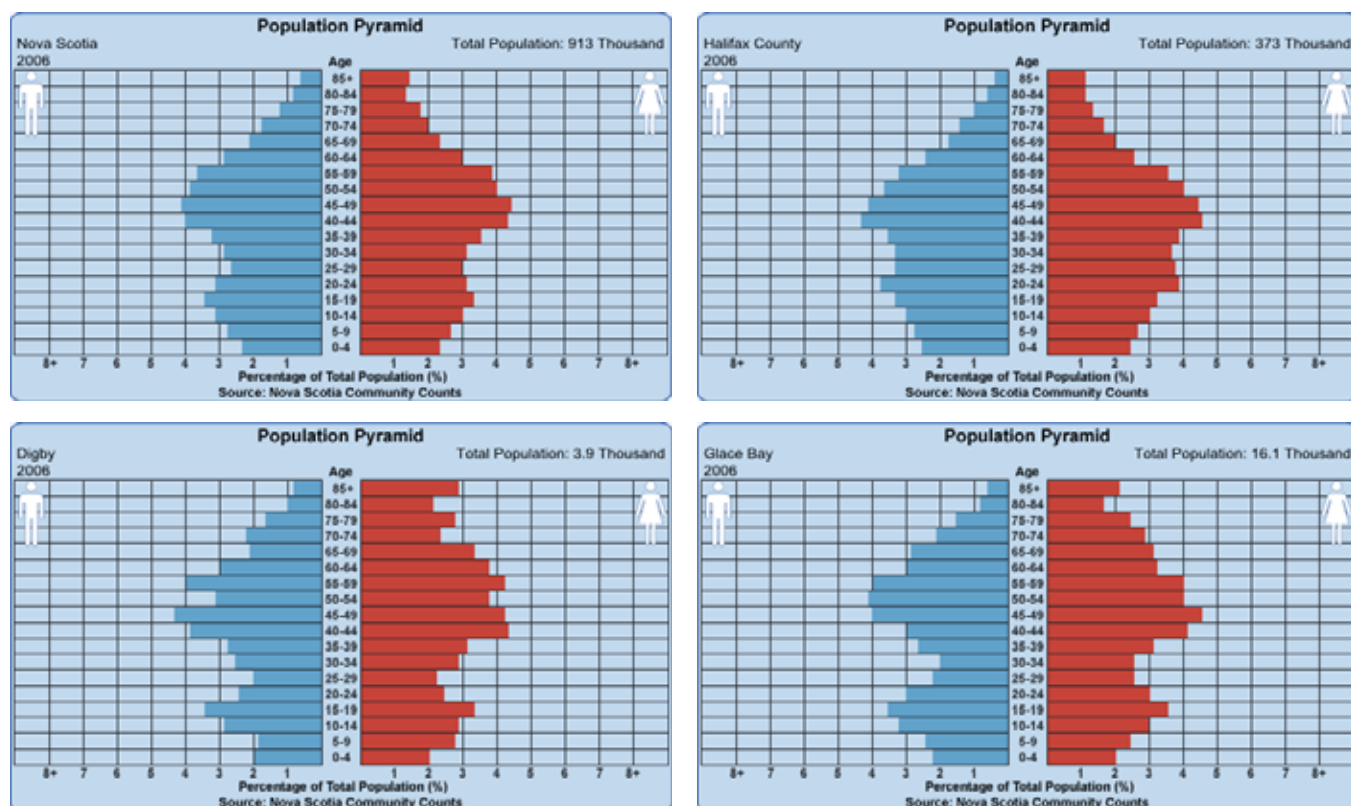


Figure 3.17: 2006 Population pyramids for Nova Scotia, Halifax County, Digby and Glace Bay (Source: Nova Scotia Community Counts, 2008)

Table 3-8: Educational attainment for people 20 years and older in Nova Scotia

	<i>1991 Census</i>		<i>1996 Census</i>		<i>2001 Census</i>	
	#	%	#	%	#	%
Total Reporting	639,380	100	658,055	100	670,930	100
Less than High School	252,085	39.4	233,530	35.5	212,670	31.7
Less than Grade 9	88,035	13.8	76,640	11.6	63,640	9.5
Without secondary school graduation certificate	164,050	25.7	156,890	23.8	149,030	22.2
High School Graduation Certificate	65,190	10.2	65,210	9.9	65,435	9.8
Some Post-Secondary Education	59,025	9.2	60,335	9.2	92,870	9.3
College	27,590	4.3	26,880	4.1	27,160	4.0
University	31,435	4.9	33,455	5.1	35,710	5.3
Post-Secondary Certificate or Diploma	189,645	29.7	210,985	32.0	227,360	33.9
College	152,655	23.9	170,020	25.8	209,395	31.2

	<i>1991 Census</i>		<i>1996 Census</i>		<i>2001 Census</i>	
	#	%	#	%	#	%
University	36,990	5.8	40,965	6.2	17,965	2.7
University Degree - Bachelor's or Higher	73,435	11.5	87,990	13.4	102,590	15.0

Source: Nova Scotia Community Counts, 2008

3.2.2.3 HEALTH

The overall health of a population may have implications for the economic development and well being of the province. While a healthy population tends to be more economically active, an unhealthy population tends to place stress on the province's resources. Table 3.9 provides some general statistics on the health of Nova Scotians.

Table 3-9: Community Health Survey 2007

Self-Reported Health Status	
Very good/excellent health	57%
Population with self-reported heart disease	6.10%
Population with self-reported diabetes	6.80%
Population with self-reported respiratory illnesses	12.70%
Population with self-reported hypertension	19%
Overweight (using body mass index)	57.50%
Personal Health Practices	
Population who are smokers	24.60%
Population who drink more than 5 drinks per week	11.80%
Population who drink more than 5 drinks per month	28.70%
Population who consume 5 servings of fruit/vegetables daily	34.70%
Population who are physically active/moderately active.	48.60%
Health Service Use	
Population who have a regular family doctor	94.30%
Population who had an overnight stay in a hospital, nursing or convalescent home in the past 12 months	8.20%
Population who had a flu shot in the past 12 months	40.60%

Source: Nova Scotia Community Counts, 2008

In general, Nova Scotians tend to be less healthy than Canadians as a whole. Life expectancy in Nova Scotia, although it has increased in the past decade, has remained below the Canadian average. For women born in 2004, life expectancy was 81.6 years in Nova Scotia compared to 82.6 years in Canada, and for men born in 2004, life expectancy was 76.5 years in Nova Scotia compared to 77.8 years in Canada (Nova Scotia Department of Finance, 2007b). In 2001, more Nova Scotians aged 15 and over reported having a disability that limited their everyday activities than in Canada (Nova Scotia Department of Finance, 2007b). Cancer incidence rates are also higher in Nova Scotia than in Canada, and cancer, along with circulatory disease, are among the leading causes of provincial deaths.

3.2.2.4 LABOUR, INCOME AND WEALTH

Labour Force

In 2006, Nova Scotia's labour force consisted of 476,125 people, of which 432,590 were employed (Nova Scotia Community Counts, 2008). The participation rate (or people wanting to work) of people over 15 in the labour force was 62.9% in 2006 (Table 3.10). This is lower than the Canadian rate of 67%; the only province with a lower participation rate is Newfoundland and Labrador (Nova Scotia Department of Finance, 2007b). The unemployment rate in the province has dropped dramatically since 1996. It was 13.3 in 1996 and had dropped to 9.1 by 2006 (Nova Scotia Community Counts, 2008a). This is still high compared to the Canadian unemployment rate of 6.0% (2007) (Statistics Canada, 2008a, Table 282-0002). The labour force statistics follow the same trends as the demographics. Labour force participation rates are highest in the Halifax County (68.9%) and lowest in Richmond County (52.0%); while unemployment rates are lowest in Halifax County (6.3%) and highest in Victoria County (26.1%). Likewise, the labour force is aging. Between 2000 and 2006, the number of people in the labour force aged 25-39 decreased by 19,200, while the number of people in the labour force aged 55 and above increased by 26,800 (Nova Scotia Department of Finance, 2007b). Labour force data are generally not available for coastal communities; labour participation rates for various types of coastal communities are, however, provided in Chapter 5.0.

Table 3-10: 2006 Labour participation rate, employment and unemployment in Nova Scotia by county

<i>County</i>	<i>Participation Rate (%)</i>	<i>Employment Rate (%)</i>	<i>Unemployment Rate (%)</i>
Total Nova Scotia	62.9	57.2	9.1
Central Core			
Halifax County	68.9	64.5	6.3
Hants County	63.6	58.6	7.9
Kings County	62.4	57.4	8.0
Colchester County	62.1	57.2	7.9
Southwest-Valley			
Lunenburg County	59.0	53.7	9.0
Yarmouth County	61.2	54.4	11.3
Shelburne County	60.9	51.1	16.1
Annapolis County	55.9	49.5	5.1
Digby County	58.8	51.2	12.9
Queens County	52.1	45.7	12.2
Mainland Northeast			
Antigonish County	65.7	59.5	9.4
Cumberland County	57.1	50.8	11.1
Pictou County	60.6	54.8	9.5
Guysborough County	54.8	46.5	15.2
Cape Breton			
Inverness County	59.8	50.8	15.0
Victoria County	61.4	45.3	26.1
Cape Breton County	53.0	44.5	16.2
Richmond County	52.8	43.9	16.6

Source: Nova Scotia Community Counts, 2008

Income and Wealth

Nova Scotians are considered to be financially less affluent than other Canadians. In 2005, two-parent families with children in Nova Scotia had an average total income that was 14.7 % lower than the average total income of all Canadians (Nova Scotia Department of Finance, 2007b). In 2006, the average household income of Nova Scotian households was \$57,366, and the average individual income was \$22,815 (Nova Scotia Community Counts, 2008). In 2005, approximately 5.2 % of all employees in Nova Scotia worked for minimum wage or less. Nova Scotia Community Counts analysed the 2001 household and individual incomes in Nova Scotia as presented in Figure 3.18. This indicates that the lowest incomes are in the rural areas (Whycomomagh IR 2, Cape Breton and Pomquet and Afton IR 23, Antigonish), and the highest are in Bedford.

Low income is defined as the income at which a family (or person) spends at least 20% more proportionately than the average on basic necessities (food, water, shelter), i.e., the lower the income, the higher proportion is spent on basic necessities. In 2006, approximately 10.3% of all Nova Scotian families and 35% of individuals 15 years and over experienced low income (Nova Scotia Community

Counts, 2000). In 2005, economic families of two persons or more faced an average low income gap of \$5,200, representing the amount of additional income they required to bring them above the low income level (Nova Scotia Department of Finance, 2007b).

Net worth (or wealth) of a person or family unit is correlated to income level. Current data for net worth are not available, although 1999 data provide an indication of the status in Nova Scotia. In 1999, families in Nova Scotia with after-tax income between \$20,000 and \$30,000 had accumulated \$57,328 in wealth, while families with after-tax income between \$50,000 and \$75,000 had accumulated \$163,000 in wealth (Nova Scotia Department of Finance, 2007b). Net worth of a family is also correlated to age and level of education. In 1999 the median amount of total assets of Nova Scotia families was \$98,800 compared to \$136,600 for Canadian families. The median amount of financial assets was \$13,383 for Nova Scotia families and \$16,500 for Canadian families (Nova Scotia Department of Finance, 2007b).

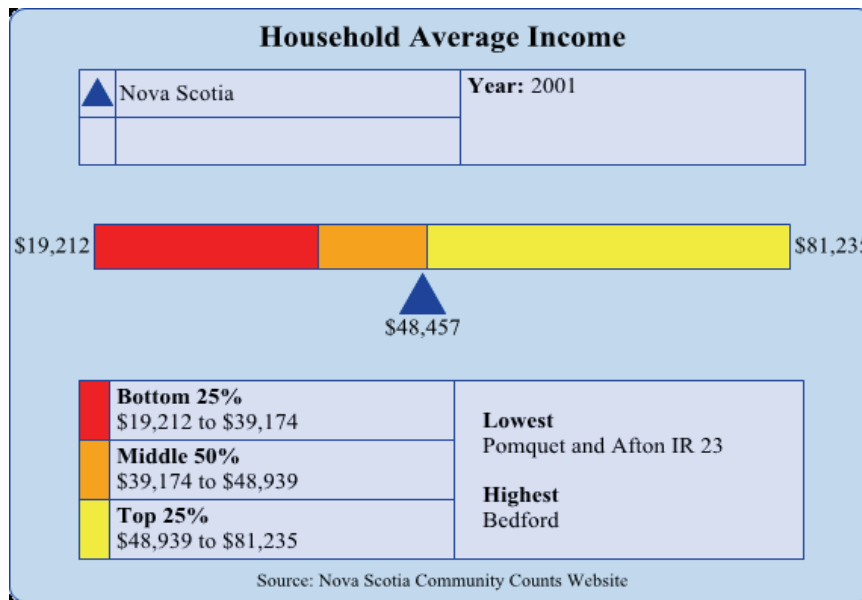
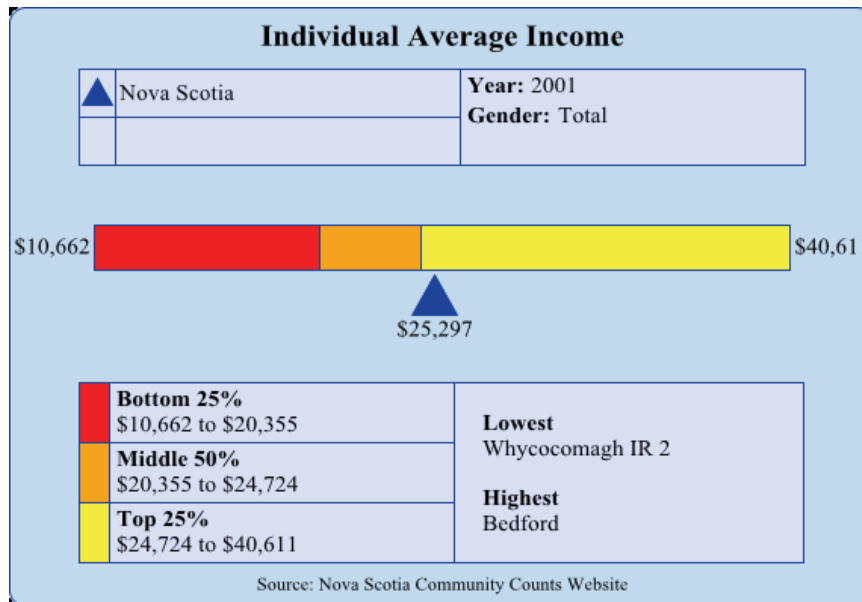


Figure 3.18 Individual and household incomes for Nova Scotia (2001)

3.2.3 Culture and Heritage

“Our heritage is part of the quality of life that makes Nova Scotia more desirable than other places” (Voluntary Planning Heritage Strategy Task Force, 2006). It is recognized that cultural heritage makes an economic contribution to the province by attracting tourists and new residents, and by stimulating spending. Singh (2004) estimated that the GDP of the cultural sector in Nova Scotia was \$570 million and provided about 13,100 jobs in 2001.

3.2.3.1 CULTURAL DIVERSITY

Culture is the way of life of a group of people. It encompasses the behaviours, beliefs, values, and symbols that they accept, generally without thinking about them, and that are passed along by communication and imitation from one generation to the next. The culture of Nova Scotia, as a Maritime province, is firmly rooted in links to the sea. This is reflected in Tourism Nova Scotia’s promotion of

Nova Scotia as “North America's original maritime culture where visitors are captivated by a culture of old world charm with a new world pulse, shaped by the sea and the spirit of Nova Scotians” (Department of Tourism, Culture and Heritage press release, November 26, 2007, <http://www.gov.ns.ca/news/details.asp?id=20071126010>).

Because of the intangible nature of many of the aspects of culture, the focus of this section is on the cultural diversity of Nova Scotia as represented by the groups of people that inhabit the province. In general, Nova Scotia's culture is influenced by several well established cultural groups, which are sometimes referred to as the "founding cultures", including the Mi'kmaq First Nation, Acadian, Gaelic and the Black Nova Scotian groups.

Archaeological evidence indicates that the Mi'kmaq of eastern Canada and northeastern United States first appeared here approximately 10,000 years ago (Mi'kmaq Resource Centre, 2008). The first inhabitants arrived from the west and lived as hunters and gatherers attuned to the shifting, seasonal resources of the area. The Mi'kmaw call the region “Mi'kma'ki”. During the summer months they hunted and fished, sometimes venturing out to sea to hunt whales and dolphins. Their winter camps were inland, built along rivers and lakes so that they could augment their hunting by spearing and trapping eels and other water creatures (Mi'kmaq Resource Centre, 2008). There is archaeological evidence of Mi'kmaq seasonal camps on Halifax Harbour, which was then called Kjipuktut or Chebucto. The Mi'kmaq travelled primarily by foot and boat and moved between coastal and inland areas along the province's rivers (Bird, 1955; Boileau, 2007; Dr. H. Millward, Department of Geography, Saint Mary's University, pers. comm., 2008). The tribal territory included all of what is now Nova Scotia and Prince Edward Island, the Gaspé Peninsula of Quebec, the north shore of New Brunswick and inland to the Saint John River watershed, eastern Maine, and part of Newfoundland, including the islands in the Gulf of Saint Lawrence as well as St. Pierre and Miquelon (Mi'kmaq Resource Centre, 2008).

The history of Nova Scotia's cultural development is dominated by the settlement of the various groups, most of whom settled on or near the coast (see also Section 3.3.1). The first European settlers were the French, who founded Acadia in 1604. Nova Scotia was briefly colonized by Scottish settlers in 1620, though by 1624 the Scottish settlers had been removed by treaty, and the area was turned over to the French until the mid-18th Century. After the defeat of the French and prior to the expulsion of the Acadians, settlers of English, Irish, Scottish and African descent began arriving on the shores of Nova Scotia (Choyce, 2007; Clark, 1968; Gwyn, 1998). There was also some settlement by German protestants in the 1750s in the Lunenburg area, encouraged by George III (House of Hanover).

Settlement was greatly accelerated by the resettlement of Loyalists to Nova Scotia during the period following the end of the American Revolutionary War. It was during this time that a large African Nova Scotian community took root, populated by freed slaves and Loyalist blacks and their families, who had fought for the crown in exchange for land. This community grew further when the Royal Navy intercepted slave ships destined for the United States and deposited these free slaves on Nova Scotia's shores.

Later in the 19th century, the Irish Famine and, especially, the Scottish Highland Clearances resulted in large influxes of migrants with Celtic cultural roots, which defined the dominantly Celtic character of

Cape Breton and the north mainland of the province. This Gaelic influence continues to play an important role in defining the cultural life of the province, and around 500 to 2,000 Nova Scotians today are fluent in Scottish Gaelic. Nearly all live either in Antigonish County or on Cape Breton Island.

Modern Nova Scotia is a mix of many cultures, although the government works particularly to support the founding cultures through the establishment of specific offices, i.e., Aboriginal Affairs, Acadian Affairs, Gaelic Affairs and African-Nova Scotian Affairs (see http://www.gov.ns.ca/tch/culture_diversity.asp). Table 3.11 indicates the current diversity of population based on ethnic origin. In 2006, approximately 88.5% considered themselves to be of British origin; 19.5% were of French (Acadian and other) origin, and 23.8% were of other European origin. The Aboriginal population makes up approximately 5.5% of the people of Nova Scotia, of which 1.3% are Inuit and Métis. African Nova Scotians make up only 1.1% of the population of the province, while other cultures make up another 3.5% of the population. English is the predominant language, with 96% speaking only English in the home and 97.8% speaking only English at work (2006 Census) (Nova Scotia Community Counts, 2008). This compares to 65.9% and 76.4% respectively for Canada. 1.9% of Nova Scotians speak only French at home and 0.1% speak French and English at home. For Canada, 21.2% speak only French at home while 0.3% speak English and French at home (2006 Census, Nova Scotia Community Counts, 2008). Only 1.7% speak another, non-official language at home.

Table 3-11: Population of Nova Scotia by ethnic origin

<i>Ethnic Origin</i>	<i>1996 Census</i>		<i>2001 Census</i>		<i>2006 Census</i>	
	<i>Number</i>	<i>Percentage (%)</i>	<i>Number</i>	<i>Percentage (%)</i>	<i>Number</i>	<i>Percentage (%)</i>
Total Reporting	899,970	100.0	897,570	100.0	903,090	100.0
Canadian	324,495	36.1	425,880	47.4	368,940	40.9
Aboriginal*	26,265	3.0	33,995	3.8	49,070	5.5
British	828,705	92.2	709,810	79.1	799,420	88.5
French	181,465	20.1	160,960	17.9	176,365	19.5
American	3,915	0.4	4,380	0.5	5,945	0.7
European	199,575	22.1	185,700	20.8	214,080	23.8
Arab	7,270	0.8	8,170	0.9	8,855	1.0
African	8,355	1.0	9,645	1.1	9,805	1.1
Asian	9,890	1.0	10,370	1.2	13,600	1.5
Central & South America	70	0.0	240	0.0	135	0.0
Caribbean	2,055	0.2	1,935	0.2	2,355	0.3

Notes:

- Source: Nova Scotia Community Counts, 2008: data modelled from Statistics Canada, Census of Population, 1991, 1996, 2001, 2006.
- Percentages will not equal 100, as both single and multiple responses have been used. These data are from Statistics Canada's standard profile series, and include fewer responses and categories than represented on the Statistics Canada web site.
- The above data are derived from the Census long form (20% of the population).
- Please note that a value of 0 may represent a true zero count, unavailable data or suppressed data.
- Detailed data are suppressed for communities with population less than 100.

- *Aboriginal includes those who self-identify as Aboriginal as part of the Statistics Canada Census of Population. The Province of Nova Scotia uses Aboriginal Identify Population numbers (also from Statistics Canada) rather than the broader category of Aboriginal Origin. For comparison purposes the Aboriginal Identity population numbers for the three census years would be:
 - 1996 – 12, 380 (1.4%)
 - 2001 – 17,010 (1.9%)
 - 2006 – 24,175 (2.7%)

Through the Office of Immigration, the Province is trying to attract an immigrant population to the province to promote cultural diversity and economic development. Table 3.12 provides a summary of immigration statistics to the province since 1996. In 2006, only 5% of the population was made up of immigrants, of which only about 11,000 have immigrated to Nova Scotia since 1996 (Nova Scotia Community Counts, 2008).

Table 3-12: Immigration statistics for Nova Scotia (1996-2006)

<i>Immigrant Status</i>	<i>1996 Census</i>		<i>2001 Census</i>		<i>2006 Census</i>	
	<i>Number</i>	<i>Percentage (%)</i>	<i>Number</i>	<i>Percentage (%)</i>	<i>Number</i>	<i>Percentage (%)</i>
Canadian Citizen	886,015	98.4	883,450	98.4	887,990	98.3
Non-Canadian	13,955	1.6	14,120	1.6	15,095	1.7
Non-Immigrant	856,405	95.2	853,655	95.1	854,495	94.6
Immigrants	41,955	4.7	41,315	4.6	45,190	5.0
Non-Permanent Residents	1,605	0.2	2,595	0.3	3,400	0.4

Notes:

- Source: Nova Scotia Community Counts, 2008: data modelled from Statistics Canada, Census of Population, 1991, 1996, 2001, 2006.
- The above data are derived from the Census long form (20% of the population).
- Please note that a value of 0 may represent a true zero count, unavailable data or suppressed data.
- Detailed data are suppressed for communities with population less than 100.

3.2.3.2 HERITAGE RESOURCES

Heritage is defined as that which society inherits from previous generations and deems worthy of taking special measures to preserve for future generations including tangible and intangible cultural and natural heritage (Nova Scotia Tourism, Culture and Heritage, 2008). Tangible cultural heritage includes artefacts, buildings and records, while intangible cultural heritage includes folklore, language and oral history. The focus of this section is on tangible heritage resources and the information repositories for intangible cultural heritage, e.g., archives and museums. Cultural diversity, which is part of the intangible cultural heritage, is discussed in Section 3.2.3.1. Natural heritage is recognised as critical and is discussed in Section 3.1, as well as Chapter 9.

The heritages resources of Nova Scotia are rich and varied. A brief summary of some of the major resources is provided below.

Archaeological Sites

Archaeology is the systematic study of past human life and culture by the recovery and examination of remaining material evidence, such as graves, buildings, tools and pottery (Voluntary Planning Heritage

Strategy Task Force, 2006). According to the Nova Scotia Department of Tourism, Culture and Heritage, there are currently 1541 known archaeological sites in the province (Figure 3.19), of which about 49% are along the coast (Bob Ogilvie, Heritage Division, Department of Tourism, Culture and Heritage, pers. comm., 2008). It is also acknowledged that a large, but unknown, number of pre-Contact sites have been lost over the centuries.

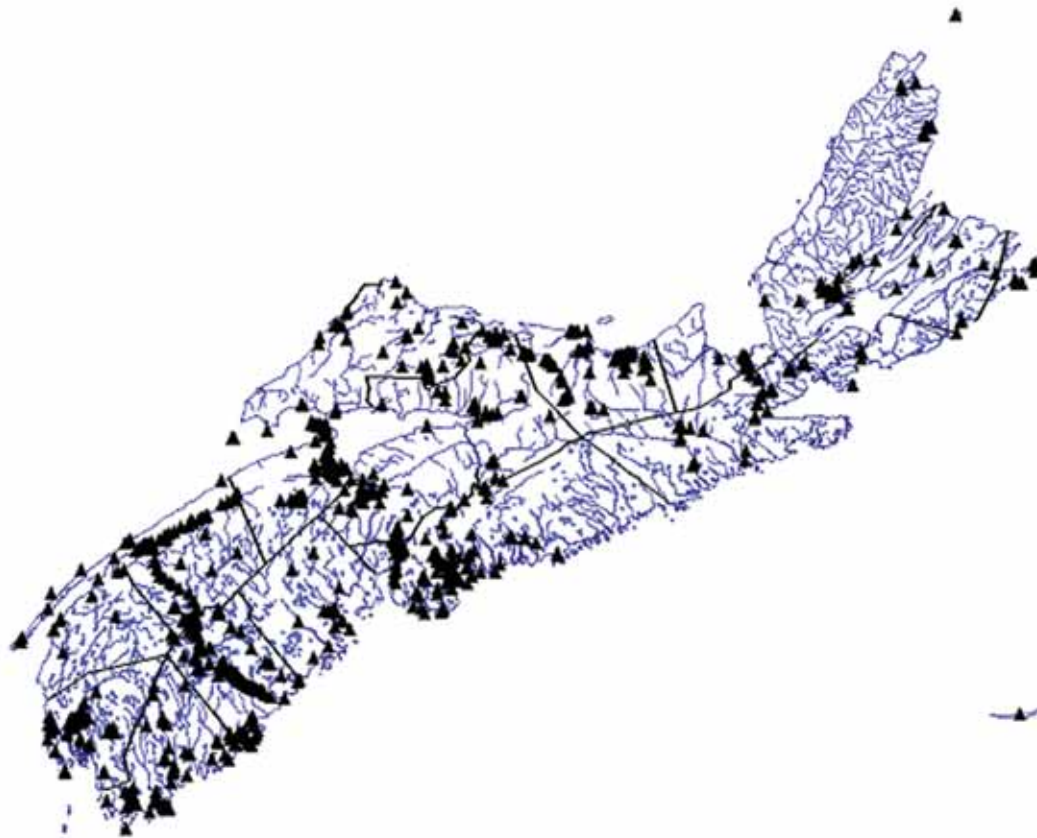


Figure 3.19: Known archaeological sites in Nova Scotia (Source: Special Places Program, Department of Tourism, Culture and Heritage)

To protect the sites, information on many is confidential. Further, there is no full audit or inventory of heritage resources in Nova Scotia, nor comprehensive site monitoring. Information, however, is available on sites that have been excavated and on some of the more famous archaeological locations. Early archaeological work has included investigation at a variety of shell middens or kitchen middens including those at French Village (1863), St. Margarets Bay (1867), Cole Harbour (1867), Merigomish Harbour (1914) and Mahone Bay (1929); there has also been investigation of the Mi'kmaq petroglyphs at Kejimkujik and McGowan Lakes (1888) (Nova Scotia Museum, 2008a).

Some of the most well-known coastal archaeological sites include:

- Fortress Louisbourg, Cape Breton - Louisbourg was a large French settlement founded in 1713, fortified in the 1730s, besieged twice by New Englanders and the British, and finally demolished and abandoned by the British in the 1760s. Relatively untouched since the fall of the Fortress, the remnants of the colonial settlement have survived the centuries in a remarkable state of preservation.

Extensive archaeological excavations and historical research in the mid-20th century guided the partial reconstruction of the fortified town and defensive walls. Approximately 25% of the Fortress has been brought to life and stands as the largest reconstruction project in North America (see <http://fortressoflouisbourg.ca/ArchaeologyE/SiteInformation.html>);

- Belleisle, Annapolis County – Belleisle was an Acadian settlement in 1679, upriver from Annapolis Royal. It was excavated in 1983, providing valuable insights into early Acadian life (see <http://museum.gov.ns.ca/arch/sites/belleisl/belleis.htm>);
- Birchtown, Shelburne County – Birchtown was a Black Loyalist settlement dating back to 1784, which was investigated in 1993 (see <http://museum.gov.ns.ca/arch/sites/birch/>);
- Shubenacadie Canal, Halifax County – Built between 1826 and 1853, the Shubenacadie Canal is the most significant 19th century canal development project in the Maritimes. The Fletcher Lock has been declared a Designated Special Place under Nova Scotia's *Special Places Protection Act* (see <http://museum.gov.ns.ca/arch/sites/shubie/shubie.htm>);
- Central Trust Site, Halifax Co. - During construction of the Central Trust Tower in downtown Halifax in 1984, structural debris and numerous 18th century artefacts were uncovered. Archaeologists and volunteers were given permission to conduct a rescue recovery of archaeological deposits in the northwest corner of the construction area. Approximately 1,000 artefacts were recovered, many dating to the first decades after the founding of Halifax in 1749 (see <http://museum.gov.ns.ca/arch/sites/central/ctintro.htm>); and
- Port Morien French Mine, Cape Breton – The mine at Port Morien, Cape Breton was established by the French in 1720 (see <http://museum.gov.ns.ca/places/morien/morien.htm>) and was the first coal mining operation in North America. The site is protected under the *Nova Scotia Special Places Protection Act*.

Erosion of Heritage

Heritage resources throughout the province are being threatened by changing sea level and erosion of the coastline. An example of this is the story of the West Pubnico Aboiteau, Yarmouth County.

In 1990, local residents found a couple of boards sticking out of an eroding beach on Double Island, West Pubnico, southwestern Nova Scotia. They returned to the site in 1994 and removed the overburden of marsh mud and gravel to reveal the presence of a wooden sluice known to the Acadians as an aboiteau. An aboiteau is a simple sluice used by the Acadians to drain salt marshes for the purpose of crop cultivation.

Nova Scotia Museum staff visited the site on October 3, 1995. It was apparent that the aboiteau was in danger of being lost to erosion as it was already partially exposed to the elements. The dyke which was associated with the aboiteau has completely washed away. Upon return to the Nova Scotia Museum a second trip to the site was planned to remove the structure, with excavation assistance by the Pubnico community.

On October 24, 1995 the marsh mud and gravel was carefully removed from the top and sides of the aboiteau with shovels and hoe. After the structure was photographed it was lifted by hand and placed on a specially designed "aboiteau stretcher" for transportation to a nearby garage for conservation and storage. An examination of the exposed portion of the aboiteau revealed that the wood (white pine) was very soft and water saturated and would require immediate conservation. The aboiteau was washed and the soaked in a solution of polyethylene glycol for several months. It was removed and allowed to dry slowly. It has now been given pride of place at the Acadian Museum in West Pubnico.

(Source: <http://museum.gov.ns.ca/arch/sites/aboiteau/aboit1.htm>).



Photograph from:

<http://www.museeacadien.ca/gallery/gallery.htm>

Paleontological Sites

Paleontology is the study of the forms of life existing in prehistoric or geological times as represented by the fossils of plants, animals and other organisms. Nova Scotia is widely known for the quality of its fossil sites, due to the lengthy coastal exposures and the variety of fossils they offer to researchers (Bob Ogilvie, Heritage Division, Department of Tourism, Culture and Heritage, pers. comm., 2008). Though the recently declared World Heritage Site at Joggins is perhaps the most widely known, world class exposures are found at many other locations in the province and almost all of these are coastal (Figure 3.20).

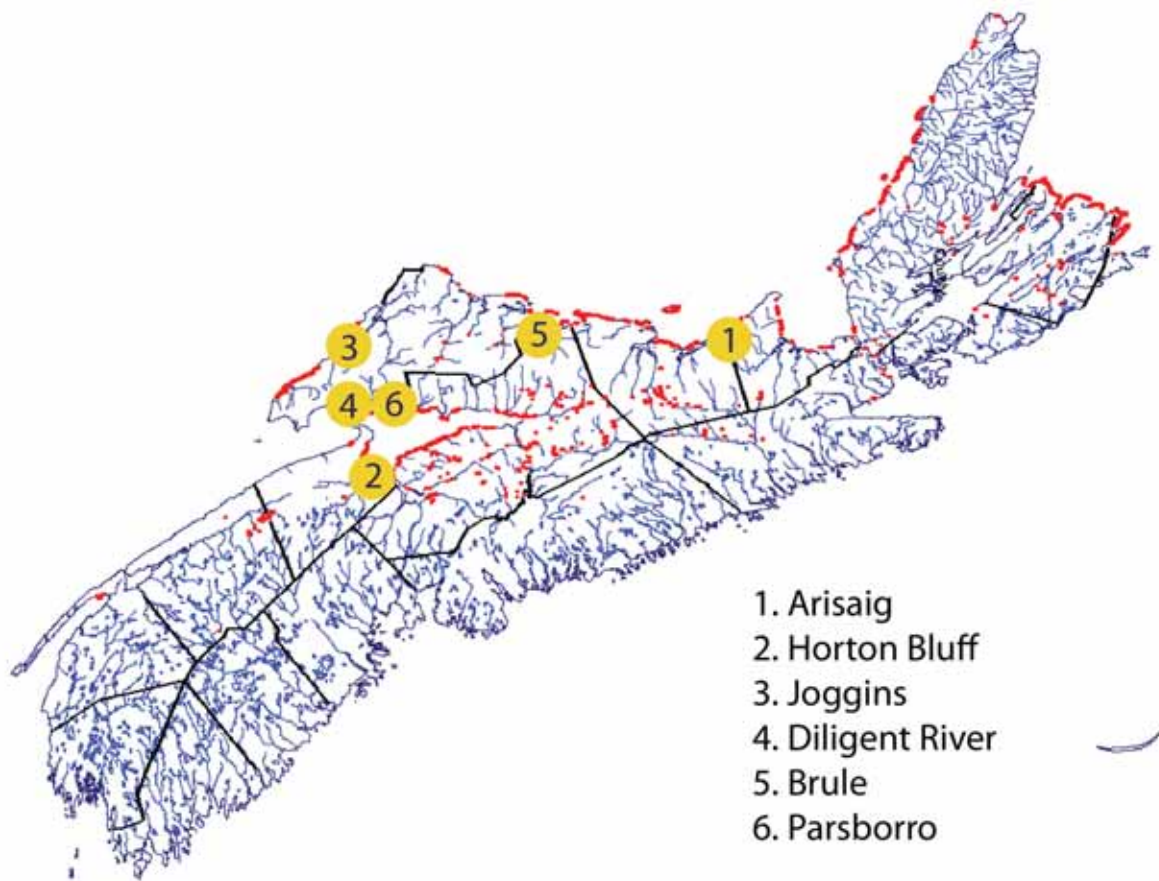


Figure 3.20: Fossil sites in Nova Scotia (Source: Special Places Program, Department of Tourism, Culture and Heritage)

Major coastal fossil sites of national and international importance include (see Figure 3.20):

- Arisaig Sea Cliffs (Silurian Period: 438 - 408 million years ago) - The sea-cliffs at Arisaig represent the longest unbroken sequence of 400 million-year-old rocks in North America. This stretch of shoreline is one of the continent's best locations for studying rocks and fossils of this age. It represents a continuous, chronological record of a time when there was more life in the seas than there was on land. Arisaig's cliffs and the fossils in them were deposited in an ancient sea more than 200 million years before the evolution of dinosaurs (see <http://museum.gov.ns.ca/fossils/amazing/arisaig.htm>). A portion of the cliffs fall within the Arisaig Provincial Park.
- Horton Bluff Footprints (Lower Carboniferous Period: 360 - 310 million years ago) - The trackway (set of footprints), found at Horton Bluff, is 20 m long and includes 27 exceptionally large fossilized amphibian footprints. No bones from a creature old enough and large enough to have made these tracks have ever been found in Canada (see <http://museum.gov.ns.ca/fossils/amazing/horton.htm>).
- Joggins Fossil Cliffs (Upper Carboniferous Period (310 - 290 million years ago) - The fossil cliffs of Joggins are a world-class palaeontological site located near the head of the Bay of Fundy (see <http://museum.gov.ns.ca/fossils/sites/joggins/index.htm>). This area is subjected to some of the world's highest tides, over 15 m. The tidal action causes steady erosion of the 23 m high cliffs, constantly revealing new fossils. The cliffs have yielded fossils which give an unprecedented glimpse into life during the Carboniferous Period including a rich variety of flora, a diverse amphibian fauna, exciting *Arthropleura* trackways and some of the world's first reptiles. At Joggins, the rare remains of the

earliest true reptiles have been found inside fossilized tree stumps. The Joggins Fossil Cliffs are protected under the provincial *Special Places Protection Act* and, in 2008, designated as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site.

- Diligent River Trackways (Upper Carboniferous Period: 310 - 290 million years ago) - There are at least four different styles of trackways found at Diligent River, Nova Scotia, including some with serpentine marks left by dragging tails (see <http://museum.gov.ns.ca/fossils/amazing/diligent.htm>);
- Brule Trackway (Permian Period: 286 - 245 million years ago) - In 1994 a rare fossil find was made on the shores of the Northumberland Strait at Brule. This site is the only example of a fossilised *Walchia* (primitive conifer) forest ever found in its original growth position. Animal tracks meander along the ancient forest floor, providing the oldest evidence of herding behaviour in animals (see <http://museum.gov.ns.ca/fossils/amazing/brule.htm>).
- Parrsboro Fossil Site (Jurassic Period: 201 - 144 million years ago) - The Parrsboro Fossil Site, located on Wasson's Bluff, on the shores of the Bay of Fundy, 6 km from Parrsboro, was designated a Special Place under the terms of the *Special Places Protection Act* on March 1, 1990. It comprises the largest discovery ever made in North America of vertebrate fossils from that period and provides the strongest evidence so far supporting a mass extinction prior to the emergence of dinosaurs and mammals (see <http://museum.gov.ns.ca/fossils/sites/parrs/index.htm>).

Historic Places

National historical sites are nationally recognised as important historical heritage sites, reminding us of our history, culture and tradition. Parks Canada has the mandate to maintain and protect these national sites. Nova Scotia is currently home to 24, of which the majority are close to the coastline (Parks Canada, 2008).

Of particular interest is the UNESCO World Heritage Site at Lunenburg. Lunenburg is the best surviving example of a planned British colonial settlement in North America. Established in 1753, it has retained its original layout and overall appearance, based on a rectangular grid pattern drawn up in England. The inhabitants have managed to safeguard the city's identity throughout the centuries by preserving the wooden architecture of the houses, some of which date from the 18th century.

Other historic places include culturally altered landscapes, heritage buildings, lighthouses, cemeteries, churches, parks and bridges. The Nova Scotia Historic Places Initiative (Heritage Division, Nova Scotia Department of Tourism, Culture and Heritage) was established in 2003 to promote the protection of Nova Scotia's historic places, and currently lists 802 historic properties in its database (see <https://eapps.ednet.ns.ca/HPIPPublic/propertysearch.aspx>).

Cemeteries have been recognised as important heritage resources, particularly for those interested in personal or community genealogy and history. Unfortunately there is no comprehensive inventory of the cemeteries of Nova Scotia.

Lighthouses are another important heritage resource, particularly considering Nova Scotia's nautical history and current role as a port province on the east coast of North America. Nova Scotia has the largest number of lighthouses in Canada (~165) and some of the oldest (Figure 3.21). Sambro lighthouse, built in 1758, is the oldest operating lighthouse in North America (Nova Scotia Lighthouse Preservation

Society, 2008). All of Nova Scotia's lighthouses have been automated and de-staffed. Some are in the care of communities and are open to the public (Nova Scotia Lighthouse Preservation Society, 2008). Not all are in good working order. The following are some of the lighthouses (or associated buildings) that are in danger of being lost through neglect and environmental conditions (Nova Scotia Lighthouse Preservation Society, 2008):

- Bear River: Decommissioned wooden lighthouse;
- Cape Roseway: Dwellings and old fog alarm building;
- Country Island: Keeper's house (one house was burned in 2005);
- Cross Island: Keeper's houses;
- Devils Island: Wooden lighthouse and keeper's house;
- French Point (Musquodoboit Harbour): Wooden lighthouse;
- Georges Island: Keeper's house;
- Green Island: Keeper's house and old lighthouse (one house burned in 2005);
- Guyon Island: Keeper's houses;
- Ingonish Island: Concrete lighthouse and keeper's house;
- Isaac's Harbour: Combined dwelling/lighthouse;
- Margaree Island: Lighthouse and dwelling;
- Moshers Island: Keepers' houses and small fog alarm building;
- Peases Island: Keeper's duplex;
- Queensport (Rook Island): Combined dwelling/lighthouse;
- Sambro Island: Dwellings and gas house;
- Seal Island: Lighthouse, built 1831, the second oldest timber lighthouse in Canada, radio operator's house and barn; and
- Saint Paul's Island: Southwest lightkeeper's house and wireless operator's house at Atlantic Cove.

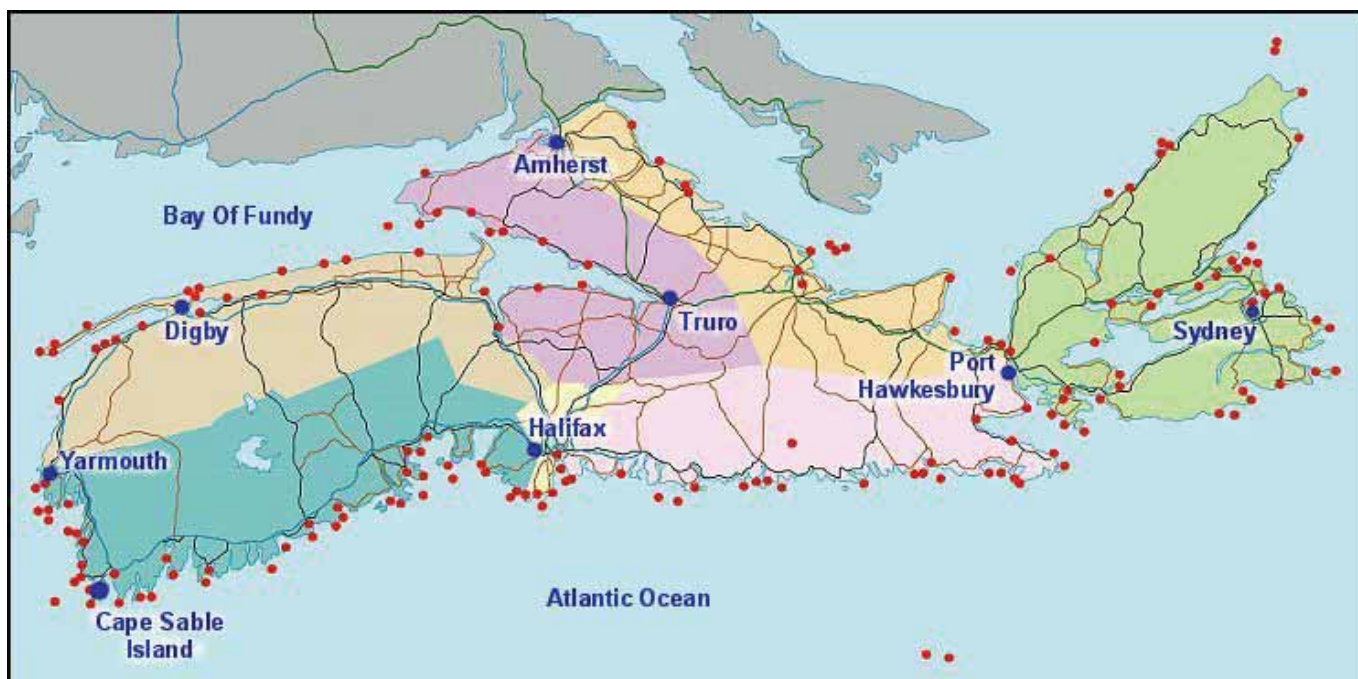


Figure 3.21: Nova Scotia's lighthouses (Source: Nova Scotia Lighthouse Preservation Society, 2008)

The *Heritage Lighthouse Protection Act* has been passed and is due to come into force in 2010. This will allow some of the lighthouses in Nova Scotia to be designated as heritage lighthouses and protected under the Act.

Underwater Cultural Heritage

“Underwater cultural heritage means all traces of human existence having a cultural, historical or archaeological character which have been partially or totally under water, periodically or continuously, for at least 100 years” (*United Nations Convention on the Protection of Underwater Cultural Heritage*, 2001). There is little information available on submerged settlements; but Nova Scotia has a wealth of shipwrecks along its coastline (Voluntary Planning Heritage Strategy Task Force, 2006). In fact, it is estimated that Nova Scotia has over 25,000 shipwrecks (Figure 3.22), of which about 5,000 are recorded in the Nova Scotia Museum’s database (Maritime Museum of the Atlantic, 2008). Only a small percentage of these have been documented as to their true location and condition.

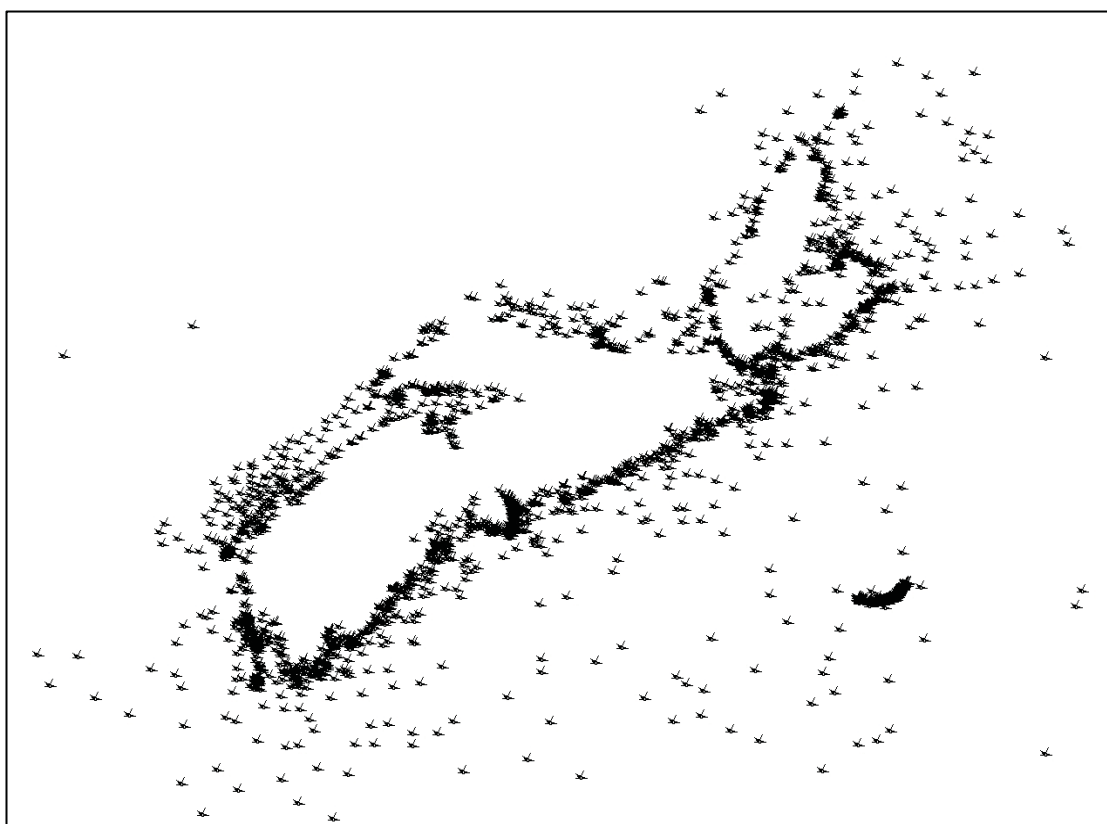


Figure 3.22 Shipwrecks off Nova Scotia’s coast define the province’s coastline
(Source: Special Places Program, Department of Tourism, Culture and Heritage)

Geological Sites

As detailed in Section 3.1, Nova Scotia has a diverse geological history with a wide variety of unique rocks, fossils, minerals and landforms (Atlantic Geoscience Society, 2001). Many geological sites have become part of the province’s heritage as they have played a major role in the historical development of communities and are major tourist attractions. Donahoe *et al.* (2005) cite more than 60 geological sites of interest that have such status. Examples include: Peggy’s Cove with its glacial-striated granite boulders

and rocks; the Halifax Citadel situated on a prominent drumlin comprising glacial till; Porcupine Mountain with its granite aggregates that contributed to the construction of the Canso Causeway; the Old French Mine in Port Morien which, established in 1723, was the first coal mine in North America, and Joggins, with its internationally-renowned Triassic fossil deposits and columnar basalt on the North Mountain.

Archives and Museums

Archives and museums are critical to the preservation of both tangible and intangible cultural heritage resources. The provincial government provides approximately \$16 million annually to fund the provincial museum system and more to fund the 67 community based museums and archives in the province.

Nova Scotia Archives and Records Management (Department of Tourism, Culture and Heritage) acquires, preserves and makes available the province's documentary history stretching back 300 years (Voluntary Planning Heritage Strategy Task Force, 2006). In 1998, the new *Public Archives Act* limited Nova Scotia Archives and Records Management to preserving archival records of provincial government departments, agencies, boards and commissions, and private sector records of provincial scope. Municipalities are encouraged to take care of their own records (Voluntary Planning Heritage Strategy Task Force, 2006), and some of the Nova Scotia Archives and Records Management records were transferred to more appropriate archives. Nova Scotia Archives and Records Management online database can be accessed at <http://www.gov.ns.ca/nsarm/>.

The Nova Scotia Museum is the most decentralized museum in Canada, made up of 27 museums across the province, including over 200 historic buildings, living history sites, ships, specialized museums and close to a million artefacts and specimens (Nova Scotia Museum, 2008b). These resources are managed either directly or through a system of cooperative agreements with societies and local boards.

The Nova Scotia Museum was created by the *Nova Scotia Museum Act* and is mandated to collect, research and document Nova Scotia's natural and human history; provide exhibits, programs, buildings and publications for self-directed learning, and help Nova Scotia tourism by developing and maintaining high quality museums. Of the 27 museums, nine are directly linked to Nova Scotia's Maritime heritage (although others may be indirectly linked); these include:

- The Maritime Museum of the Atlantic, Halifax (see <http://museum.gov.ns.ca/mma/index.html>);
- Fisheries Museum of the Atlantic, Lunenburg (see <http://museum.gov.ns.ca/fma/>);
- Dory Shop Museum, Shelburne (see <http://museum.gov.ns.ca/dory/>);
- Fundy Geological Museum, Parrsboro (see <http://museum.gov.ns.ca/fgm/en/home/default.aspx>); and
- Fisherman's Life Museum, Jeddore Oyster Pond (see <http://museum.gov.ns.ca/flm/>);
- Museum of Natural History (see <http://museum.gov.ns.ca/mnh/index.htm>);
- The Acadian Village of Nova Scotia / Le Village Historique Acadien de la Nouvelle-Écosse (see <http://museum.gov.ns.ca/av>);
- Lawrence House Museum (see <http://museum.gov.ns.ca/lh/index.htm>); and
- Sherbrooke Village (see <http://museum.gov.ns.ca/sv/index.php>).

3.3 Built Environment

The built environment refers to the human-made, physical structures built upon the Nova Scotian landscape. This includes buildings, such as houses and factories, as well as non-building developments, such as roads, power poles and wharves. Land use activities take place within the built environment (Hodge, 2003), and the latter is a product of Nova Scotia's natural, social, cultural and economic resources. The opportunities and challenges that the province has faced throughout its history are reflected in settlements, architectural styles, building sizes, roads and other physical characteristics. The built environment reflects our past and provides a foundation for the future. It is identified by the Province as an important foundation for sustainable prosperity and provides the nexus between financial, natural, human and social foundations (see Section 3.4.4; Nova Scotia Community Services, no date).

Coastal areas were the first places settled in the province and continue to provide homes, workplaces and recreation areas for residents and visitors. Understanding the history and nature of the built environment in coastal areas is, therefore, essential for informing decisions regarding effective coastal management. The built environment is connected to other key aspects of the coast as discussed in this report. For example, what is built or developed along the coast can either facilitate or block coastal access. Activities that are part of working waterfronts influence what gets built on the coast. The built environment impacts upon coastal ecosystems, habitats and coastal water quality, while sea-level rise and coastal storm events in turn impact upon structures and infrastructure in the built environment.

This section provides a historical overview of development patterns and linkages, current development patterns and linkages, as well as types of coastal land use and development. Further information on coastal development can be found in Chapter 4.

3.3.1 Historical Development Patterns and Linkages

This historical overview demonstrates how coastal settlements evolved, became connected and linked through transportation and communication networks. These patterns set the stage for understanding coastal development, coastal access, working waterfronts and human impact on the coastal environment. Nova Scotia's past is indivisible from the history of its coastal use and settlement. The Atlantic Ocean and its harbours provided a living, a means of transportation and a portal to the rest of the world. There is a long-standing pattern in the province of economic rise accompanied by settlement expansion during war times, followed by periods of decline and community hardship. Its well-established naval bases and maritime industries allowed Nova Scotia to thrive during times of war. From the American Revolution and Napoleonic wars up to World War II, Nova Scotia provided a safe base and supplies for British, then Canadian and American navies.



Figure 3.23: Samuel de Champlain's view of the Atlantic Region in 1632 (Source: Clark, 1968)

As indicated in Section 3.2.3.1, ancestors of the Mi'kmaq First Nation are the first known inhabitants of the province. They did not build permanent settlements, but rather moved according to the seasons and available resources. In warmer summers they lived in coastal areas and subsisted on fishing, shellfish harvesting and hunting marine mammals and birds. Winters took them to sheltered forests inland where they survived on hunting and gathering.

During the 16th and 17th centuries Europeans in pursuit of cod and whales landed on the shores of Nova Scotia, occasionally erecting temporary structures in the summer from where they traded European goods for fur and fresh meat from the Mi'kmaq. Early explorers and missionaries regarded Nova Scotia as covered with dense forest and difficult to settle, apart from the areas where overflows of the sea and freshwater had exposed the land (Bird, 1955; Boileau, 2007).

As Britain and France ramped up their struggle for colonial control over North America, Nova Scotia grew in strategic importance. In 1605 Samuel de Champlain established Port Royal, followed by other temporary military outposts and colonies on the coast such as those at Ste. Croix and La Have. Figure 3.23 is a map by Samuel de Champlain of the Atlantic region. The identified settlements were located based on security, shelter from the sea and strategic vantage points (Bird, 1955; Boileau, 2007). In the early 1700s, the French built Louisbourg, a fortress on Cape Breton, from where they intended to protect their interests in fishing and colonial expansion in North America (Bird, 1955).

The French Acadians skillfully recovered land from the Bay of Fundy using dykes and converted it to productive farmland. On tidal land in the Annapolis Basin, the Acadians kept livestock and cultivated rye, corn, oats, apples and variety of root vegetables. Acadians were self-sufficient, with a flourishing, technically-advanced, export-oriented agriculture (Gwyn, 1998; Parker, 2006). The agricultural and built forms established by the early Acadians were quite distinct from the built form of Ontario farmsteads and Western boomtowns (Gentilcore *et al.*, 1993).

Over time other settlements appeared in safe harbours around the Minas Basin and Chignecto Bay, centered on fishing or farming. Although forestry was an important early industry, it resulted in far less permanent settlement than either fishing or farming. During the early 1700s, over 85% of the European population had settled on marshlands, with some of the earliest and long-standing settlements established along the south shore. Boat travel on both salt and fresh water was the primary mode of transportation and connection between the early settlements. As indicated on Figure 3.24, even communities that were primarily agricultural were established along rivers enabling people and goods to travel to the larger port developments on the coast (Bird, 1955; Clark, 1968; Dr. H. Millward, Department of Geography, Saint Mary's University, pers. comm., 2008).

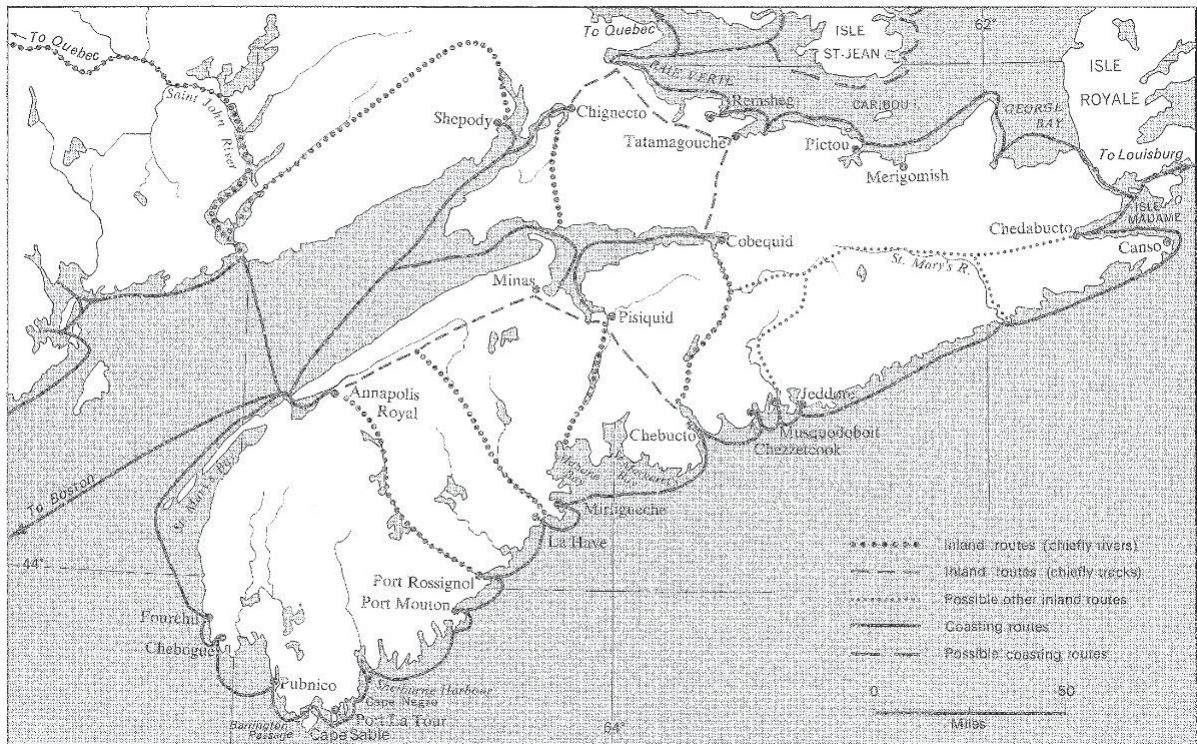


Figure 3.24: Transportation and communication routes in the early 18th Century
 (Source: Clark, 1968)

The mid-1700s was a period of heightened conflict between Britain and France, and military forms prevailed in the built environment. Although the British returned the conquered Fortress Louisbourg to the French in 1748, they began a strategic campaign to gain dominance in the region. In 1749 the British government set up a fortress in Chebucto Harbour and renamed it Halifax. Strategically it was intended to be Britain’s primary north Atlantic naval station, which could respond to the power of Louisbourg and counteract the thriving Acadian population (Bird, 1955; Hodge, 2003; Boileau, 2007).

British colonial settlements were typically laid out on a regular gridiron, rectangular in shape, with lots divided relative to a survey baseline along the harbour. The 1749 plan for Halifax was drawn up in this manner in Europe prior to settlement (Figure 3.25). Even on the steep slopes of Lunenburg, the British established a rigid grid (Figure 3.26). Although Halifax, Lunenburg, and other larger settlements were planned according to the British grid, the built form of the small coastal communities followed the path of the shore and the topography of the land. Coastal access was essential as people depended on the sea for fish and other food sources (Wynn, 1987a).



Figure 3.25: The 1749 plan for Halifax (Source: Dawson, 2007)



Figure 3.26: 1864 map showing grid pattern Established by the British in Lunenburg (Source: Dawson, 2007)

Lots were often long and narrow to provide waterfront property to as many settlers as possible (Figures 3.27 and 3.28). Long lots were intended to provide enough developable land for additional streets and buildings in urban areas, and to allow for farm land and forestry in rural communities. Lots were divided to attract settlers who could not afford similar properties in Britain. Colonial plans designated space for a church, governor's residence, barracks and parade ground, cemetery and warehouses. The central bastion established in Halifax remains today as Citadel Hill, overlooking the city and harbour. Charles Cornwallis settled Halifax along with 2,576 settlers, soldiers and government staff. (Dawson, 1988; Ennals and Holdsworth, 1988; Hodge, 2003; Boileau, 2007; Dawson, 2007; Dr. S. Guppy, School of Planning, Dalhousie University, pers. comm., 2008).

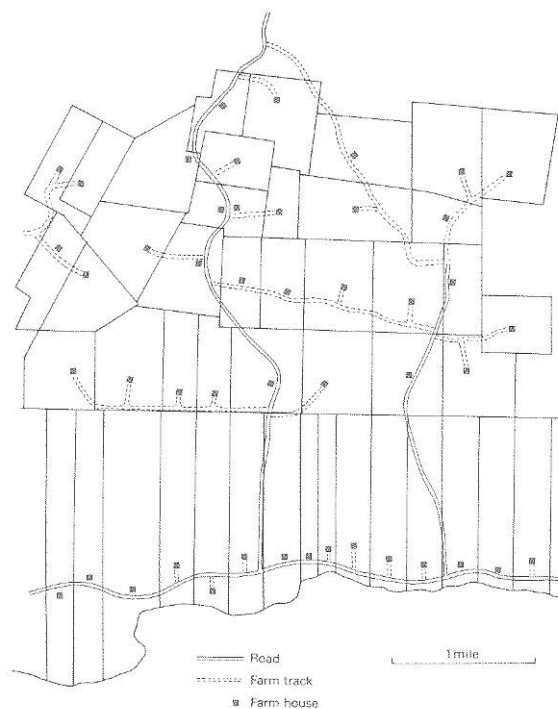


Figure 3.27: Hornsby's illustration of lot division in 19th century Cape Breton. Note: demonstrates how people moved between long waterfront lots defined by the coastline and the patchwork of backlots defined by other topographical features (Source: Hornsby, 1988)

A significant change in the population and the physical landscape occurred in 1755 when British officials deported the Acadians. The dramatic reduction in the overall population of the colony and the loss of Acadian dykeland agricultural production led to a significant economic downturn. British settlers who replaced the Acadians did not have the knowledge nor the skills to farm, maintain and reconstruct the declining dykelands (Gwyn, 1998).

The population did not recover until Nova Scotia received an influx of Loyalist refugees following the American Revolution. Between 1782 and 1784 approximately 25,000 Loyalist refugees arrived and reinforced the settlement pattern along the Atlantic shore as people clustered around fish and lumber resources as well as trading opportunities. Loyalist refugees bolstered the populations of Halifax, Shelburne, Annapolis Royal and the head of Chignecto Bay (Bird, 1955). This settlement was not a smooth process, as the colonial administration was ill-equipped to distribute enough land grants, and the land grants that were made available were far from fairly distributed. Halifax was particularly overcrowded and impoverished. Throughout the winter of 1783, for example, the sea itself provided a home for many destitute women and children who had no other shelter than a crowded boat. Black loyalists were treated extremely poorly and relegated to farm and fish from marginal land (Wynn, 1987a, b; Choyce, 2007).



Figure 3.28: 1879 map of an area west of River John (Source: Dawson, 2007)

Bird (1955) and Wynn (1987a) suggest that settlement patterns in the Maritimes provinces were largely determined by the dawn of the 19th Century. Early settlers discovered productive farmland and safe harbours and, although attempts were made to extend farming and fishing to other areas, settlement returned to the most productive areas (Troughton, 1988; Gentilcore *et al.*, 1993; Millward, 1999). Early settlements, for example, were established in the safe harbours along the South Shore that provided for safe navigation and access to the offshore banks (Figure 3.29).

The Eastern Shore was less settled due to the lack of natural harbours and the shifting sandbanks, both of which made it difficult to dock larger boats. Development of the Eastern Shore was facilitated only in the 20th Century by government intervention and the creation of artificial harbours and breakwaters. The western coast of Cape Breton remained largely unsettled due to the harsh climate and the galeforce suete winds. The exception is Chéticamp, which is protected by an island and was settled by Acadian refugees following the expulsion. Mi'kmaq settlements clustered around sheltered areas of the Bras d'Or Lakes (Dr. H. Millward, Department of Geography, Saint Mary's University, pers. comm., 2008).



Figure 3.29: 1865 Map showing settlement of safe harbours in Halifax County (Source: Church, 1865)

In the early 19th Century, as the timber industry grew in Atlantic Canada so did the shipbuilding industry; timber needed to be shipped to Britain, and timber was needed to construct the ships. The ship building industry, therefore, developed around areas where timber resources were plentiful. St John, New Brunswick was the largest ship building centre in the region, but Yarmouth County and Pictou County emerged as important ship building hubs during the early years of the 19th Century. In Nova Scotia, particularly in Halifax, the shipping industry was largely focused upon the needs of the fisheries and trade with the West Indies and Britain. Throughout the late 1800s, also known as the “golden age of sail”, the shipping industry grew rapidly, and shipbuilding became an important industry for many other communities throughout Nova Scotia, including Lunenburg, Shelburne, Guysborough, Tatamagouche,

Diligent River, Port Greville, Spencers Island, Avocate Harbour, along the Minas Basin from Great Village to Economy, as well as on the Northumberland Strait. Halifax developed into the largest port through which the trade was channelled, but other communities, including Yarmouth, Pictou, Windsor, Sydney and Digby, developed ports and were involved in trade (Sager and Panting, 1985; Sager and Fischer, 1986; Ruff and Bradley, 1997; Colchester Historical Society, 2000; Parker, 2000; Acker and Jackson, 2001; Brown, 2002; Grant, 2004).

The late 19th Century brought significant changes in transportation that would connect previously dispersed and insular communities and thrust Nova Scotia from a mercantile economy to an industrial one. In the early 1800s, the Shubenacadie Canal was constructed to provide a link between the Bay of Fundy and Halifax Harbour. From the late 19th Century, sailing ships were replaced by steamships and rail. Prior to Confederation a rail line connected Halifax, Windsor and Truro. Following Confederation the rail line was transferred to the Intercolonial Railway and was extended further into the industrializing areas of Halifax Harbour. The railway reinforced port and industrial development in Halifax. Several deep-water shipping terminals were constructed along the shore taking advantage of Halifax's ice-free deep water harbour. The industrialization of Halifax Harbour and its growing importance as a hub for trading and shipping allowed manufacturing to thrive, particularly in Dartmouth. In 1841 Halifax, with a population of 14,000, was incorporated as a municipality. The Mayor and aldermen attempted to bring order and utilities to the municipality and established the first building code, started waterworks construction, laid gas lines and built new cemeteries. Figure 3.30 provides an impression of Halifax in 1890, depicting its many wharves, piers and warehouses that supported the harbour economy.



Figure 3.30: The Halifax Harbour in 1890 (Source: Dawson, 2007)

In the 1890s the railway line was extended along the South Shore, connecting the communities and economies between Halifax and Yarmouth. An additional rail line, opened in 1916, connected Dartmouth with Upper Musquodoboit (Neilly *et al.*, 2003; Dawson, 2007). In the early 20th Century, coal, iron and steel industries transformed the landscapes and economies of New Glasgow, Springhill, Stellarton and Glace Bay. Nevertheless, many people employed in these new industries supplemented their incomes through continuing traditional activities of farming and fishing. Through this pattern of labour, Nova Scotians maintained strong linkages between rural and urban areas (McCann, 1988). The fishing industry

also experienced significant change at this time as traditional fishing methods were replaced by trawlers (Boileau, 2007).

Industrialization brought economic growth and people to Halifax and the other larger communities. The Halifax economy was particularly strong during World War I and World War II, with periods of recession and social unrest following each. Ferries were always an important link between Dartmouth and Halifax. Ferry operation began in 1752 and progressed through a succession of rowboats, sailboats, horse-powered, steam powered and finally petroleum powered ferries. The rising use of the automobile and the expansion of the road network led to the construction of the first bridge (Angus L. MacDonald Bridge) across the Halifax harbour between 1952 and 1955. High traffic on the first bridge led to the construction of a second bridge, the A. Murray Mackay Bridge, between 1967 and 1970 (Boileau, 2007). Continuing industrialization and growth resulted in over-crowding and concern over living conditions throughout Canada. Halifax was no exception and underwent a period of urban renewal in the mid 20th century as areas determined to be slums were demolished and replaced by high-rise development and associated infrastructure projects (Boileau, 2007; Hodge, 2003).

Halifax and Dartmouth continued to develop their industrial and administrative capacities with the construction of the Imperial Oil Plant and Refinery in 1917-18, Pier 21 in 1928, the Tufts Cove generating station in the mid-1960s, the opening of the Bedford Institute of Oceanography in 1962 and the construction of Halterm in 1969. This was the first shipping terminal in Canada that facilitated the transport of standard-sized containers between ships, trains and trucks (Boileau, 2007).



The common user container terminal, Halterm
(Source: <http://lighthouselogistics.ca/ESW/Images/halterm.jpg>)

Although these intensive large scale industrial and shipping uses were developed on the shores of Halifax Harbour in the mid-20th Century, many small marine based industries and businesses closed during this period. This changed the physical form of the urban shoreline, once characterized by numerous finger piers (Figure 3.30) (Boileau, 2007; Dr. S. Guppy, School of Planning, Dalhousie University, pers. comm., 2008).

Much of the Halifax waterfront is still occupied by large naval and industrial uses. The cruise ship industry, for example, has grown in importance. The waterfront, however, is also increasingly used for events and cultural activities. Although many coastal communities have active working waterfronts, many have experienced a substantial decline in fishing, fish processing and other marine-related industries. While traditional industries remain an important part of coastal economies, there is a marked shift towards tourism, recreational and residential development, which has changed the physical character and configuration of the waterfronts involved (Boileau, 2007; Dr. S. Guppy, School of Planning, Dalhousie University, pers. comm., 2008).

3.3.2 Current Development Patterns and Linkages

There is a considerable range of development in the Province. Halifax County is the most densely settled; Guysborough County is the least (see Figure 3.16). In Nova Scotia today, coastal development ranges from dispersed rural or cottage area development through to small villages and cities, which serve a diversity of economic and administrative functions. Those coastal regions that have supported settlements throughout history remain the most densely populated; this includes the Halifax area, the South Shore, the Acadian Shore on the northwestern coast, coastal areas bordering the Minas Basin, Cobequid Bay, as well as the Northumberland Strait and areas of Cape Breton. While some coastal communities, such as Halifax, Truro and Bridgewater have grown since 1996, other areas have declined

particularly along the eastern and south shore and in areas of Cape Breton. With the exception of Amherst and Kentville, eight of the largest 10 communities in Nova Scotia, both in terms of population and dwellings, are situated directly on the coast, or have access to the coast through harbours, bays and tidal rivers (Table 3.13). Their location speaks to the importance of the coast for the historic development of industries and economies in these communities.

Table 3-13: The 10 largest communities in Nova Scotia (Nova Scotia Community Counts, 2008)

	<i>Communities</i>	<i>Population 2006</i>	<i>Population 2001</i>	<i>Population Change</i>	<i>Total Private Dwellings 2006</i>	<i>Land Area (km²)</i>
	Nova Scotia	913462	908,007	0.6%	425,681	52,917.46
1	Halifax	282,924	276,412	2.4%	131,268	262.6478
2	Cape Breton - Sydney	33,012	33,913	-2.7%	14,720	51.4473
3	Truro	22,376	21,710	3.1%	10,272	44.7213
4	New Glasgow	20,876	21,102	-1.1%	9,309	39.5093
5	Glace Bay	19,968	21,187	-5.8%	8,575	35.1478
6	Sydney Mines	15,500	16,068	-3.5%	6,468	28.4652
7	Kentville	13,552	13,121	3.3%	6,093	33.3658
8	New Waterford	9,661	10,185	-5.1%	4,125	20.8122
9	Amherst	9,547	9,502	0.5%	4,428	12.0491
10	Bridgewater	8,021	7,782	3.1%	3,769	13.7921

Administratively and politically, Nova Scotia is incorporated into municipalities. There are three regional municipalities (Cape Breton, Halifax and Queens), 31 towns, and 21 county or district municipalities. Within the county or district municipalities there are village commissions that provide varying levels of administration and services (Service Nova Scotia and Municipal Relations, 2007).

Until recently, communication in the province was reliant on the physical transportation networks, i.e., roads, rail and shipping. Since the advent of the telephone and internet, and the latter's growing importance in personal and business communication, there is a shifting dependence to communication networks, i.e., the phone, cable and internet lines. In 2005 in the Atlantic provinces, 51.9% of adult individuals who used the internet at home for non-businesses purposes had a telephone line connected to a computer and 41.6% had a cable connection. Compared to the rest of Canada, the Atlantic provinces had a greater percentage of individuals connected to the internet by telephone instead of cable (Statistics Canada, 2008a, Table 358-0134). The Broadband for Rural Nova Scotia initiative is a \$74 million joint federal, provincial and private sector project, which seeks to provide high speed internet access to all Nova Scotians, including rural areas, by the end of 2009 (Nova Scotia Economic and Rural Development, 2008). Improvements in the speed of transportation and communication networks increases development pressures on coastal areas as they allow people to live in coastal areas, valued for their aesthetic and recreational qualities, and commute or "tele-commute" to work.

3.3.3 Types of Coastal Land Use and Development

There is a range of coastal land use and associated development in Nova Scotia: residential, industrial, recreational and protected areas, institutional, commercial, rural, and land and water transportation. The following provides a brief description of each type.

3.3.3.1 RESIDENTIAL

Residential development includes all dwellings that are occupied and used as residences, whether year round or seasonal; these can be occupied by owners or renting tenants. Coastal areas are valued for residential development because of the aesthetic and recreational amenity they offer, and those areas within commuting distance of larger urban centres experience particularly high development pressures (European Environment Agency, 2006).

Along the Nova Scotia coast there are a range of housing and occupancy patterns. There are: permanent private dwellings, where people live year round and either work locally or commute to larger centres; private dwellings where people from other parts of the province, country and other countries live seasonally, also called summer homes and dwellings that are occupied seasonally on a rental basis as part of the tourism industry, also called cottages, camps or cabins. Residential development on the coast varies in the type of development pattern. In some cases it extends back only one lot from the coastline, and in other cases there are clusters of residential developments, or subdivisions, adjacent to the coast.

Although housing data are not collected for coastal areas in particular, observation shows that there is a range of housing types and densities in coastal areas from apartments and duplexes to large single detached houses. There are 425,681 private dwellings in Nova Scotia; the majority (67.3%) are single detached, see Figure 3.31 (Statistics Canada, 2006).

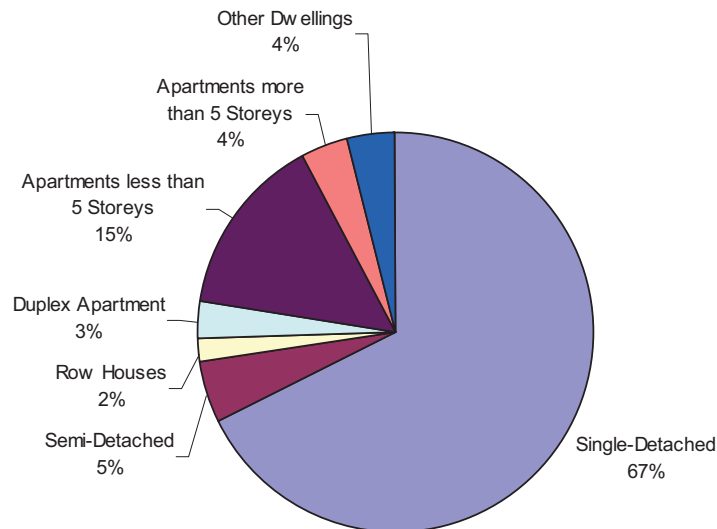


Figure 3.31 Distribution of private dwellings by housing type in Nova Scotia (Source: Statistics Canada, 2006)

3.3.3.2 INDUSTRIAL

Industrial development includes all land and buildings associated with light to heavy industrial activities, including processing, assembly, manufacturing, finishing, packaging and refining. Light industrial uses, such as warehousing and packaging, are generally located closer to residential and commercial areas than heavy industry. Heavy industry generally involves the processing of raw materials, such as a timber or coal, and includes developments such as pulp and paper mills, power generating stations, oil refineries, chemical plants and industries producing construction supplies. Development associated with resource extraction includes pits, quarries and mines and all accessory buildings related to the storage of materials and equipment, as well as loading areas. Slag and other waste materials that are a by-product of the extraction process are also found on land used for resource extraction and processing.

Both industrial and resource extraction industries are associated with good harbours and benefit from proximity to port facilities. Figure 3.32 shows the key communities and areas within Nova Scotia with significant industrial development. Industrial developments can include stockpiles of materials that, in bulk quantities, can become a water quality concern to the watershed involved. Industrial land uses have been a primary tenant on coastal property, particularly in Cape Breton. This includes, for example, the many industrial activities around the Strait of Canso, including those located in the Point Tupper Industrial Estate.

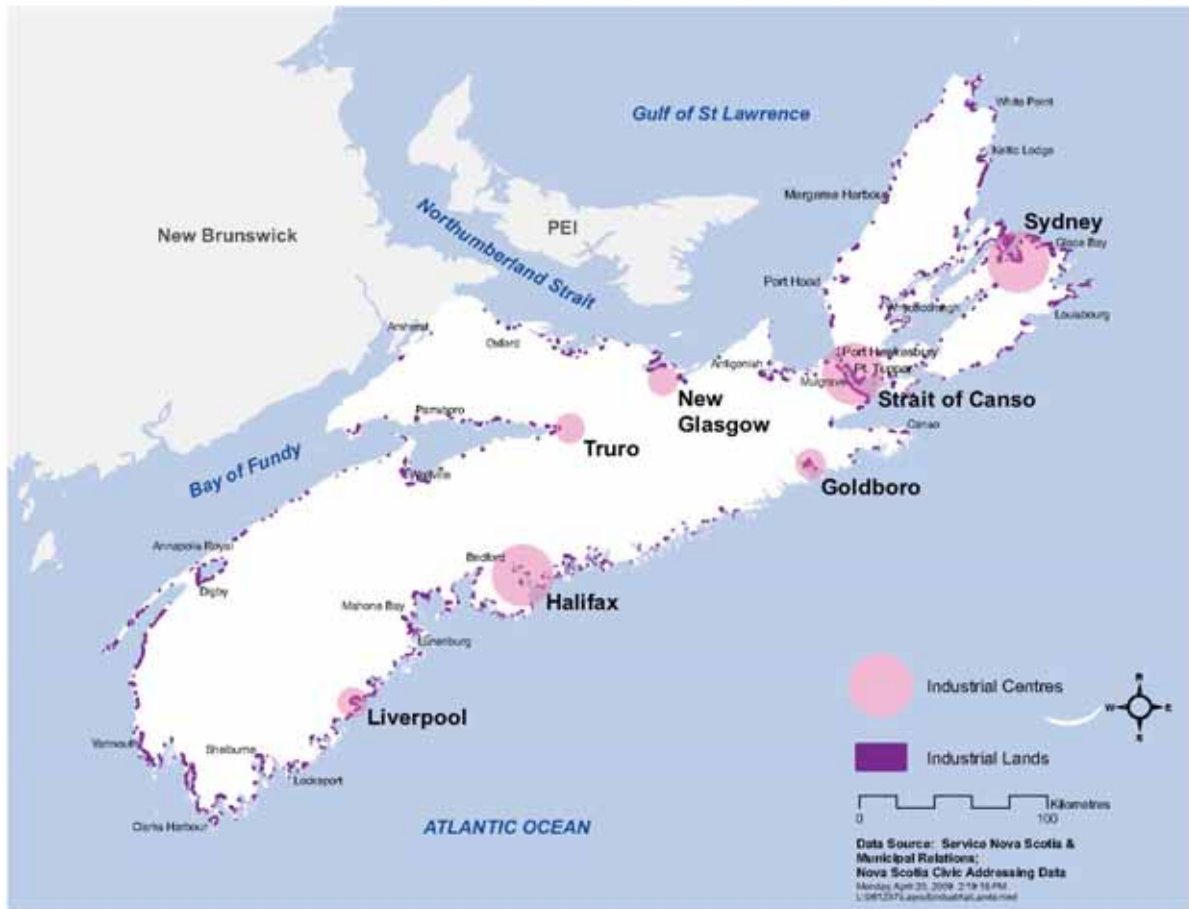


Figure 3.32: Primary industrial development areas in Nova Scotia (Source: Service Nova Scotia and Municipal Relations; Nova Scotia Civic Addressing File)

3.3.3.3 INSTITUTIONAL

Institutional developments include all buildings that house a government, non-profit or public use, such as schools, government offices, town halls, hospitals, churches, military uses and developments related to infrastructure, including sewage pumping stations, water treatment plants and power generating stations. In Nova Scotia, many institutional land uses are located on coastal properties. This is due at least in part to the historic importance of coastal locations and related development initiatives.

3.3.3.4 COMMERCIAL

Commercial development includes all buildings from which a business is conducted, such as offices, retail shops, restaurants and other general or business service stores. In many coastal areas today commercial development is geared towards providing products and services for the tourism industry. In larger centres, such as Halifax, other important commercial uses on the waterfront include office buildings and mixed use developments that include residential and commercial tenants.

3.3.3.5 RECREATIONAL LANDS AND PROTECTED AREAS

Recreational developments include all buildings and pedestrian trails associated with federal, provincial and private parks, wilderness areas, protected areas, golf courses, marinas and campgrounds. Recreational developments along the coast often occur in a thin strip close to the water. The value of these developments is usually associated with direct access to the water, or at least good views of the

coastline. This type of development is scattered throughout the province, associated with beaches and areas of beauty. As referenced in Section 3.1.5.8 and Appendix 3, there are many Provincial Parks on the coast; the Provincial government also has protected areas on the coast, including: Blandford and Duncans Cove Nature Reserves; Terence Bay; Bonnet Lake Barrens; Canso Coastal Barrens; Gabarus, Scatarie Island; French River, and Polletts Cove-Aspy Fault Wilderness Areas (see Figure 3.9). The federal government manages Cape Breton Highlands National Park and the Kejimikujik Seaside Adjunct on the South Shore.

3.3.3.6 RURAL

Rural land classification generally includes land used for agriculture, forestry and other undeveloped fields, forests or wetlands. Developments associated with agriculture include residences, barns and other warehouse and storage facilities for crops, animals and equipment. Agricultural development includes land that has been cleared and cultivated as cropland, pasture, orchards, vineyards, groves, nurseries, confined feeding and other productive agricultural land uses. In current day Kings County a sophisticated dyke system, established by the Acadians, allows for the extension of agriculturally productive land.

Forested land includes both deciduous and coniferous trees, which may or may not be actively used for forestry purposes such as logging or timber extraction. Developments associated with forestry include piles of lumber, areas used for processing, loading and transportation of forestry products. Some coastal areas in Nova Scotia remain rural, particularly those areas which have formal protection as recreational or natural areas. In these cases, the land beyond the waterfront or beach is covered by forest, field, wetlands, salt marshes and other rural land uses.

3.3.3.7 LAND AND WATER TRANSPORTATION

Nova Scotia has infrastructure that facilitates transport over both land and water. Transportation developments include ports, ferry and shipping terminals, wharves, all classes of roads, railway lines, and airports and landing strips. This infrastructure is found throughout both built up and forested or agricultural rural areas. It influences surrounding land uses by creating boundaries and by extending access to particular areas, which can increase development potential. Ports are particularly important to coastal economies, as they are where multiple modes of transportation converge, facilitating shipment over both land and sea.

3.4 Regulatory Environment

The regulatory environment includes the laws, regulations and policies that have been put in place by federal, provincial and municipal governments to control and guide the behaviour and actions of people and organizations. This section provides a brief overview of the jurisdictional, legislative and policy instruments that influence coastal management in Nova Scotia.

3.4.1 Legislative Jurisdiction

The Constitution of Canada was established through the *Constitution Act, 1867* (originally the *British North America Act, 1867*). It has since been updated and is now embodied in the *Constitution Act, 1867* and the *Constitution Act, 1982*, as well as 29 other Acts and Orders contained in the Schedule to the *Constitution Act, 1982*. According to Section 52 of the *Constitution Act, 1982*, the Constitution of

Canada is the “supreme law of Canada”, and any law inconsistent with it is of no force or effect. The interpretation of the Constitution is overseen by the courts, which apply its principles to the particular facts in each case. Even though the legal principles are consistent, differences in factual circumstances can produce different outcomes. The Supreme Court of Canada is the final level of appeal on constitutional questions.

Sections 91, 92 and 92A of the *Constitution Act, 1867* outline the law-making powers of the federal and provincial governments according to subject area. With regard to coastal and ocean management, sole regulatory authority is assigned to the Federal Government for: militia, military, naval service and defence; beacons, buoys, lighthouses and Sable Island; navigation and shipping; quarantine and the establishment and maintenance of marine hospitals; sea coast and inland fisheries, and ferries between a province and any other country or between two provinces. The Province has exclusive jurisdiction over: the management and sale of public lands (except federal Crown lands, which are primarily national parks and lands covered by the *Indian Act*); property and civil rights, i.e., rights in property and tort law matters; exploration, development, conservation and management of non-renewable resources; forestry resources; sites and facilities for generation and production of electrical energy; municipal institutions, and “generally all matters of a merely local or private nature in the Province”, which may include a wide variety of unspecified coastal matters.

The federal and provincial governments each have the ability to address environmental aspects of topics for which they are responsible, such as federal authority over fisheries habitat, or provincial authority over industrial activity as ‘property and civil rights’. The Federal Government can exercise authority over environmental matters of national concern that cannot be addressed by provinces. Although the norm is that only one level of government could make laws on the same matter, under Section 95, agriculture is one of the few areas of simultaneous jurisdiction, although in the event of any conflict the federal law is paramount (Hogg, 2007).

Given the complexity of the Constitution on jurisdictional responsibility, there is a reliance on case law and federal and provincial coordination to determine regulatory responsibilities. Coastal matters often highlight the challenges. From an international perspective, Canada controls coastal waters from the ordinary low water mark seaward to 200 nautical miles (370.4 km). Within Canada, the Constitution determines which level of government can regulate in any particular location on any particular topic. Unless they are expressly adopted by the Federal Government, Nova Scotia’s laws only operate within the province’s boundary, as defined by Section 7 of the *Constitution Act, 1867*, i.e., “the same limits as at the passing of this Act”. Because no further description is given there, the question of how the Province’s laws apply on various under-water lands requires research in each instance and depends on the status of that location when Nova Scotia entered Confederation on July 1, 1867.

It is undisputed that the province’s boundary includes everything landward from the ordinary low water mark on the coast. The coastal areas between the ordinary high and low water marks are provincial Crown land, except in a few areas where an ownership transfer has occurred, e.g., traditional waterlots for wharves and piers (see Nichols *et al.*, 2000). The Supreme Court of Canada has also determined that a province’s boundary may include an area of ‘internal waters’ or additional lands and waters that can be proven to have been included within the colonial boundary of Britain prior to Confederation (see the

Supreme Court of Canada decision in reference re: Ownership of the Bed of the Strait of Georgia and Related Areas, [1984] 1 S.C.R. 388, p. 401). Nova Scotia and the Government of Canada may have different views on the interpretation of the pre-Confederation historical record and, therefore, on the location of the Province's geographical limits, but have a history of resolving the issue without confrontation in the courts. The two governments have been able to accommodate the uncertainty through collaborative law-making and administrative efforts. The laws establishing the Canada-Nova Scotia Offshore Petroleum Board and the federal-provincial regulatory regime established for the possible re-working of the Donkin coal mine are two examples.

Municipalities, their boundaries, powers and responsibilities are determined by the province. Municipal authority is delegated by the Province primarily through the *Municipal Government Act*, 1998. Under this Act, within their municipal boundaries, municipalities have regulatory authority for such matters as local infrastructure and land use planning.

3.4.2 Aboriginal and Treaty Rights

Section 35 of the *Constitution Act*, 1982, recognises existing treaty rights of Aboriginal peoples. Aboriginal rights are those rights that peoples have due to traditional use and occupancy of land. These rights encompass all aspects of life, including culture, land and traditions. The term "treaty rights" refers to those guarantees explicitly and implicitly agreed upon through historical treaties. Under the terms of treaties, First Nations peoples agreed to share the land in return for specific rights, including for future generations. Those that affect the Aboriginal people of Nova Scotia include: Treaty of 1725 (and subsequent ratification treaties); Treaty of 1752; Treaty of 1760; 1760-61 Peace and Friendship Treaties; The Royal Proclamation 1763, and Treaty of Watertown 1776. These provide the aboriginal peoples with rights to coastal resources, but do not currently give them legislated jurisdictional responsibilities. The *Indian Act*, 1985, through the Minister of Northern and Indian Affairs, may delegate authority to manage reserve lands to the councils of registered bands.

To resolve issues related to treaty and Aboriginal rights in Nova Scotia, a tri-partite forum, *The Made-in-Nova Scotia Process*, has been established between the Mi'kmaq, Nova Scotia and Canada. The aim is to resolve issues related to Mi'kmaq treaty rights, Aboriginal rights, including Aboriginal title, and Mi'kmaq governance. The Process began with the signing of the *Umbrella Agreement* in June 2002, in which the Parties confirmed their intention to begin a negotiation process to address these issues. On February 23, 2007, the Parties signed the *Mi'kmaq-Nova Scotia-Canada Framework Agreement*, which outlines procedures that will guide the negotiations and the topics to be covered (<http://www.gov.ns.ca/abor/officeofaboriginalaffairs/whatwedo/negotiations>). The Framework Agreement states that the objectives of the Process are "to create stable and respectful relationships and to reconcile the respective interests of the parties through a Mi'kmaq of Nova Scotia Accord that sets out the manner in which the Mi'kmaq of Nova Scotia will exercise constitutionally protected rights respecting land, resources and governance, to the extent the issues are dealt with in the Accord".

The Parties may establish working groups to examine certain issues in more detail and make recommendations. Currently there are three working groups that influence the use of coastal resources in the province: Forestry Working Group, Fisheries Working Group and Land Protection Working Group (Office of Aboriginal Affairs, 2008).

Supreme Court of Canada (SCC) decisions indicate that government has a duty to consult, and where appropriate, accommodate Aboriginal peoples where the interests of Aboriginal peoples may be affected by a Crown action or decision.

An interim provincial policy was prepared and distributed to government departments in June 2007. As part of the commitment under the Umbrella Agreement, the Mi'kmaq-Nova Scotia-Canada Consultation Terms of Reference was developed and approved-in-principle by Cabinet in 2007. This Terms of Reference is currently operating on a pilot basis and provides a coordinated approach to consultation in Nova Scotia.

3.4.3 Legislation

Within this context, federal, provincial and municipal government have developed laws and policy to manage coastal and ocean resources. Appendix 3 provides a summary of legislation that is applicable to coastal zone management in Nova Scotia and identifies responsible authorities. Some of the most pertinent legislation to coastal management is described below.

3.4.3.1 FEDERAL LEGISLATION

The main federal legislation affecting Nova Scotia's coastal waters includes the *Oceans Act*, the *Fisheries Act* and the *Canadian Environmental Protection Act*.

The *Oceans Act*, which operates in coastal waters from the low water mark seawards to 200 nautical miles offshore, and is administered by Fisheries and Oceans Canada (DFO), defines Canada's international jurisdiction over its ocean area and provides for the development of a national ocean management strategy. Under the Act, *Canada's Ocean Strategy* is based on the three principles of sustainable development, integrated management and the precautionary approach. It makes commitments to integrated management of Canada's estuaries, coastal waters and marine waters and recognizes that ocean governance is a collective responsibility, not just a federal responsibility (Fisheries and Oceans Canada, 2002). The *Oceans Act* and *Canada's Ocean Strategy* also require DFO to "lead and coordinate the development and implementation of a national system of marine protected areas (MPAs) on behalf of the Government of Canada" (*Oceans Act*, Section 35(2)). Thusfar, no coastal MPAs have been designated in Nova Scotia.

The *Fisheries Act*, dating back to Confederation, was established to manage and protect Canada's fisheries resources (Fisheries and Oceans Canada, 2009). It applies to all fishing zones, territorial seas and inland waters of Canada (Fisheries and Oceans Canada, 2009). Under the Act, "fish" are defined as "*shellfish, crustaceans, marine animals and any parts of shellfish, crustaceans or marine animals*" (*Fisheries Act*, Section 2). Of particular note are the habitat provisions of the Act (Section 35), which state that a "harmful alteration, disruption or destruction of fish habitat" cannot occur without authorization pursuant to the Act. The Act also prohibits the unauthorized killing of fish by means other than fishing (Section 32), makes provisions for ensuring fish passage, particularly for migratory species (Sections 20 and 22) and prohibits the release of substances deleterious to fish (Section 36). DFO has primary responsibility for administration of the *Fisheries Act*, but Environment Canada has been assigned responsibility for administration and enforcement of the pollution prevention provisions of the Act.

The *Canadian Environmental Protection Act (CEPA)*, administered by Environment Canada, provides a framework for environmental protection in Canada, particularly with regard to pollution control. It gives the Minister of Environment the authority to issue non-regulatory objectives, guidelines and codes of practice to prevent and reduce marine pollution from land-based sources following consultation with other affected Ministers. The Act also prohibits the disposal of wastes and other matter at sea within Canadian jurisdiction and by Canadian ships in international waters and waters under foreign jurisdiction, unless the disposal is done under a permit issued by the Minister.

Other relevant federal statutes include:

- *Canada Water Act* (Environment Canada), which protects water resources and promotes sustainable management of water use;
- *Species at Risk Act (SARA)* (Environment Canada), which protects endangered and vulnerable plants, animals and birds;
- *Migratory Birds Convention Act* (Environment Canada), which protects birds and their habitats along migration routes;
- *Navigable Waters Protection Act (NWPA)* (Transport Canada), which protects the public right of navigation;
- *Canadian Environmental Assessment Act (CEAA)* (Canadian Environmental Assessment Agency), which sets out federal requirements for environment assessment of scheduled activities; and
- *Fishing and Recreational Harbours Act*, which involves the management of small craft harbours including the divestiture of harbours to local authorities, a process which began in 1995.

3.4.3.2 PROVINCIAL LEGISLATION

There are currently numerous provincial environmental laws that relate in some way to coastal issues (see Appendix 3). Legislation that directly relates to coastal resources includes:

- *Environment Act* (Nova Scotia Environment (NSE)), which gives broad powers to the Minister of Environment to protect the environment and provides for considerable oversight, review and appeal measures in the process;
- *Fisheries and Coastal Resources Act (NSDFA)*, which promotes and implements programs that will sustain and improve the fishery, including aquaculture. The purpose of the Act is also to: service, develop and optimize the harvesting and processing segments of the fishing and aquaculture industries for the betterment of coastal communities and the province as a whole; assist the aquaculture industry to increase production; expand recreational and sport-fishing opportunities and ecotourism; foster community involvement in the management of coastal resources; provide training to enhance the skills and knowledge of participants in the fishery, including aquaculture, and increase the productivity and competitiveness of the processing sector by encouraging value-added processing and diversification;
- *Beaches Act* (NSDNR), which provides for the protection of beaches and associated dune systems as significant and sensitive environmental and recreational resources. The Act also provides for the regulation and enforcement of the full range of land-use activities on beaches, including aggregate removal, so as to leave them unimpaired for the benefit and enjoyment of future generations. The Act also controls recreational and other uses of beaches that may cause undesirable impacts on beach and associated dune systems;

- *Beaches and Foreshores Act* (NSDNR), which outlines provisions and restrictions for the granting or lease of any ungranted flat, beach or foreshore upon the Nova Scotia Coast;
- *Provincial Parks Act* (NSDNR), which allows for the preservation of significant historic or natural environment resources and recreational opportunities;
- *Wilderness Areas Protection Act* (NSE), which also creates and manages protected areas;
- The *Special Places Protection Act* (Department of Tourism, Culture and Heritage), which provides for the preservation, regulation and study of archaeological and historical remains and palaeontological and ecological sites;
- *Agricultural Marshland Conservation Act* (Department of Agriculture), which gives the Minister of Agriculture authority to develop marshland, defined as land that is subject to periodic flooding and designated by the Minister as marshland, for agricultural purposes. The Act also gives the Minister authority to reconstruct and repair any dykes or other works, including breakwaters, canals, and ditches, for the maintenance of agricultural land that would otherwise be marshland;
- *Public Highways Act* (Department of Transportation and Infrastructure Renewal), which provides for the construction, supervision, management and control of highways. The Act enables the Department to: purchase or otherwise acquire coastal properties for roads, bridges and other structures; maintain/steward the public transportation corridor and assets; control drainage; implement coastal habitat restoration and compensation projects; and manage the right-of-way to prevent accidents, maintain road safety and protect adjacent and downgradient environments;
- *Wildlife Act* (NSDNR), which is aimed at conservation of wildlife species and their habitat. The Act regulates coastal wildlife resource use in the form of angling, hunting and trapping; and
- *Endangered Species Act* (NSDNR), which provides for the protection, designation, recovery and conservation of species at risk in the Province, including those found in coastal habitats.

In terms of broader policies impacting the coast, the Province has undertaken an ambitious agenda for sustainable development, set out in an *Environmental Goals and Sustainable Prosperity Act*. The Act promotes environmentally sustainable economic development that recognizes that the economic value of the province's environmental assets is essential to the long-term prosperity of the Province. Of particular relevance for the coast are several environmental and economic goals:

- twelve percent of the total land mass of the Province will be legally protected by the year 2015;
- a policy of preventing net loss of wetlands will be established by the year 2009;
- a comprehensive water-resource management strategy will be developed by the year 2010; and
- wastewater treatment facility discharges will be provided at least primary treatment by the year 2017.

The Act also gives the Governor in Council authority to establish or participate in programs including those related to adaptation to the effects of climate change. The policy framework underpinning this Act is discussed in Section 3.4.4.

3.4.3.3 MUNICIPAL LEGISLATION

The Province's *Municipal Government Act* gives authority to municipal councils over governance within the jurisdiction given to them, including land use planning. The Act also includes five statements of provincial interest, which direct and guide provincial and municipal land use decisions regarding drinking water, flood risk areas, agricultural land, infrastructure, and housing (see Service Nova Scotia and Municipal Relations, 2009a, b).

Land use planning is carried out by way of municipal planning strategies and land use by-laws, which can include policies and regulations regarding development in coastal areas. Although the Act is not explicit about how to control land use in coastal areas, it provides municipalities with authority to control development and land use by way of land use zoning, comprehensive development districts, (including requirements for location of structures, landscaping, and infilling of land). Other tools include land acquisition and easements.

3.4.4 Provincial Policy Framework

The province of Nova Scotia recognizes the need for coastal management to be applied within the context of Nova Scotia's framework policies for economic and social development. In general there is a trend toward sustainability in the policies and legislation of the Province that supports the *Coastal Management Framework*. This includes the Opportunities for Sustainable Prosperity 2006.

The foundation of the *Opportunities for Sustainable Prosperity 2006* is that of sustainable competitiveness. Concomitantly, *Weaving the Threads* promotes the concepts of social sustainability, social prosperity and sustainable prosperity as the foundations of the framework. Essentially these concepts recognise the need to protect and enhance the distinct quality of life in Nova Scotia for current and future generations, while pursuing economic growth in an environmentally responsible and sustainable way. The foundations for growth, to provide a better business climate and better quality of life, are the five "capitals of productive capacity":

- **Financial Capital** includes conventional assets such as savings and investments that drive economic growth, and provides the money available for delivery of social services;
- **Natural Capital** includes the natural resources, land, and ecosystems that must be conserved if prosperity is to be sustained;
- **Built Capital** includes machinery, buildings and infrastructure, communication networks, education facilities and health care facilities, etc.;
- **Human Capital** is represented by the people of Nova Scotia, and the knowledge, skills, competencies, and attributes they possess; and
- **Social Capital** refers to the strength of relationships among people, companies, organizations, and government in a society.

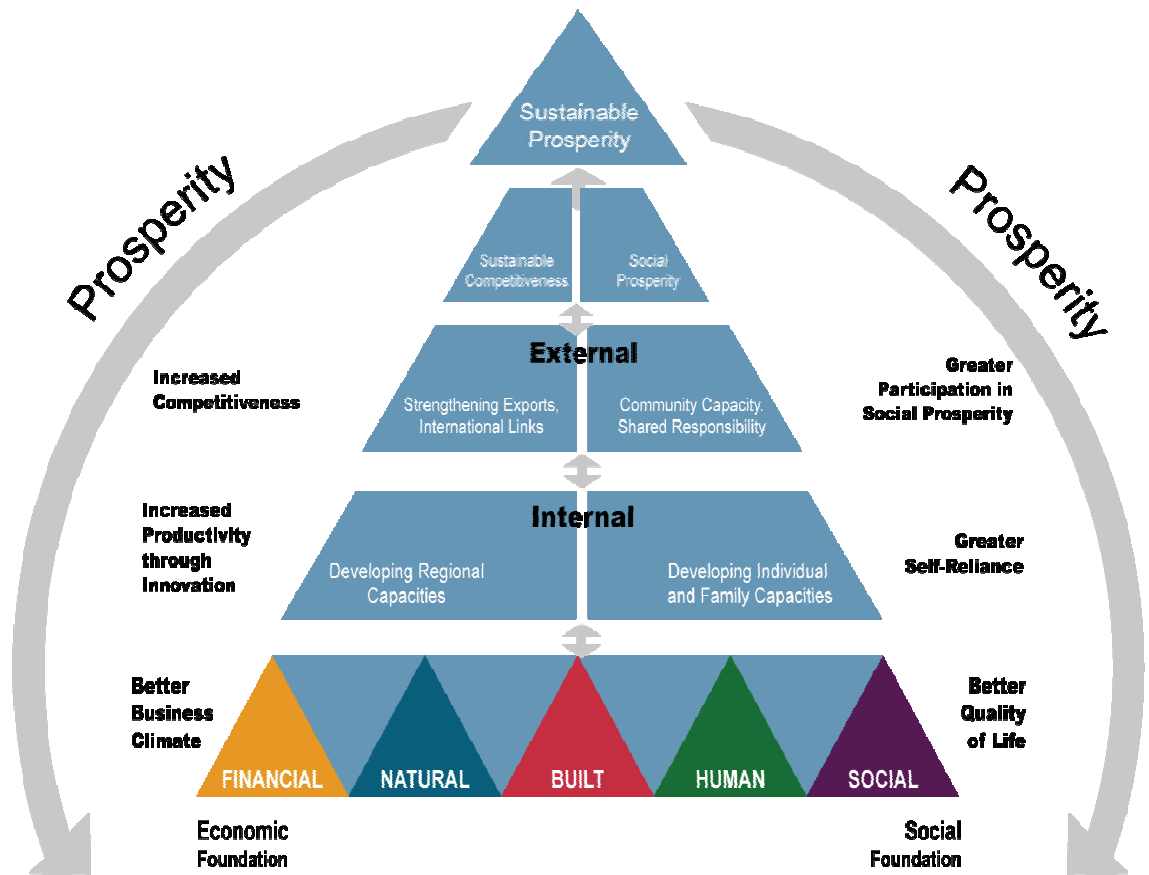


Figure 3.34: Framework for sustainable prosperity in Nova Scotia

The road to sustainable prosperity is ensuring that there is a balance between economic growth (left side of the pyramid; Figure 3.34) and social well-being (right side of the pyramid). Some programs would focus on aspects internal to the province, building regional economic capacity and ensuring that individual and families' needs are met. Other programs would focus on external elements, strengthening exports and international links on the economic side, and strengthening community capacity on the social side.

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Chapter 4 **Coastal Development**

4.1 Introduction

Coastal development is defined as the human-induced alteration of the landscape, including the erection of structures, within sight of the coastline. As noted in Chapter 1, it would be possible to define the whole of Nova Scotia as a coastal zone, but to bring focus to this discussion of coastal development, this chapter concentrates on an area approximately 2 km landward and seaward from the high water mark. This area is clearly coastal, but includes sufficient land and ocean area to capture those developments that are changing the physical and environmental character of the provincial coast.

The scale of the development involved is an important dimension when discussing the consequences of development on the coast. All developments (residential, roads, ports, energy facilities, shoreline stabilization structures, docks, aquaculture, agricultural operations, etc.) have consequences. Small developments, such as individual buildings, have an impact that is largely limited to the immediate vicinity; larger developments or operations, such as logging, industrial plants or residential subdivisions, impact a larger area and may have greater consequences in space and over time.

People are often aware of primary impacts, which are changes that result directly and immediately from development and are normally associated with the physical area relatively near to the development activity involved. Such impacts usually become apparent within the lifetime of a project, and often their effect is immediate. It is harder to identify secondary and cumulative impacts. Secondary impacts, rather than resulting directly from project construction activities, are usually triggered by the operations phase of a project, may reach outside a project's boundaries and may begin before or extend beyond a project's life cycle (Energy and Biodiversity Institute, 2009). Cumulative impacts are incremental environmental changes that occur when several development projects overlap in space and time to produce a combination of impacts.

Secondary and cumulative impacts can have lasting consequences such as habitat loss, air and water pollution, impeded navigation and loss of public access to coastal areas; many of these are addressed in following chapters (see Chapters 5, 6, 8 and 9). This chapter focuses on the pattern and extent of existing development along Nova Scotia's coasts and describes the competition for the use of the province's coastal area.

4.2 Pattern of Development

Development along the coast is diverse. There is a continuum of development intensity from areas with little or no development, such as the lands associated with national and provincial parks, through to intensely developed areas such as major urban centres (Figure 4.1). The latter are characterized by areas of intensive use, with much of the land area either developed or hard surfaced with materials such as asphalt or concrete. Such areas include cities, towns, villages, strip development along transportation and communication routes, and areas occupied by industrial, commercial and institutional complexes (Anderson *et al.*, 1976).

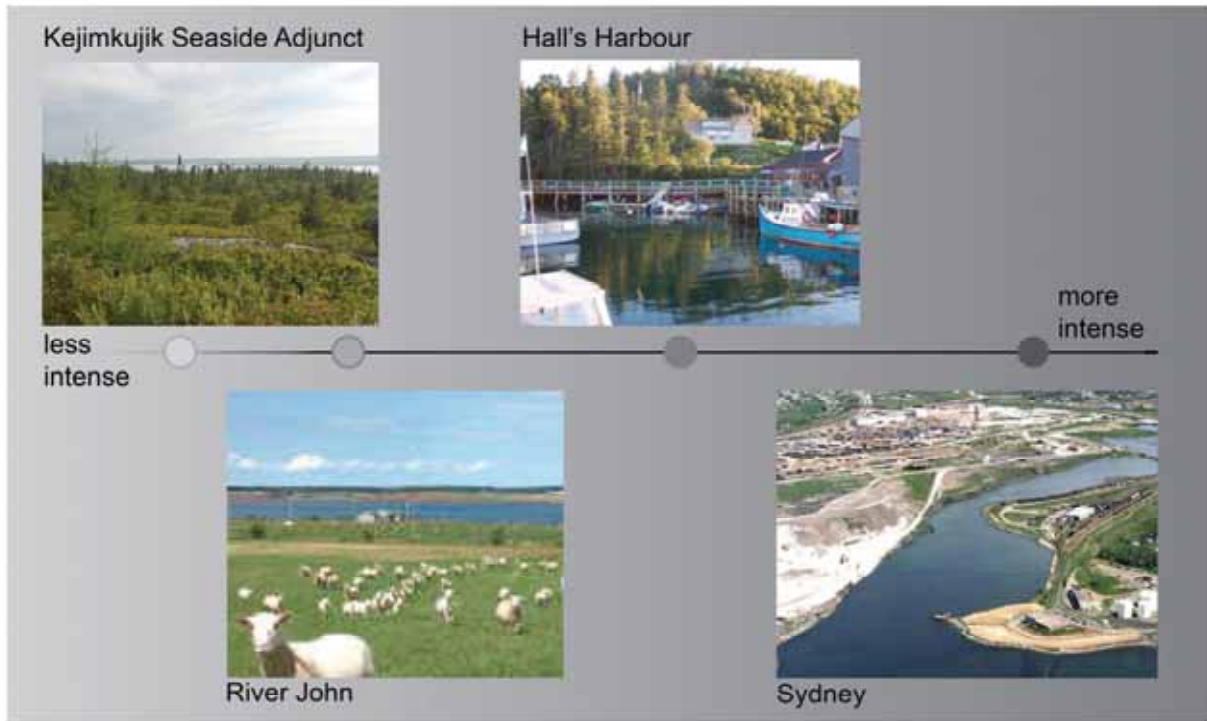


Figure 4.1: Range of development intensity in coastal areas
 (Sources: http://farm4.static.flickr.com/3026/2717689376_2f232ed8e2.jpg?v=0;
http://www.sunrisetrail.ca/lismore/sheep_in_green_grass_004.jpg;
http://www.bbcanda.com/bb_forseal/browofthemountain/hall%27s-harbour.jpg
<http://www.tpsgc-pwgsc.gc.ca/bulletin/fa-db/2007/2007-02/images/007-01.jpg>).

About 70% of the population of Nova Scotia live in coastal communities (see Coastal Communities Network, 2004). Eighty percent of the area within 2 km of Nova Scotia’s coastline is undeveloped forested or non-forested lands and a further 2% of the area is managed forest stands (Table 4.1). Urban development, which is a noticeable concentration of residences and other uses on the air photos used for interpretation, comprises 8% of this area (Figure 4.2 and Table 4.1). Agriculture covers 7% and infrastructure and industrial uses cover 3%. At this scale, the data have been simplified, but the overall predominance of urban, or residential, development is apparent. These development types are based on the NSDNR identification codes as defined in the Nova Scotia Forestry Database (see Appendix 4a). These data are fairly coarse and do not pick up individual residences.

Table 4-1: Coverage of different development types within 2 km of the Nova Scotia coastline

<i>Development Type</i>	<i>Area (ha.)</i>	<i>Percentage</i>
Undeveloped - Forest	535,694	66%
Undeveloped - Non-Forest	110,179	14%
Urban	66,997	8%
Agriculture	56,298	7%
Infrastructure and Industrial Uses	21,179	3%
Managed Stand	15,781	2%
Total	806,128	100%

Source: (NSDNR Digital Data, 1998-2008)

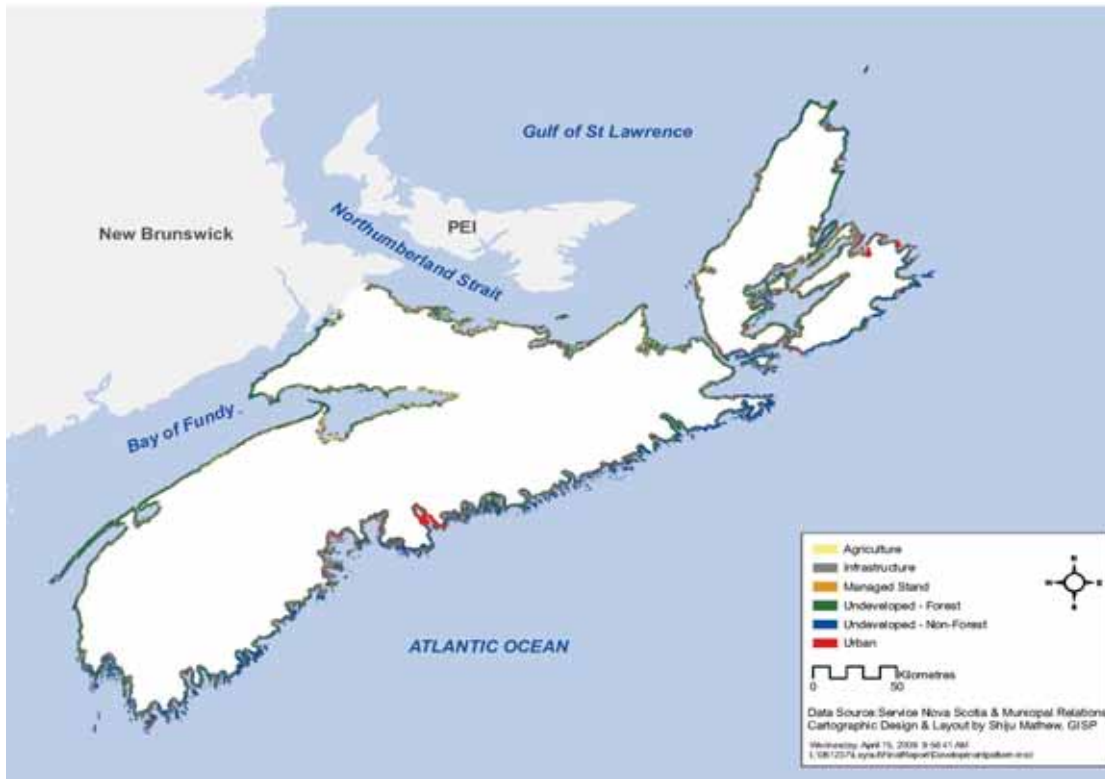


Figure 4.2: Location of different development types within 2 km of the Nova Scotia coastline (Source: NSDNR Digital Data, 1998-2008)

In an attempt to further define the extent of different types of development along the Nova Scotia coast and to capture individual residential properties that do not show up in the Nova Scotia Forestry Database, information from the NS Civic Address File Building Use Code was accessed and used to determine building uses that touch the coast (see Table 4.2 and Figure 4.3). Data are available for most of Nova Scotia, with the exception of HRM, which does not submit building use information (see box on data gaps).

Table 4-2: Land Uses Immediately Adjacent to Nova Scotia's Coast

<i>Land Use</i>	<i>Length of Coast (m)</i>	<i>Percentage of Total Coast</i>	<i>Percentage of Known Coast</i>
Undesignated	3,629,794	66.4%	74.6%
Residential	945,310	17.3%	19.4%
Industrial	108,033	2.0%	2.2%
Protected	76,340	1.4%	1.6%
Commercial	70,710	1.3%	1.5%
Fishery	15,566	0.3%	0.3%
Agriculture	14,117	0.3%	0.3%
Institutional	5,919	0.1%	0.1%
Information not Provided (HRM)	604,098	11.0%	n/a
Total	5,469,891	100.00%	100.0%

Source: NS Civic Address File Building Use Code

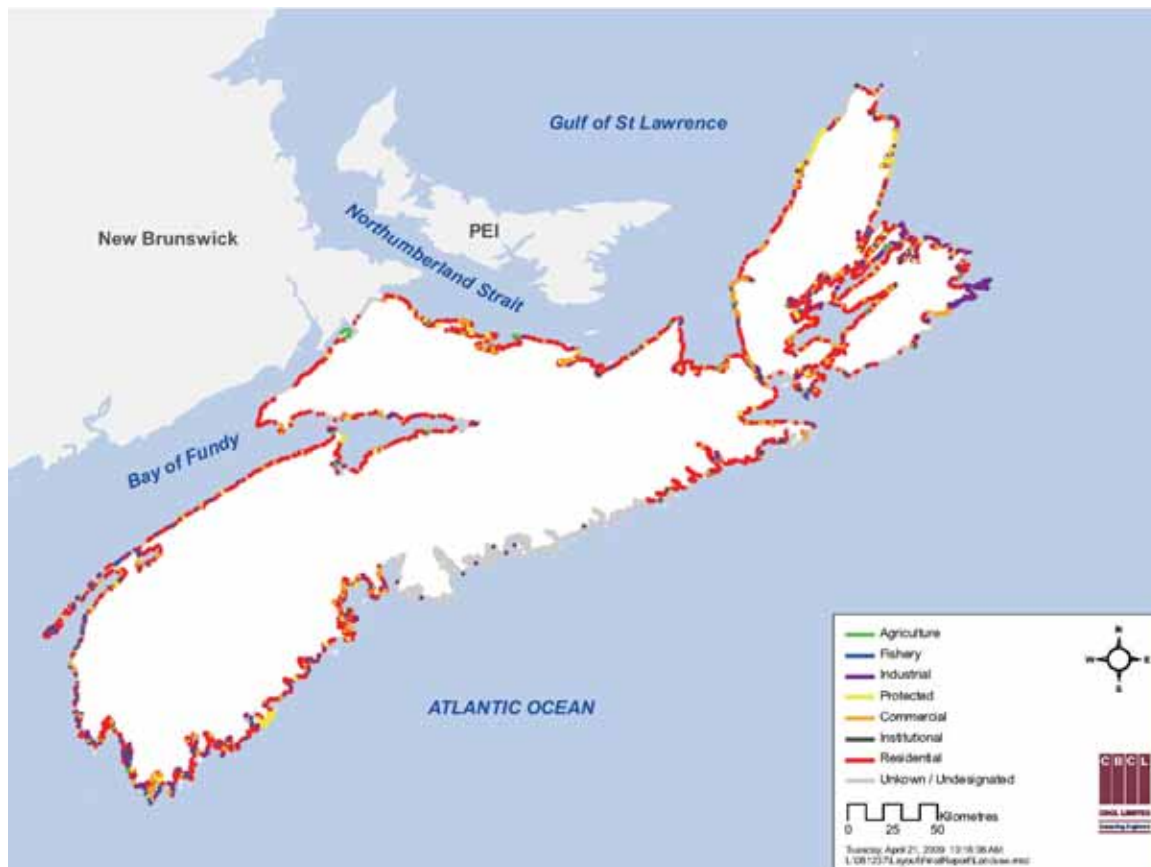


Figure 4.3: Major building uses along Nova Scotia's coast
 While 74% of the coast outside the Halifax Regional Municipality is undesignated, known development types have been emphasized for legibility.
 (Source: NS Civic Address File Building Use Code)

Based on the information obtained from the NS Civic Address File Building Use Code, undesignated lots do not have buildings upon them and are, therefore, likely predominantly undeveloped, natural lands or agricultural fields. Outside of HRM, almost 75% of Nova Scotia's coast is not built upon. Further, residential development on the coast is many times more prevalent than any other type of development (see Figure 4.3). While protected coastal areas, including the Highlands National Park, Blomidon Provincial Park and Kejimikujuk Seaside Adjunct are apparent, other valued coastal areas such as the Cape Chignecto Provincial Park, the Canso Coastal Barrens and the Gabarus Wilderness Areas are not distinguished by the database at this scale. Industrial lands around Sydney show clearly, as do

Deficiencies in Using NS Civic Address File Building Use Code

HRM, which represents 11% of the coastline, has not submitted building use information to the database. A further 74.6% of the type of development on the coast (exclusive of small islands) is designated as unknown in the database. The unknown designation is the result of what information is collected. In general, at least outside of HRM, a civic address and hence a building use code is assigned only where there is a building in existence to have an address. The large numbers of undeveloped lots, whether on a public road or not, will not be assigned a civic address and building use code and, as a result, are undesignated. In addition, this building use information, which is used to as a proxy for land use, was captured in the early 2000s and has not been updated. While the general pattern of development will not have radically changed, the information becomes less accurate with time.

small pockets of other industrial, commercial, agriculture and fisheries use along the coast, but other important coastal uses are not well identified by the NS Civic Address File Building Use Code. Information could be assembled from other sources, such as the Agricultural Land Information Program and municipal planning documents, but this information has neither been collated into one database, nor has it been kept up to date.

The most densely developed areas are the urban service centres including HRM, Truro, New Glasgow, Antigonish, Yarmouth and the Cape Breton Regional Municipality (Figure 4.4). Other densely developed areas include the lands along the Northumberland Strait, along the northern portion of the Fundy shore and around Bridgewater, located several kilometres inland on the tidal LaHave River. Development is sparse on the north-western and south-eastern coasts of Cape Breton, in Guysborough County, along Chignecto Bay in Cumberland County and along the South Shore in Queens and Shelburne Counties. The principal non-coastal concentrations of development are located along Highway 102 between Halifax and Truro and in the Annapolis-Cornwallis valleys.

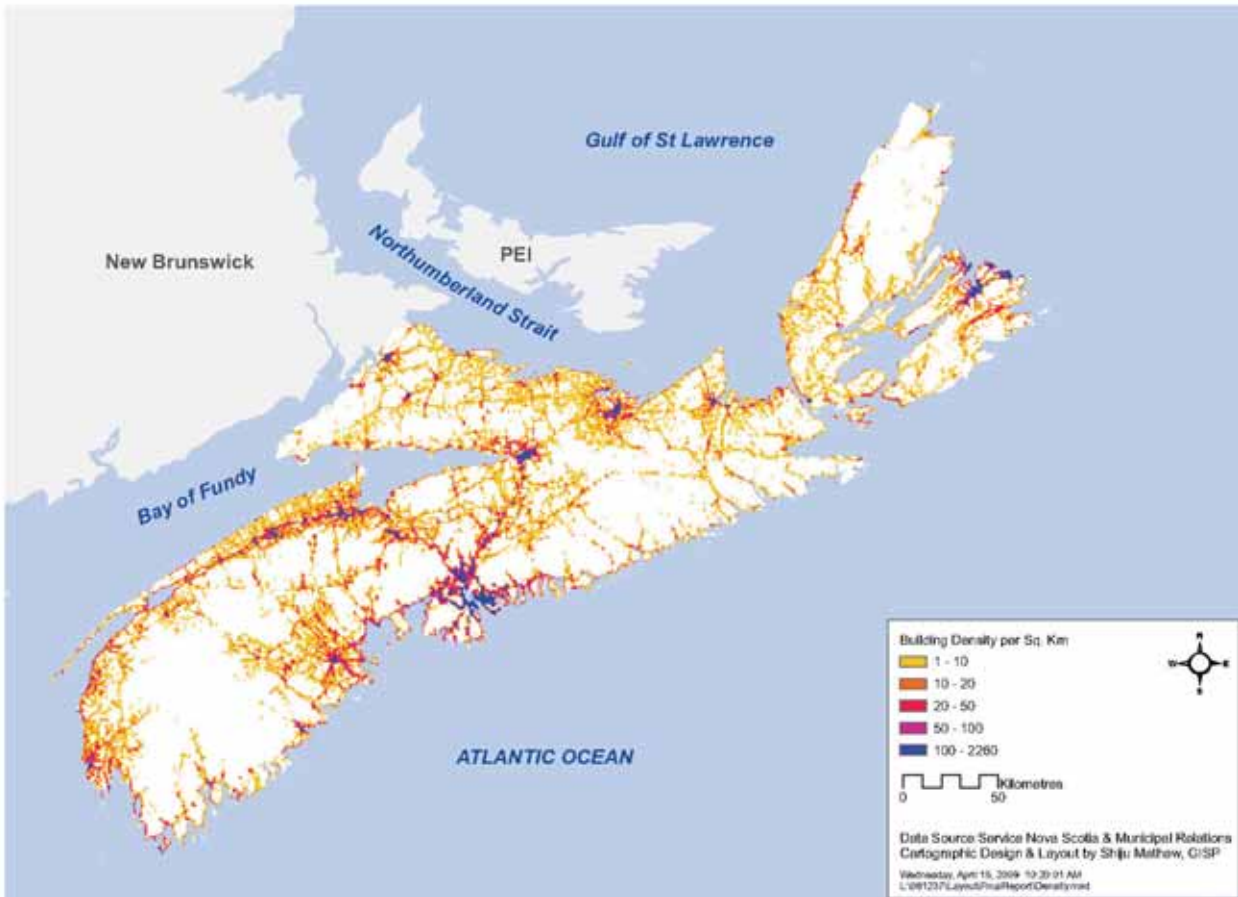


Figure 4.4: Density of civic address points in Nova Scotia.
 (Source: Nova Scotia Property Online Database)

The locations of concentrated coastal development can be attributed to physical and socio-economic factors (see Sections 3.1 and 3.2) as well as historical development patterns (see Section 3.3). Influencing factors include the quality of the harbours, access to land and marine resources, soil conditions, the global demand for materials and products, as well as factors that have become of increasing significance through the latter part of the 20th Century, including quality of life aspects such as scenic settings for primary homes and vacation properties.

4.3 Trends in Coastal Development

Throughout the 19th and early part of the 20th centuries, the intensification of coastal use was based on the conventional economic model of growth, where infrastructure development, e.g., harbours, railways and road networks, drove the coastal economy (see Section 3.3). This development attracted labour, and urbanisation followed. Today, much coastal development follows a different model, with the main trends related to residential, recreational and industrial development (see Figure 4.3).

4.3.1 Residential and Recreational Development

Residential building, both permanent and seasonal, has become a significant driver of coastal development. Between 2001 and 2006 most of the rural census subdivisions in the province experienced increases in occupied dwellings (Figure 4.5).

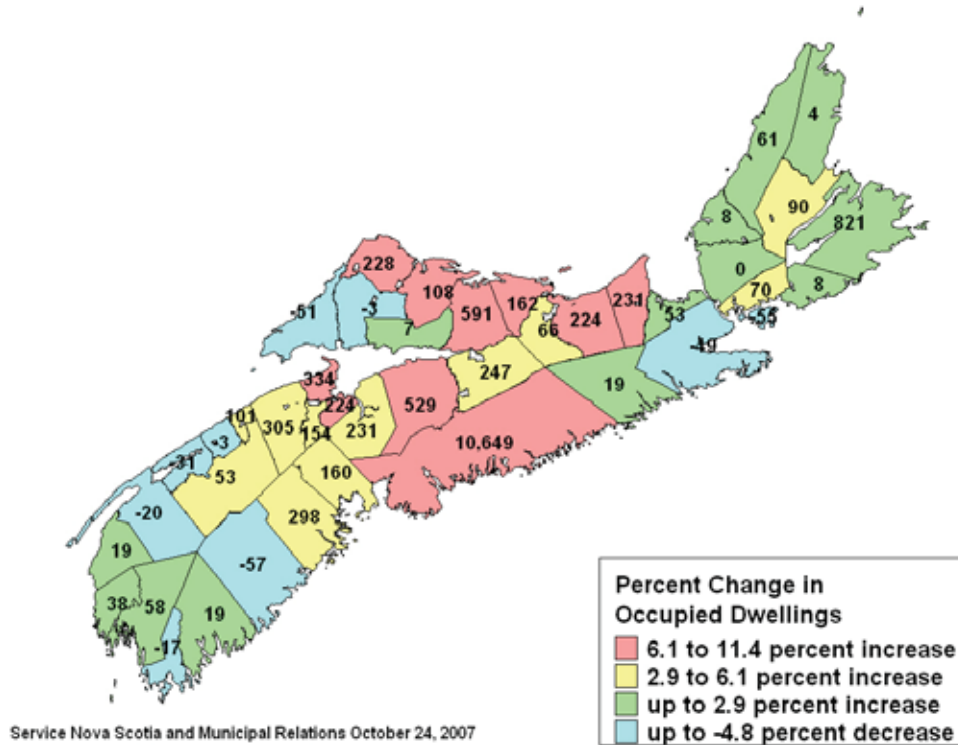


Figure 4.5: Absolute change from 2001 to 2006 in occupied dwellings by Census subdivision

Based on an analysis of Census dissemination areas, Coastal Communities Network (2004) determined that over a quarter of a million people live in the coastal rural zone of Nova Scotia (see the blue area on Figure 4.6). While increased urbanization is leading to population decline in much of rural Nova Scotia (see Section 3.2.2), the demand for oceanfront and oceanview development locations has tempered this trend along the coast. Coastal areas in Nova Scotia lost 6% of their population between 1991 and 2001, and shrank from 30% to 28% as a proportion of the total population; in contrast, non-coastal rural areas lost 13% of their population and shrank from 33% to 28% as a proportion of the total Nova Scotia population (Coastal Communities Network, 2004).



Figure 4.6: Coastal Rural Area (Source: Coastal Communities Network, 2004)

Coastal residential development is often located near a larger community, enabling residents to enjoy the benefits of coastal living while commuting to jobs in the urban centre. People like to live by the sea because of an arguably better quality of life (European Environment Agency, 2006). This is often expressed in elevated real estate prices. Properties with oceanfront, for example, can sell for up to \$100,000 more per lot than inland properties, even those just across the road (Wendy Harrington, Prudential Property Specialists, pers. comm., 2009). Interestingly, oceanfront property also sells for higher prices and is in greater demand than lakefront property. The South Shore, i.e., Lunenburg and Mahone Bay, is considered one of the most desirable locations in the province due to the attractive villages and proximity to larger towns such as Bridgewater, which provide shops, service facilities, entertainment and amenities. Some real estate agents consider the Eastern Shore not as popular as potential homebuyers consider the area too foggy and wet, and less accessible to amenities (Wendy Harrington, Prudential Property Specialists, pers. comm., 2009).

Residential development, both permanent and seasonal, often proceeds in a strip-like manner along the coast to take advantage of the amenities, i.e., views and easy access for boating and swimming, leaving the inland areas undisturbed (see Figure 4.7). These areas typically rely on individual wells and septic systems, and the linear form of development makes the

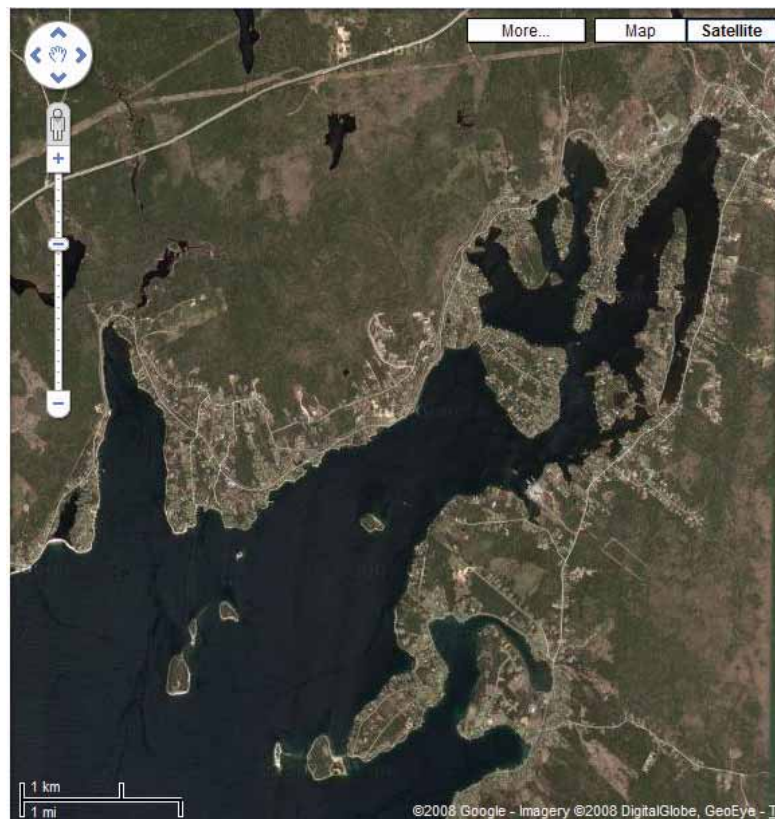


Figure 4.7: An Example of coastal residential development, Tantalton, outside Halifax (Source: <http://maps.google.ca>)

provision of centralized sewer and water supply services expensive.

Recreation development also tends to occur in a thin strip close to the water. Figure 4.8 shows an area near Fox Harbour, where a strip of largely seasonal cottages extends along the coast to the west of the Fox Harbour Resort and Golf Course; the latter is also developed adjacent the coast. The attractiveness of such recreational development is usually associated with either direct access to the water, or good views of the coastline. Comparable developments are located throughout the province in proximity to good beaches and areas of natural beauty



Figure 4.8: An example of coastal cottage and recreational development, Fox Harbour, NS. (Source: Nova Scotia Geomatics Centre Datalocator 1995 & 2005, retrieved 3 February 2009 from www.nsgc.gov.ns.ca/datalocator)

Although industrial developments can garner public attention because they are perceived as causing environmental degradation, residential and recreational developments also have major impacts on the character and natural environment of the coast. These developments require the clearing of large tracts of land, affecting ecosystems and impacting landscape aesthetics. Poorly installed or maintained septic systems, can cause water pollution and stormwater runoff can affect water quality, erosion and sedimentation. Whereas industrial developments are usually highly regulated and regularly monitored to ensure compliance with environmental regulations, residential developments are seldom inspected following construction.

Case Study: Patterns of Development in Sheet Harbour

Sheet Harbour provides a case study of the comparative extent of industrial versus residential and other types of development (see figure below). The industrial area involves a block of cleared land approximately 53 hectares in extent; the residential and related development involves land along the coast that amounts to approximately 250 hectares. Both types of development have an impact on the environment and character of the area. The industrial site affects 11.4 m of coastline per hectare of development, whereas the residential development affects 47.7 m of coastline per hectare of development. The industrial area is a concentrated, regulated and monitored development. In contrast, the residential and related development is dispersed, subject to little regulation and less monitoring. The latter has had a significant cumulative impact on the appearance of the area; the large areas of impermeable and less permeable surfaces, the concentration of overland water flows in swales and ditches and the presence of many individual wells and septic fields affects both ground and surface water affecting, in turn, marine water quality.



Development of Sheet Harbour. (Source: Nova Scotia Geomatics Centre Data locator 1995 & 2005, retrieved 3 February 2009 from www.nsgc.gov.ns.ca/datalocator)

One of the main concerns with residential development is intensifying land use, as indicated by subdivision. The steady and dramatic increase in the rate of the subdivision of coastal land through the 20th Century is depicted on Figure 4.9. This change is in part the result of:

- Smaller household size, i.e., from 2.6 people per house in 1996 to 2.4 in 2006 (Nova Scotia Community Counts, 2008);
- Improved highway access and higher personal vehicular use resulting in an increased willingness of people to commute longer distances to work; and
- Increased demand as a result of the maturing baby boom population and concomitant increases in disposable income that enabled more people to purchase second homes.

The rate of subdivision has recently slowed, perhaps as a result of changes in these demographic trends. For instance, baby-boomers are beginning to retire with a change in lifestyle and income that has reduced demand for second homes. Also less land is available for subdivision. As an example, along the South Shore, most of the premium waterfront land in Lunenburg County has already been developed and larger tracts of waterfront that are still intact, i.e. the Ovens Natural Park, are not currently available. In areas further away from Halifax, such as Queens, Shelburne and Yarmouth counties, there are still development opportunities available at reasonably affordable prices (Tony Walters, Claussen Walters and Associates Ltd., pers. comm., 2009).

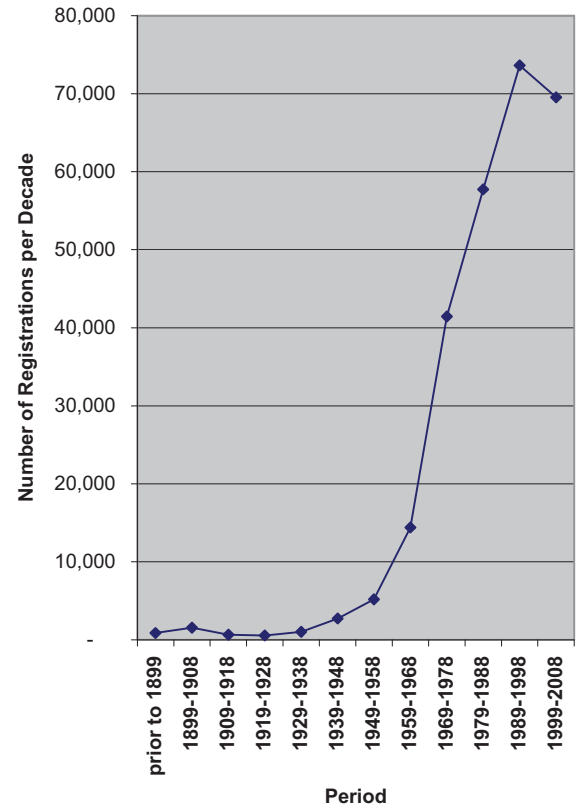


Figure 4.9: Rate of lot registration within 2 km of the Nova Scotia coastline per decade (Source: Nova Scotia Property Online Database)

While conventional wisdom suggests that there is more pressure to subdivide and develop coastal land near the major urban centres, the geographical analysis of changes in the number of lots being created shows that the subdivision process has been widespread throughout the province (see Figure 4.10). Lots are registered as they are created, and the year of lot registration provides an indication of when and where subdivision is occurring.



Figure 4.10: Location of new lot registrations in the Pubnico / Shag Harbour area (Source: Nova Scotia property online database)

Subdivision for rural residential development lots is occurring in many areas on what had been agricultural land. These subdivisions occur where there had been no such development before (Figure 4.11a), through the extension of an existing pattern of subdivision into agricultural land (Figure 4.11b), and through the absorption of agricultural land between the highway and the coastline (Figure 4.11c).



a: Subdivision where none existed before – Heather Beach



b: Extension of existing pattern – East Wallace



c: Subdivision between the highway & coast – Malagash Point

Figure 4.11: Examples of residential lot subdivision on agricultural land in Nova Scotia (Source: Mark Poirier, Service Nova Scotia and Municipal Relations, pers. comm., 2009)

4.3.2 Industrial Development

The coastal zone supports 30% of the jobs in Nova Scotia, and the province depends on the coastal-rural regions for its overall economic growth and stability (Coastal Communities Network, 2004). Natural resources, including forests, minerals and wildlife, provide approximately 10,000 direct well-paid jobs and \$1.5 billion in annual sales; they account for about one-third of the province's exports (Nova Scotia Economic Development, 2000). Industries such as fish and fish preparation, non-metallic minerals and mineral fuels, lumber, wood pulp, paper and paper board are predominantly rural-coastal based, rely on a rural-based labour force and often ship product. These resource-based industries and associated businesses will continue to provide considerable economic value, especially in rural areas. Their future viability and their continuing contribution to the economy, however, will require a skilled and committed labour force living in the regions where the productive activities take place (Coastal Communities Network, 2004).

Coastal dependant industries play a role in the economies of coastal communities, but that role is changing. Over the last century or more, with the shift away from water-based transportation systems and other changes in technology, the overall amount of coastal industrial waterfront use has been decreasing. Shipbuilding, for example, was a widespread activity throughout the province, but is now limited to the Irving Shipyard in Halifax and some boatbuilding yards around the province (see Section 3.2.1.9).

Industrial and resource extraction projects are often based on site specific conditions that make it difficult to predict general trends, but there is evidence to suggest that proposals for oil and gas, quarries and pulp and paper mills are increasingly associated with coastal sites (Ecology Action Centre, 2008). Recent examples of coastal industrial development include: the development of the gas plant at Goldboro where the Sable Natural Gas pipeline makes landfall; [the development of a tidal power demonstration and research facility in the Bay of Fundy](#); the continued development of the Martin Marietta quarry at Auld's Cove; the 30 megawatt wind farm at Pubnico Point; the proposed container terminals at Melford and Sydport; and the possible reopening of the subsea coal mine at Donkin. While the land area directly associated with the operation of industrial or resource extraction developments is usually limited in extent, their effects can be experienced over a greater area. Proposed industrial or resource extraction developments can be divisive, with some people supporting the economic development opportunities offered (especially in more remote, smaller communities), while others express concern over impacts on the natural environment, the character of the area, or negative effects on existing businesses in the area.

Industrial Development

Industrial development, such as that at Point Tupper, is often associated with good natural harbours and associated port facilities. Similarly, if the geology is appropriate, quarries will be located in locations where the product can be readily shipped. The Martin Marietta quarry on the Strait of Canso is a case in point. Such developments make significant changes to the landscape in which they are located.



The Martin Marietta Quarry at Auld's Cove, An Example of Coastal Resource Extraction.
Source: <http://www.atyp.com/martinmarietta/>

Case Study: The Shift in the Use of the Halifax Waterfront

The aerial photographs below show the same area of the Halifax waterfront in 1921 and 2008. In the later photograph, almost all the finger piers and buildings along the waterfront associated with the landing and shipping of goods have been removed. The immediate waterfront area now contains large office buildings and a boardwalk for recreation and tourism. Most of the boats tying up in the area are tourist/recreational vessels. Rail lines to the right of the earlier photograph have been removed and road infrastructure, e.g., Barrington Street and the Cogswall Interchange, has a much more prominent presence. The only area to stay relatively unchanged is the Naval Dockyards.



Halifax Harbour, 1921. Source: http://airphotos.nrcan.gc.ca/photos101/halifax_e.php



Halifax Harbour, 2008. Source: <http://maps.google.ca>

Comparison of waterfront development in Halifax Harbour

Other new industries that could have an impact on the coast include wind farms and tidal power projects. These energy projects have the potential to diversify Nova Scotia energy sources and provide a greater supply of clean renewable energy. Currently 88 per cent of the province's electricity comes from fossil fuels (Nova Scotia Department of Energy, 2009). Wind could potentially provide 20 per cent of Nova Scotia electricity by 2013 (Nova Scotia Department of Energy, 2009). In a 2006 research study EPRI estimated that in-stream tidal technology in the Bay of Fundy could generate 300 megawatts of green, emission-free energy from two locations. Nova Scotia already has North America's only operational tidal power station located in Annapolis Royal producing 20 megawatts of energy. These energy sources can have impacts on land use and the latter on marine waters.

Aquaculture is a valuable water-based industry which has the potential to have impacts on the aesthetic and water quality of the coast. While there was a large expansion of this industry through the 1990s (see Section 3.2.1.5), the industry is still in its developmental stages in Nova Scotia.

Case Study: Whites Point Quarry and Marine Terminal Project

Pressures on coastal land are strong, and the need for a coastal strategy has been identified in the Review of the Environmental Assessment for the White's Point Quarry on Digby Neck. The Panel reviewing the assessment found that in a marine setting, a quarry's influence will be felt on recreational activities, tourism, shipping, large marine animals, the commercial fishing industry and local aesthetics (since a large-scale operation is a prominent coastal feature). There is also the potential for the creation of a downstream effect mediated by the circulation of local ocean currents.

The Panel found that provincial departments differ in the priorities they set for the coastal zone, thus contributing to uncertainty for communities and investors about what kinds of uses will be permitted. Federal authorities promote free trade and community sustainability without acknowledging that in some cases those objectives conflict. Panel members repeatedly heard from interveners that proposals for major industrial developments targeted at internationally recognized or environmentally important coastal regions should be deferred until a provincial plan on coastal management policy has been completed. The Panel stated that with such an extensive coastline to manage, Nova Scotia needs to expedite planning for the coastal zone to facilitate decision-making.

The Panel recommended that the Province of Nova Scotia develop and implement a comprehensive coastal zone management policy or plan for the Province.

(Fournier *et al.*, 2007)

4.3.3 Competing Interests

Pressures on the provincial land base are changing, and in some areas increasing, with respect to both consumptive uses, e.g., resource extraction, hunting and protection-oriented uses, e.g., outdoor recreation, wildlife and habitat, ecotourism and conservation. The appropriate balance can provide both economic and quality-of-life advantages to Nova Scotians (Nova Scotia Economic Development, 2000).

The concept of competing interests is recognised as one of the major issues facing many coastal communities. The wide variety of uses that shoreline areas can serve are frequently incompatible. This leads to conflicts between various interest groups and demands that more conscious attention be directed to determining society's values and socio-economic priorities with respect to this resource (Wood, 1990). Urban sprawl, resort development, industrial development, aquaculture and other use demands are leading to local use pressures and to changes that can directly affect ecosystems. Such impacts can extend beyond the direct footprint of the development and can lead to pollution, sedimentation and changes in coastal dynamics (European Environment Agency, 2006). Examples of competing interests (Figure 4.12) include, but are not limited to:

- Traditional, resource-based lifestyle versus tourist lifestyle;
- Conservation versus industry or mineral extraction;
- Rural livelihood versus commuter lifestyle;
- Newcomers wanting a coastal lifestyle and willing to pay more than long-term residents for coastal properties can cause property values to increase resulting in property tax increases and difficulties for long-term resident to be able to afford to stay (Murphy, 2008);
- Any type of development versus the preservation of coastal aesthetics; and
- Aboriginal treaty rights and the preservation of other sometimes intangible historical and cultural resources versus new development.



Figure 4.12: Headlines Related to Competing Interests (Source: Coastal Coalition of Nova Scotia, Presentation to Provincial Deputy Ministers, March 27, 2007)

There are many examples of competing land use interests on the coast. At the following sites, for example, recreational beach use has to be balanced with the preservation of habitat for the endangered Piping Plover and other wildlife habitat: the Musquodoboit Harbour Ramsar site, the Martinique Beach Provincial Park and the Kejimkujik Seaside Adjunct. A contributing factor to environmental damage in such areas is the increasing popularity of motorized forms of recreation, primarily the use of all-terrain vehicles (ATVs). These vehicles tend to be more destructive than previous forms of recreation.

Tensions can also develop between long-term residents, who have often worked the land and the ocean for their livelihoods, and newcomers, who come for recreational or lifestyle choices. When there is high demand for coastal property, prices in local markets can increase sharply, with concomitant increases in property assessments and taxes (Voluntary Planning Task Force, 2001; Murphy, 2008). Many long-term residents worry about a future where their children can no longer afford to buy or to maintain property that was perceived to be their cultural birthright (Voluntary Planning Task Force, 2001). This especially affects young people and public employees, who cannot afford to live nearby. Their housing demand moves to the coastal hinterland, or further inland. As a result, the social fabric of local communities deteriorates and commuter transport demand increases (Toews, 2005; European Environment Agency, 2006). Conflict can also occur when some people benefit from non-resident ownership and others are affected negatively by the new owners through impacts such as higher property taxes, reduced ability to purchase land or reduced access to resources. New developments have the potential to alter the way of life in small towns and rural areas (Toews, 2005).

Case Study: Oakland Condominium Development

Local residents are concerned about the development of 26 cottage condominium units across from Mahone Bay. While the developer is trying to make the cottages fit in with the style of local homes, local residents have concerns about the density of the development. While the municipality has approved the development, people are asking the court to rescind the approval (Murphy, 2008).

Halifax Harbour

HRM recognizes that there are competing uses for the harbour coupled with a finite amount of water and land available. HRM recognizes that the harbour operates as a seaport, a transportation hub, a playground, a place to live, and as an ecosystem.

HRM recognizes that it is important that a future plan for the harbour determine the right balance among land uses - commercial/industrial marine uses, transportation, recreational, residential, institutional and environmental. This requires an analysis of site specific development opportunities and constraints, taking into account factors such as harbour dependent needs, the relative importance of uses, intensity of uses, infrastructure requirements, community compatibility/impacts and environmental considerations (McLellan, 2004).

4.4 Policies, Programs and Initiatives

4.4.1 Legislation and Policy

The principal legislation that affects coastal zone planning is discussed in Section 3.4.3 (see also Appendix 3). The number of Acts and their inter-related and sometimes overlapping jurisdictions make it challenging for both proponents of projects and regulators, but the key legislation that influences how demand for coastal development is accommodated include the federal *CEAA*, the Nova Scotia *Environment Act* and the *Municipal Government Act*.

Both the *CEAA* and the Nova Scotia *Environment Act* stipulate circumstances where environmental assessment of a proposed development may be required. An assessment is triggered federally when a federal authority:

- proposes a project;
- provides financial assistance to a proponent to enable a project to be carried out;
- sells, leases, or otherwise transfers control or administration of federal land to enable a project to be carried out; and
- provides a license, permit or an approval that is listed in the “Law List Regulations” that enables a project to be carried out (Canadian Environmental Assessment Agency, 2009).

Unless one or more of the above factors apply there will be no federal assessment. Provincially, the Environmental Assessment Regulations pursuant to the Nova Scotia *Environment Act* identify the range of projects that will be subject to assessment and the nature of that assessment. There are circumstances where both regulatory regimes apply, and circumstances that involve one or other. The determination is project and site specific. Both processes can prohibit a proposed project from proceeding, or allow it to proceed with or without conditions. Once released from the environmental assessment process, all projects will also be subject to any other regulatory requirements, e.g., the need to attain a Section V approval under the Provincial *Environment Act*, or authorization under the *Fisheries Act*, etc.

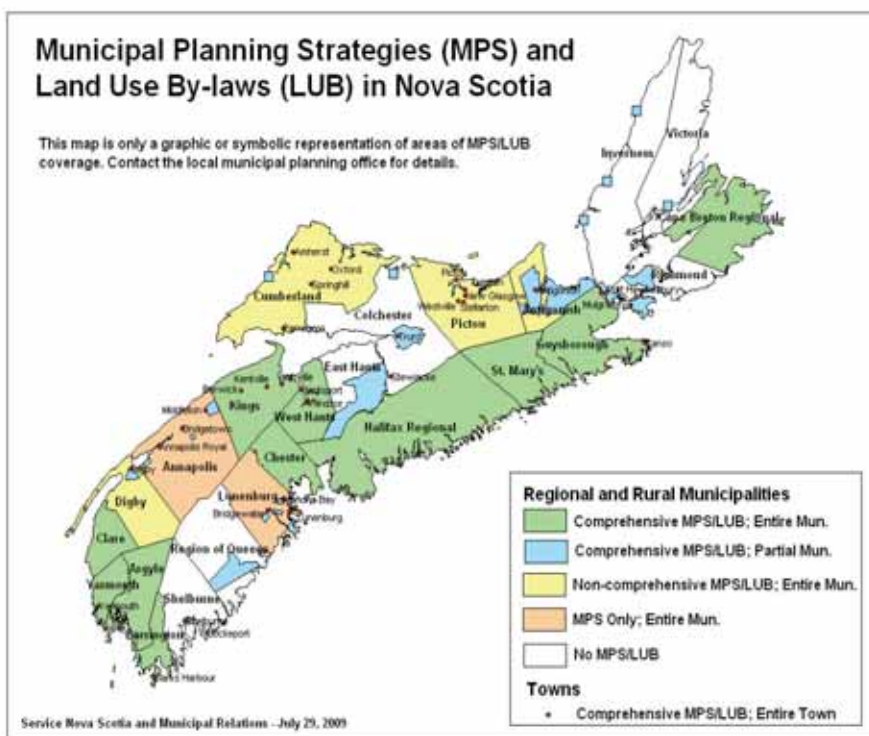


Figure 4.13: Areas in Nova Scotia with Municipal Planning Strategies and or Land Use Bylaws (Source: Service Nova Scotia and Municipal Relations, 2007)

In addition to the construction, management and control of public highways throughout the Province, the *Highways Act* has considerable control on adjacent property development via regulation and approvals related to the construction of buildings, driveways, access roads and drainage control and the installation of advertising signage to prevent accidents, maintain road safety and protect downstream environments and scenic views (see Appendix 3 for further details). Nova Scotia Transportation and

Infrastructure Renewal (NSTIR) district staff review applications and recommend Ministerial approvals for property development and the “breaking of soil.” The review process is primarily directed towards maintaining road safety, but there is potential for both enhanced consideration of environmental concerns and greater cost recovery for application processing to help ensure coastal sustainability and clean water.

The Province has delegated the zoning power to the municipalities and does not require municipalities to adopt an official plan. It can, however, require that any new planning conform to the Statements of

Provincial Interest set out in the *Municipal Government Act*. At present there is no specific Statement of Provincial Interest regarding coastal development and wider coastal issues. While the existing Statements of Provincial Interest do not specifically address protection of the environment, they attempt to limit development in areas susceptible to flooding, among other things. The Minister of SNSMR also has the power to invoke an interim planning area where a municipality fails to protect a provincial interest.

Nova Scotia's municipalities have power over coastal development through the *Municipal Government Act*, which allows them to develop municipal planning strategies and zoning by-laws that regulate land use, but not activities. Only 45% of the provincial land area, however, is regulated through land-use planning (Figure 4.13). This means that 55% of the area of the province is unplanned, other than the province-wide standards set out by provincial subdivision regulations, building codes, and the *Environment Act* (Baccardax, 2008). Municipalities cannot control crown land, nor do they have jurisdiction over environmental issues regulated by the Province, e.g., quarries, (Hynes & Graham, 2005).

4.4.2 Current Initiatives

Integrated resource management is a long-term land use planning exercise initiated by the Province to determine future uses of Nova Scotia's publicly-owned Crown lands. The province defines integrated resource management as a planning- and decision-making process that coordinates resource use so that the long term sustainable benefits are optimized and conflicts among users are minimized. Integrated resource management aims to bring together all resource groups, rather than each working in isolation to balance the economic, environmental and social requirements of society. Integrated resource management includes planning for minerals, forests, recreation, wilderness, energy, wildlife, and parks (Nova Scotia Department of Natural Resources, 2009). This initiative has the ability to determine in a site specific manner what appropriate development and use of coastal crown lands will be.

In 2005, the Union of Nova Scotia Municipalities passed a “sustaining coastal ecosystems” resolution, but the Nova Scotia municipalities have not fully implemented this recommendation.

One initiative of SNSMR is the Community Lands Use Reporting System. This GIS-based system is designed to gather information from a variety of sources including: Nova Scotia Community Counts; Statistics Canada; Nova Scotia Property Online; the Nova Scotia Civic Address Database; the Nova Scotia Agricultural Land Use Information Program; and various databases at NSDNR such as the Restricted and Limited Use Land Database, the Nova Scotia Wetland Inventory, and the Wind Atlas from the Nova Scotia Department of Energy. It is the intention to place this database in a searchable form on the internet through the Nova Scotia Community Counts website. People would be able to manipulate the display to obtain information such as building/land use and the development of new civic address points at the community level. This information is currently available and has been tested, and is expected to be released into the public domain in the near future. The system is designed to allow for additional information to be added, such as the centroids of new lots, which would allow people to determine where new development is about to happen before new buildings are built.

The Nova Scotia Department of Energy recognizes the need for a coordinated regulatory framework for marine renewable energy, including development of marine renewable energy legislation. The

Department of Energy has been working closely with federal and provincial regulators, tidal energy developers, and stakeholders to develop policies and strategies aimed at creating efficient and effective regulatory processes for this developing industry.

An interesting initiative initiated by the Ecosystem Indicators Partnership (ESIP) under Gulf of Maine Council on the Marine Environment (2007) involves the development of indicators of ecosystem health in the Gulf of Maine, including several indicators for coastal development. ESIP's Coastal Development Sub-Committee consists of representatives from municipal, state, provincial and federal agencies, academia, and non-governmental organizations; they have Coastal Development Indicator Matrix that identifies possible indicators for coastal development. Presently, ESIP is working to collect and analyze data for three specific indicators in the Gulf of Maine: population density, point source pollution and impervious surfaces.

This State of the Coast Report is part of the activities leading to the development of a Nova Scotia Sustainable Coastal Development Strategy under the Ministry of Fisheries and Aquaculture. In addition, Nova Scotia Environment is in the midst of a three-year process to develop a Nova Scotia Water Resources Management Strategy, which has the potential to discuss issues related to coastal development and water resources.

In addition to government initiatives, there are a variety of groups concerned in whole or in part with coastal development issues. General umbrella organizations bringing groups with similar objectives together and encouraging the sharing of information include:

- Atlantic Coastal Zone Information Steering Committee;
- Bay of Fundy Ecosystem Partnership;
- The Coastal Coalition of Nova Scotia;
- Coastal Communities Network (CCN);
- The Coastal Community University Research Alliance, known as Coastal CURA;
- Gulf of Maine Council on the Marine Environment; and
- Southern Gulf of Saint Lawrence Sustainability Coalition.

Area specific groups that work on local issues include:

- Atlantic Coastal Action Program (ACAP) Cape Breton;
- Aspotogan Heritage Trust;
- Bluenose Coastal Action Foundation;
- Bras d'Or Lakes Collaborative Environmental Planning Initiative;
- Friends of Port Mouton Bay;
- Kingsburg Coastal Conservancy;
- Pictou Harbour Environmental Protection Project;
- Sable Island Preservation Trust;
- St. Margaret's Bay Stewardship Association; and
- Tuskent River Environmental Protection Association.

Other NGOs include:

- Clean Nova Scotia;
- Ecology Action Centre Coastal Issues Committee;
- Nova Scotia Nature Trust; and
- The Sierra Club.

4.5 Sustainability Issues / Key Points

Approximately 86% percent of the coastline, including the islands and the shores of the Bras d'Or Lakes, is held privately and could be developed. Publicly held lands are determined from the Nova Scotia Property Records Database and include all municipal properties, old rights of ways ("K roads"), and lands held by various provincial and federal government departments (see Appendix 4b). Some of these lands may have security and safety restrictions, (e.g., Department of National Defence (DND) properties, or municipal water treatment plants), where use by the general public is restricted (see Chapter 6). Figure 4.14 depicts lands that are provincial and federally protected; this does not include lands that are protected in other ways, e.g., through municipal ownership, NGO ownership, or conservation easements.

Development on the coast is itself an important sustainability issue, because many people and groups are concerned that not enough of the coast is protected from development. Additionally, public and non-governmental interests often conflict with landowner interests and development proposals for Crown land.

Groups such as the Voluntary Planning Heritage Strategy Task Force, Ecology Action Centre, the Atlantic Health Promotion Research Centre at Dalhousie University and the Coastal Communities Network of Nova Scotia have identified the need for improved information gathering, analysis and planning. They assert that:

- Nova Scotia's coastline, more than any other natural feature, provides the basis for our shared identity (Voluntary Planning Heritage Strategy Task Force, 2006), but despite our reliance on the coast for identity, jobs, tourism, and recreation, not sufficient emphasis is placed on coastal planning (Voluntary Planning Heritage Strategy Task Force, 2006);
- Nova Scotia has no legislative or policy framework requiring the identification of important and sensitive coastal habitats and no regulations governing the kinds of activities that can occur in and adjacent to these habitats (Ecology Action Centre, 2008);

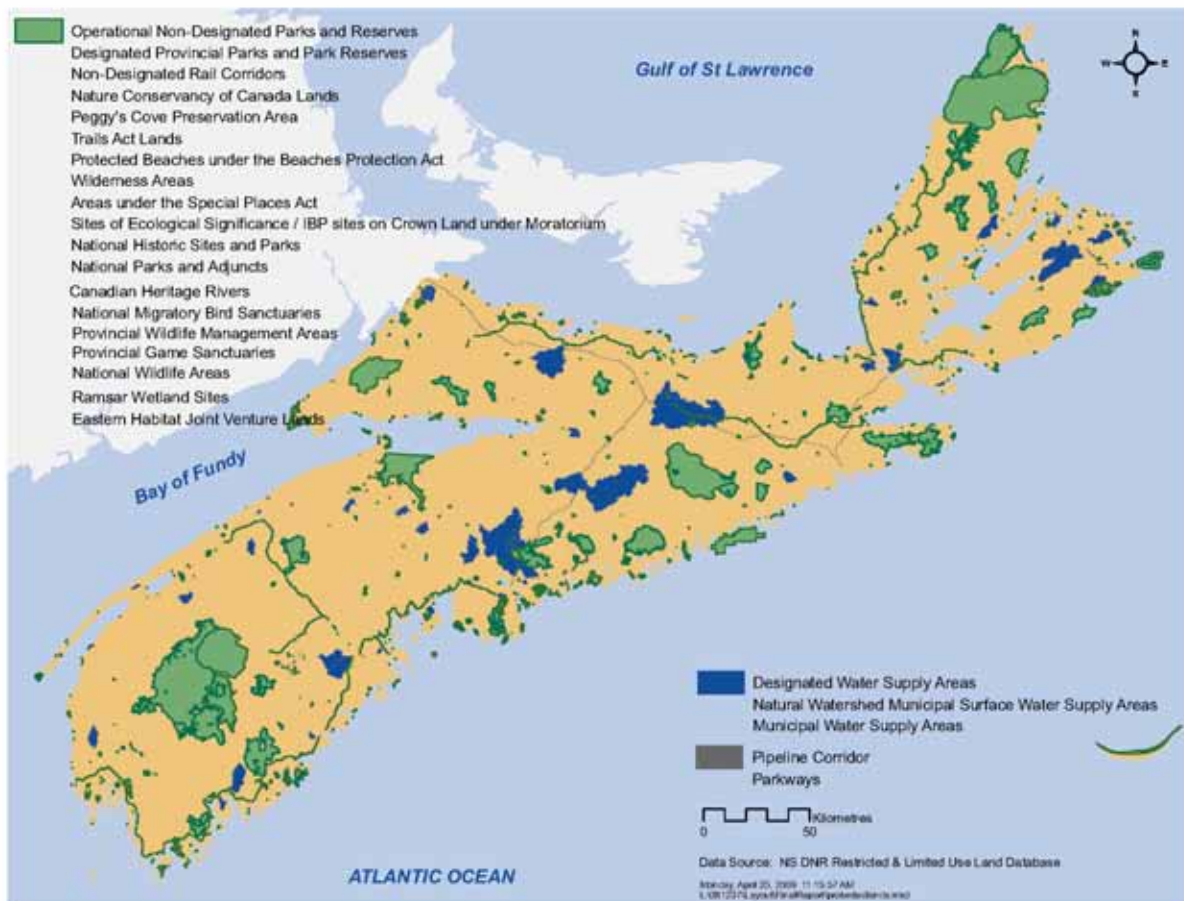


Figure 4.14: Federally and Provincially designated lands in Nova Scotia (Source: NSDNR Restricted Use and Limited Use Database)

- There is a general lack of public and government awareness about the value and sensitivity of our coastline and coastal communities and the threats they face (Ecology Action Centre, 2008);
- There is not enough information about either the extent or the nature of the impacts associated with coastal development (Ecology Action Centre, 2008);
- Coastal area management is a challenge due to jurisdictional overlap between federal, provincial, and municipal legislation (Toews, 2005);
- Planning is a means of addressing many coastal issues in a manner that supports community involvement (Toews, 2005). Responsibility for land use planning resides with the municipalities, which have the legal capacity to impose development provisions in sensitive areas, to impose buffers, and to use zoning for the protection of watercourses (which, under the stated definition, includes the ocean) (Coastal Coalition of Nova Scotia, 2008). Many municipal governments, however, lack the capacity to execute comprehensive planning exercises or enforce existing land-use bylaws (Toews, 2005; Coastal Coalition of Nova Scotia, 2008); and
- While the *Municipal Government Act* articulates provincial interest statements in five areas, none of these deal specifically with coastal issues (Baccardax, 2008).

Land use alone is not a good indicator of development impacts. The European Environment Agency (1995) found that information on land cover, together with information on relief, drainage, etc., was essential for the effective management of the environment. A system of land analysis, utilizing modern techniques of satellite imagery and geomatics, updated on a regular basis could provide much needed information on changes in the state of the Nova Scotia coast, which would assist managers in making decisions on issues and approaches to dealing with them. Such a system would develop standard nomenclature, compile development-related information in a central database, ensure that information is consistent and allow the cross-referencing of environmental data with other information (including socio-economic data) to determine possible interrelationships.

Data Gaps

- There is no centralized system for tracking and storing information related to coastal development in the province such as changes in zoning, land subdivision, land use changes, areas being cleared, new construction, population changes, etc.; and
- There is good information such as the extent of different types of development and trends in coastal development being gathered by various sources and it could be collated and displayed through the Community Land Use Reporting System under development by SNSMR, but there is a technical hitch hindering the posting of the system to the web.

Additional Limitations

- Some municipalities do not have municipal planning strategies and, of those that do, most do not have policies about coastal development; and
- Many municipal governments lack the capacity and resources to undertake complicated planning exercises, and receive little provincial support for capacity-related issues such as planning experience and technical support.

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5.1 Introduction

A working waterfront consists of sites or facilities that provide physical access to the sea for ocean-dependent uses and businesses, as well as all related infrastructure and services, which may or may not occur at the water's edge, e.g., processing plants and lighthouses, etc. (Nova Scotia Fisheries and Aquaculture, No Date). This definition focuses attention on those coastal areas that show concentrations of activity and are likely the locations that have greater impacts on coastal social, economic and environmental conditions; and create more significant competition for land and access to the ocean.

As referenced in Section 3.3, concentrations of social and economic activity of European origin in Nova Scotia tended to occur first in those areas with safe, deep harbours that were capable of supporting fishing, industrial and trading activities. The resultant infrastructure and development profoundly influenced both the location and the function of working waterfronts in the province. Today's coastal communities with working waterfronts, however, have not been immune to the late 20th and early 21st Century global economic changes that have affected municipalities across Canada. As Table 3.4 (Chapter 3) demonstrates, between 2003 and 2007 Nova Scotia saw a decline in employment in resource industries and a rise in the importance of service industries. Out-migration from smaller resource-based communities to larger urban areas with broader economic bases accompanied the decline in resource-based employment.

Smaller coastal communities within commuting distance of larger urban centres experienced rising household incomes and property values and stable to growing populations. These changes were driven largely by commuters and seasonal property owners from the larger centres. A number of the smaller coastal communities outside the commuting range of the larger centres tended to benefit from the consolidation of both economic activity and population, while other working waterfront communities declined.

5.2 Legislative and Program Background

In 1995, the Government of Canada announced the National Marine Policy, which outlined the plan, administered by Transport Canada, to rationalize the Canadian marine transportation system. The government considered the rationalization necessary to address rising over-capacity and inefficiencies. For example, by the mid-1990s, 38 of the 549 public ports in Canada handled approximately 80% of the nation's marine traffic (Transport Canada, 2008). The National Marine Policy divides ports into three types: Canada Port Authority (CPA) ports; regional/local ports slated for divestiture, and remote ports that serve the basic transportation needs of remote communities. The Port Divestiture Program, established in 1996, was one of the programs that stemmed from the National Marine Policy. As of March 31, 2007, 469 of the 549 public ports and public port facilities originally operated by Transport Canada had been transferred, demolished or had their public harbour status terminated (Transport Canada, 2007).

Small Craft Harbours is a nationwide program, established in 1988 and managed by the Small Craft Harbours (SCH) Branch, DFO. SCH operates and maintains a national system of harbours to provide

commercial fish harvesters and other harbour users with safe and accessible facilities. The mandate of SCH is to keep the harbours that are critical to the fishing industry open and in good repair. Nearly 90% of all fishing landings in Canada occur at small craft harbours.

SCH uses three main strategies to fulfill its mandate:

- Maintain a network of core harbours, i.e., those that are essential to the fishing industry;
- Promote the formation of Harbour Authorities to ensure local control over commercial fishing harbours; and
- Transfer the ownership of non-essential harbours and recreational harbours to local communities through divestiture (Fisheries and Oceans Canada, 2008a).

By April 2008, 143 Harbour Authorities managed 164 of the 187 small fishing harbours in Nova Scotia. (Fisheries and Oceans Canada, 2008b). By October 2007, all 29 recreational harbours in Nova Scotia had been divested (Fisheries and Oceans Canada, 2008c). Federal divestiture policy offers government assets sequentially to other federal departments and agencies, provincial governments, local governments, local community groups and finally, through public listing or tender, to the public at large. This shift in port ownership, management and maintenance has put an increased burden on working waterfront communities. According to SCH, 21% of Nova Scotia's most active harbours are currently considered substandard. Keeping the province's harbours and related infrastructure in good condition will become an increasing concern as communities plan ahead not only to accommodate changes in wharf usage, but also for sea-level rise, storm surges and other impacts of climate change (Coastal Communities Network, 2004).

There are three broad types of ports with working waterfronts in Nova Scotia: CPA ports, local and regional ports, and small craft harbours:

- **CPA ports:** These former Transport Canada ports are considered vital to trade and are financially self-sufficient. Nineteen sites across Canada were considered immediately eligible for CPA status, including the Port of Halifax (now the Halifax Port Authority). The Port of Halifax is the only port in Nova Scotia that was given CPA status;
- **Local and regional ports:** These former Transport Canada ports, identified in Table 5.1, serve a mixture of marine shipping and primary fishery users, but the balance is in favour of the former. Larger waterfront operations, such as those in Sydney and the Strait of Canso Superport are, for the most part, public ports that have been divested by Transport Canada. While these working waterfronts do play significant roles in the social and economic structure of their respective communities, the overall well-being of these communities, relative to smaller coastal communities with narrower economic bases, is less dependent on waterfront activities;
- **Small craft harbours:** These harbours are, or were, primarily used by the primary fishery, whose home communities are small and have relatively narrow and sometimes shallow economic bases. These communities are home to waterfronts and ports that have been divested by SCH. According to Coastal Communities Network (2004), in 2001 28% of the population of Nova Scotia lived in rural harbour communities; 24% of the employed labour force worked in rural harbour communities and 14% of the provincial labour force was employed in industries that make use of wharves, or benefitted significantly from harbours.

Table 5-1: Transport Canada port facilities transferred to private industry (December 1995-January 2009)

Facility Name	County Location	Date Sold or Transferred	New Owner's Official Name
Annapolis Royal Railway Wharf	Annapolis	August 25, 2001	Annapolis Royal Wharf Association
Indian Beach in North Sydney	Cape Breton	July 11, 2001	Cape Breton Regional Municipality
North Sydney Marine Terminal	Cape Breton	March 31, 1999	MV Osprey Limited
Sydney Marine Terminal	Cape Breton	July 11, 2001	Cape Breton Regional Municipality
Parrsboro Government Wharf	Cumberland	October 19, 2001	Parrsboro & Area Harbour Commission
Pugwash Marine Terminal	Cumberland	October 18, 1999	The Canadian Salt Company Limited
Digby Fisherman's Wharf	Digby	December, 2007	Digby Harbour Fisherman's Association
Tiverton Ferry Wharf	Digby	February 4, 2002	N.S. Dept. of Transportation & Infrastructure Renewal
Weymouth North Gov't Wharf	Digby	September 9, 1996	Irving Group
Country Harbour wharf in Stormont	Guysborough	January 19, 1998	Mersey Seafoods Ltd.
Mulgrave Marine Terminal Wharf	Guysborough	March 3, 2000	Strait of Canso Superport Corp., Ltd.
Sheet Harbour (East River) Wharf	Halifax	January 20, 1998	ERW Holdings Ltd.
Walton Gov't Wharf & breakwater	Hants	March 31, 2001	Municipality of the County of East Hants
Port Hawkesbury Gov't Wharf	Inverness	March 3, 2000	Strait of Canso Superport Corp., Ltd.
Hantsport Gov't Wharf	Kings	September 15, 2000	Minas Basin Pulp & Power Co. Ltd.
Port Williams Gov't Wharf	Kings	May 25, 2001	Base Emporium Inc.
Bridgewater Railway Wharf	Lunenburg	October 16, 1999	Artificial Reef Society of Nova Scotia
Dayspring Shipyard Wharf	Lunenburg	January 9, 1997	Snyder's Shipyard Limited
Pictou, Pier "B"	Pictou	October 20, 2000	3032542 Nova Scotia Limited
Pictou, Pier "C"	Pictou	January 14, 2000	3032542, Nova Scotia Limited
Pictou, Quay Wall (shipyard) Wharf	Pictou	June 1, 2000	3032542 Nova Scotia Limited
Baddeck Gov't Wharf	Victoria	May 14, 1999	Baddeck Area Business and Tourism Association
Iona Government Wharf	Victoria	October 16, 2000	Central Cape Breton Comm. Ventures Inc.
Yarmouth Old Public & Marginal	Yarmouth	November 16, 2001	Yarmouth Area Industrial Commission
Yarmouth Lobster Rock Wharf	Yarmouth	November 16, 2001	Yarmouth Area Industrial Commission

Source: Transport Canada, personal communication with Lloyd Henderson.

Much of the recent discussion about coastal communities has focussed on those small rural coastal communities with economies at least partly dependent on their working waterfronts (see Coastal Communities Network, 2004). Since the decline of these communities is considered a critical issue in the character and life of the province, these small coastal communities will be the focus of the balance of this chapter, thereby highlighting the relationship between community well-being and a working waterfront. Ninety-three communities in the province are home to 247 wharves and working waterfronts (Figure 5.1). These wharves either have been divested by SCH or are still maintained by SCH. According to the 2006 Census, these 93 communities have an average population of 2,552 and a median population of 1,925. Two-thirds of the communities have populations between about 180 and 4,900.

Maintaining the built environment and associated infrastructure that enables working waterfront uses, such as wharves, breakwaters, lighthouses, and other port and harbour facilities, is an especially daunting task for those small coastal communities that are economically dependent on their harbours. Further, since SCH funding for maintenance is extremely tight, the maintenance and development of such a working waterfront, beyond its traditional roles as a site for vessel docking and fish landing, depends

almost entirely on the resources that a community itself can raise and invest. In reality, the Harbour Authorities generally do not have the additional revenue necessary to repair or upgrade existing resources, let alone expand or invest in new infrastructure and lines of business.

5.3 Status of Small Working Waterfront Communities

Working waterfront communities have been identified and grouped using the methodology described in Appendix 5a. The number and location of the wharves was drawn from databases belonging to the CCN. The analysis undertaken was based on community data from 1991 and 2006. From an initial list of 12 variables, four were used to cluster working waterfront communities in categories:

- income per household member;
- the fraction of dwellings requiring major repair;
- the labour force participation rate, i.e., the fraction of the population aged 15+ who have jobs or are looking for work; and
- population change.

These variables were identified as being the most effective indicators of community health, which in turn suggests the extent to which a working waterfront is a source of economic support.

Table 5.2 provides working definitions for the types of small working waterfront communities identified by the two-stage cluster analysis that was undertaken. The cluster analysis identified four types of communities in 1991. By 2006, all transitional communities had shifted to either healthy or declining communities, and there was an increased gap between the well-off and the less well-off working waterfront communities.

Table 5-2: Classification of 93 working waterfront communities

<i>Type</i>	<i>Name</i>	<i>Characteristic</i>	<i>Number of Communities by Type</i>	
			<i>1991</i>	<i>2006</i>
1	“Healthy” Communities	Well-off in the material sense and demographically robust	26	31
2	“Transitional” Communities	Moderately well off in a material sense, but showing significant declines in population	27	NA*
3	“Declining” Communities	Less well-off in a material sense and experiencing significant declines in population	39	61**
4	Statistical Outlier	Very poorly off in a material sense and experiencing a very significant increase in population	1	1

* Cluster analysis algorithm identified only two significantly different groups and an outlier for 2006

** While still less well off and experiencing significant population declines, the Type 3 group performed marginally better than in 1991.

5.3.1 Types of Working Waterfront Communities - 1991

Table 5.3 shows the indicators of community health in 1991 for the four community types and the combined average for the 93 communities. The names and locations of the wharves/working waterfront communities in each group are shown in the Figure 5.2. Appendix 5b organizes the communities by group type and by county.

Table 5-3: Characteristics of 93 working waterfront community groups (1991)

Type		Income per Household Member (1996)		Housing not Requiring Major Repair		Participation Rate		Population Change 1991 - 1996	
		Ave.	% of Ave.	Ave.	% of Ave.	Ave.	% of Ave.	Ave.	% Points +/- Ave.
1	26	\$14,101	117%	88.7%	104%	0.638	109%	2.7%	+4.6
2	27	\$12,577	105%	87.9%	103%	0.603	103%	-0.52%	-2.3
3	39	\$10,736	89%	82.5%	97%	0.542	93%	-0,33%	-1.4
4 (Outlier)	1	\$5,069	42%	48.6%	57%	0.312	53%	16.7%	+18.6
Combined	93	\$12,034		85.4%		0.584		-1.9%	
Legend:	well above average		moderately above average		about ave.	moderately below average		well below average	

Source: Jozsa Management & Economics

Eskasoni IR3 was categorized by the analysis as an outlier and, therefore, according to the indicator variables used, was not part of any one of the broad groups of working waterfront communities. The outlier was distinguished by following features:

- Income per household member, percent of dwellings not requiring major repair and participation rates were well below average; and
- The population change from 1991 to 1996 was well above average.

5.3.2 Types of Working Waterfront Communities - 2006

Table 5.4 shows the indicators of community health in 2006 of the four community types and the combined average for the 93 communities. The same indicator variables were used for the 2006 two-stage cluster analysis, and the analysis shows that no working waterfront communities remained in the transitional (Group 2) category. The location of the communities and their 2006 type designation are shown in Figure 5.3. Appendix 5c organizes the communities by group type and by county.

Table 5-4: Characteristics of 93 working waterfront community types (2006)

<i>Type</i>		<i>Income per Household Member (2001)</i>		<i>Housing not Requiring Major Repair</i>		<i>Participation Rate</i>		<i>Population Change 2001 - 2006</i>	
		<i>Ave.</i>	<i>% of Ave.</i>	<i>Mean</i>	<i>% of Ave.</i>	<i>Ave.</i>	<i>% of Ave.</i>	<i>Ave.</i>	<i>% Points +/- Ave</i>
1	31	\$16,857	119%	90.3%	102%	0.641	110%	3.8%	+5.6
NA									
3	61	\$13,292	94%	87.5%	99%	0.553	95%	-4.7%	-2.9
4	1	\$4,332	30%	65.9%	75%	0.372	64%	7.0%	+8.8
Combined	93	\$14,215		88.2%		0.580		-1.8%	100%
Legend:	well above average		moderately above average		about ave.	moderately below average		well below average	

Source: Jozsa Management & Economics

The cluster analysis indicates that by 2006 working waterfronts in Nova Scotia could be split into two distinct groups:

- those that were less well-off materially and showed significant declines in population; and
- those that were well off in both the material sense and showed population growth.

There were no transitional communities identified. While approximately one-third of the transitional communities had become healthy communities, having exhibited socio-economic robustness, two-thirds fell into the declining communities' category. In summary, from 1991 to 2006 the percentage of:

- “healthy” Type 1 communities rose from 28% to 33%;
- “transitional” Type 2 communities fell from 29% to 0%;
- “declining” Type 3 communities rose from 42% to 66%; and
- “statistical outlier” Type 4 communities held at 1%.

5.4 Case Studies

It was the intention that this section would draw upon case studies of wharves and waterfronts in communities that are exemplars of each statistically significant type of working waterfront community. Time, however, did not permit such an analysis. The same fate occurred in the preparation of this material as befell the research for “Between the Land and Sea” (Coastal Communities Network, 2004). The CCN researchers encountered substantial difficulties contacting Harbour Authorities and setting up meetings and interviews. The final product, as reported by the authors of “Between the Land and Sea”, suffered from variances in the depth and scope of the information received and from an incomplete range of contacts. This report’s case studies were to have provided:

- a level of ground-truthing of the statistical analyses;
- a context to the findings of the chapter; and
- additional evidence for the assessment of sustainability and trends.

This lack of case study information is the most significant data gap in this chapter. Sub-sections 5.4.1, 5.4.2 and 5.4.3 provide overviews of communities, which according to the data are exemplars of their categories. These overviews provide some context for future researchers who may chose to further pursue

this line of enquiry. It is suggested that such case studies could provide a description of the nature of the selected working waterfront from each category by:

- describing the types of working waterfront in the exemplars;
- describing the community and economic roles of the working waterfronts in the community;
- describing changes over time;
- describing what has been done to maintain them; and
- identifying main sustainability issues.

The following working waterfront communities are each an example for its group in 1991 and 2006:

- Musquodoboit Harbour, Halifax County (Type 1 in 1991 and 2006);
- LaHave, Lunenburg County (Type 2 in 1991 and Type 1 in 2006); and
- Weymouth, Digby County (Type 3 in 1991 and 2006).

The objective of such case studies would be to provide evidence of linkages, or the lack thereof, between working waterfronts and changes in the well-being of the home communities. If thoroughly documented, it would then be possible, with reasonable confidence, to extend the findings to other working waterfront communities in the group. The following sections provide some preliminary observations on each of the above referenced waterfront communities.

5.4.1 Musquodoboit Harbour, Halifax County

As referenced in Table 5.5, the community of Musquodoboit Harbour, which includes East Petpeswick, Musquodoboit Harbour, Ostrea Lake, Pleasant Point, Smith Settlement and West Petpeswick, is home to three wharves. Figure 5.4 shows the distribution of settlements in this area, including those with wharves.

Table 5-5: Wharves and harbours in Musquodoboit Harbour, Halifax County

<i>Location</i>	<i>Owner</i>	<i>Management</i>	<i>Length (M)</i>	<i>Value (\$)</i>
Coopers Point	Small Craft Harbours	Harbour Authority of Coopers Point	60	\$1,095,757
East Petpeswick	Non Profit Organization	East Petpeswick Wharf Preservation Society	N/A	N/A
Ostrea Lake	Non Profit Organization	Ostrea Lake Wharf Preservation Society	N/A	N/A

Source: Coastal Communities Network, 2008b (<http://www.close-to-the-coast.ca/map-hotspots.aspx>)

N/A = Not Available

Table 5.6 shows the 1991 and 2006 socio-economic characteristics for the community of Musquodoboit Harbour, within which the working waterfronts at Coopers Point, East Petpeswick and Ostrea Lake are located.

Table 5-6: Socio-economic changes, Musquodoboit Harbour, Halifax County

<i>Indicator</i>	<i>1991</i>	<i>2006</i>
% of Population Aged 20+ Less Than Grade 9	8.7%	5.9%
Household Income per Householder (2008\$)	\$18,036 (1996)	\$21,168 (2001)
% of Dwellings Not Requiring Major Repair	90.6%	90.2%
Participation Rate	62.9%	61.2%
Jobs per Person Aged 15+	0.543	0.567
% Moved to/from Outside Community in Previous 5 Years	19.0%	10.0%
% Population Change (1991-96) (2001-06)	2.6%	7.1%

Source: Nova Scotia Community Counts, 2008 and Jozsa Management & Economics



Figure 5.4: Community of Musquodoboit Harbour

The Musquodoboit Harbour working waterfront community remained a Type 1 (“healthy”) community from 1991 to 2006. The characteristics of Type 1 communities changed only slightly during this period:

- In 1991, they were characterized by income per householder, percent of dwellings not requiring major repair and participation rates well above average and population change from 1991 to 1996 moderately above average; and
- By 2006, they were characterized by income per householder, participation rates and population change from 2001 to 2006 that were well above average and the percent of dwellings not requiring major repair moderately above average.

5.4.2 LaHave, Lunenburg County - Case Study

The LaHave community includes Bush Island, Conquerall Bank, Crescent Beach, Crouses Settlement, Dayspring, Dublin Shore, East LaHave, Five Houses, Kingsburg, LaHave, LaHave Island, Lake Centre, Lower LaHave, Lower Rose Bay, Middle LaHave, Moshers Island, Mount Pleasant, New Cumberland,

Pentz, Pleasantville, Rhodes Corner, Riverport, Rose Bay, Upper Kingsburg, Upper LaHave, West Dublin and West LaHave (Figure 5.5). It is home to the wharves shown in Table 5.7.

Table 5-7: Wharves and harbours in LaHave, Lunenburg County

<i>Location</i>	<i>Owner</i>	<i>Management</i>	<i>Length (M)</i>	<i>Value (\$)</i>
Bush Island	Small Craft Harbours	Harbour Authority of Bush Island	159	\$36,562
Kings Bay	Municipality	Municipality of the District of Lunenburg		
Kraut Point (Riverport)	Small Craft Harbours	Harbour Authority of Riverport (Kraut Point)	276	\$508,294
Saw Pit (Lunenburg) - Back Harbour	Municipality	Municipality of the District of Lunenburg	N/A	N/A

Source: Coastal Communities Network, 2008b (<http://www.close-to-the-coast.ca/map-hotspots.aspx>)

N/A = Not Available



Figure 5.5: Community of LaHave

Table 5.8 shows the socio-economic characteristics for the LaHave community in 1991 and 2006.

Table 5-8: Socio-economic changes, LaHave, Lunenburg County

<i>Indicator</i>	<i>1991</i>	<i>2006</i>
% of Population Aged 20+ Less Than Grade 9	18.5%	14.3%
Household Income per Householder (2008\$)	\$16,461 (1996)	\$19,643 (2001)
% of Dwelling Not Requiring Major Repair	88.0%	89.2%
Participation Rate	57.6%	61.9%
Jobs per Person Aged 15+	.523	.559
% Moved to/from Outside Community in Previous 5 Years	12.2%	13.0%
% Population Change (1991-96) (2001-06)	-3.2%	-6.0%

Source: Nova Scotia Community Counts, 2008 and Jozsa Management & Economics

The working waterfront community of LaHave was among the “transitional” Type 2 communities in 1991 that was distinguished by following features:

- Income per household member, percent of dwellings not requiring major repair and the participation rate were moderately above average; and
- The population change from 1991 to 1996 was well below average.

By 2006, it had moved into Type 1 “healthy” community category that was distinguished by the following features:

- The income per householder, participation rate and population change from 2001 to 2006 were well above average; and
- The percent of dwellings not requiring major repair was moderately above average.

LaHave transferred into Type 1 in 2006 due to its strong gains in income per household and participation rates, and moderate improvement in housing stock; this was despite showing a negative change in population from 2001 to 2006. In addition, the community showed improvements in both education levels and employment rate.

5.4.3 Digby Neck, Digby County

Digby Neck is home to 10 wharves, identified in Table 5.9, all but one of which is owned by SCH. This community area includes the settlements of Central Grove, Centreville, Digby Neck, East Ferry, Freeport, Gilberts Landing, Gullivers Cove, Lake Midway, Little River, Mink Cove, Rossway, Roxville, Sandy Cove, Tiddville, Tiverton, Waterford and Westport.

Table 5-9: Wharves and Harbours in Digby Neck, Digby County

<i>Location</i>	<i>Owner</i>	<i>Management</i>	<i>Length (M)</i>	<i>Value (\$)</i>
Centreville (Trout Cove)	Small Craft Harbours	Harbour Authority of Centreville (Trout Cove)	304	\$375,025
East Ferry	Small Craft Harbours	Harbour Authority of East Ferry	68	\$984,884
Freeport (South Cove)	Small Craft Harbours	Harbour Authority of Freeport	87	\$1,389,807
Freeport-Fish Point	Small Craft Harbours	Harbour Authority of Freeport	109	\$251,468

<i>Location</i>	<i>Owner</i>	<i>Management</i>	<i>Length (M)</i>	<i>Value (\$)</i>
Wharf				
Little River (Digby Co.)	Small Craft Harbours	Harbour Authority of Little River - Digby County	101	\$1,373,077
Rossway	Non Profit Organization	Rossway Wharf Society	N/A	N/A
Sandy Cove East	Small Craft Harbours	Harbour Authority of Sandy Cove East	194	\$2,201,215
Tiverton -Fishermen's Wharf	Small Craft Harbours	Harbour Authority of Tiverton	73	\$382,821
Westport	Small Craft Harbours	Westport Harbour Authority	78	\$355,624
Whale Cove	Small Craft Harbours	Harbour Authority of Whale Cove	467	\$4,233,407

Source: Coastal Communities Network, 2008b (<http://www.close-to-the-coast.ca/map-hotspots.aspx>)

N/A = Not Available

Figure 5.6 shows the location of the wharves at Centreville, East Ferry, Freeport – Fish Point Wharf, Sandy Cove East, Tiverton – Fishermen’s Wharf, Westport and Whale Cove.

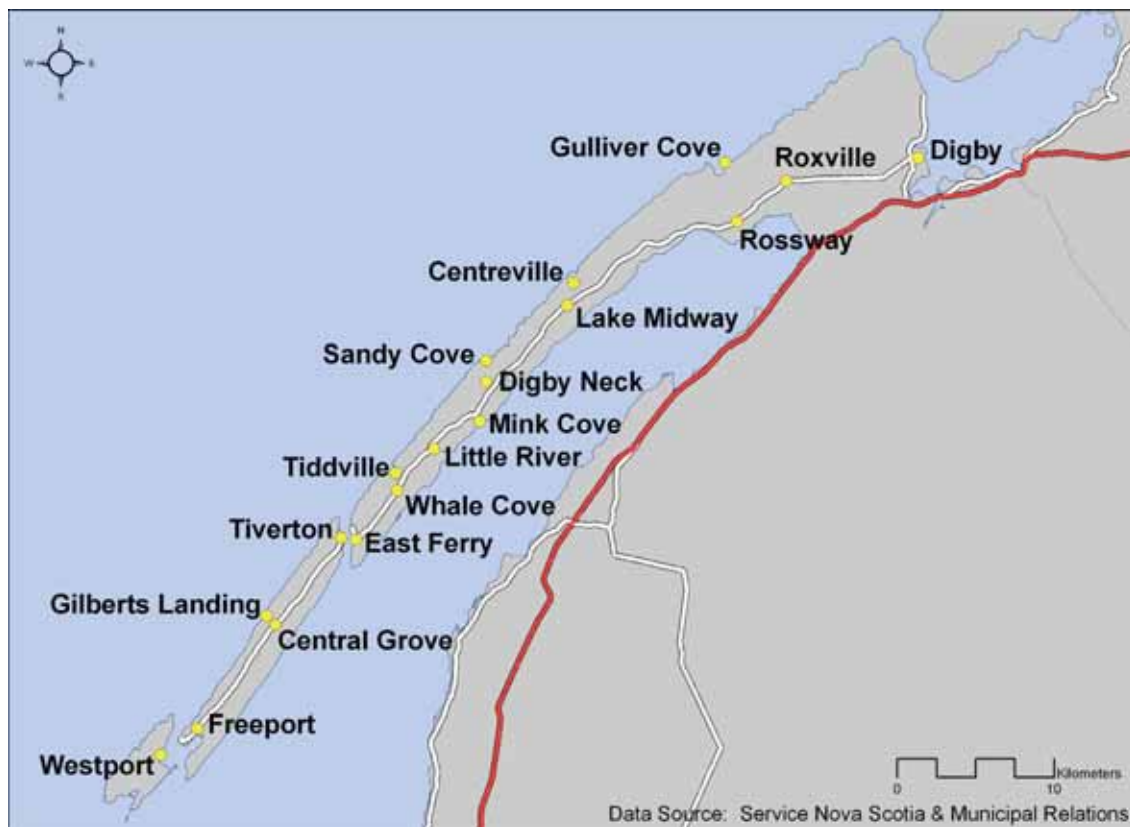


Figure 5.6: Community of Digby Neck

Table 5.10 shows the 1991 and 2006 socio-economic characteristics of the communities of Digby Neck.

Table 5-10: Socio-Economic Changes, Digby Neck, Digby County

<i>Indicator</i>	<i>1991</i>	<i>2006</i>
% of Population Aged 20+ Less Than Grade 9	16.2%	18.4% (2001)
Household Income per Householder (2008\$)	\$11,298 (1996)	\$12,284 (2001)
% of Dwelling Not Requiring Major Repair	84.5%	87.6%
Participation Rate	51.2%	55.3%
Jobs per Person Aged 15+	0.458	0.453
% Moved to/from Outside Community in Previous 5 Years	6.7%	8.3%
% Population Change (1991-96) (2001-06)	-7.4%	-5.0%

Source: Nova Scotia Community Counts, 2008 and Jozsa Management & Economics

The working waterfront community of Digby Neck was among the Type 3 (“declining”) communities in 1991, which was distinguished by following features:

- Income per householder, percent of dwellings not requiring major repair, the participation rate and population change from 1991 to 1996 were moderately below average.

In 2006, it remained a Type 3 working waterfront community, distinguished by following features:

- Income per household member, participation rates and population growth were moderately below average; and
- The percent of housing not requiring major repair improved to about average.

Since 1991, the percentage of adults with less than Grade 9 education increased, likely due to the out-migration of the younger population. Income growth has been weak, a weakness reflected in the decline of the employment rate. The percent of dwellings not requiring major repair has improved somewhat, and the rate of population decline has abated. Overall, the well-being of the community of Digby Neck has declined somewhat since 1991.

5.5 Trends

The population of the 93 working waterfront communities that are home to the 247 working waterfronts declined by 8.1% between 1991 and 2006, compared to growth of 5.4% for the rest of Nova Scotia.

Between 1991 and 2006, employment in these communities grew by 1.2%, compared to 13.9% in the rest of Nova Scotia. While 24 of the 93 working waterfront communities showed employment growth rates above the average for the rest of Nova Scotia over this period, 11 of these communities are located within a 60-minute drive of downtown Halifax. In 2001, 21,000 persons worked in the sector that made direct use of wharves and 37,000 were employed by industries that benefit significantly from the wharves (Coastal Communities Network, 2004). These jobs represented 14% of total Nova Scotia employment reported in the 2001 Census (Coastal Communities Network, 2004).

The employment rate (persons aged 15+) in the 93 communities improved marginally over the 15-year period from 48.4% to 50.2% (versus 58.1% and 59.6% respectively in the rest of Nova Scotia). The

combination of modest employment growth and, in general, population decline resulted in increases in employment rates in 46 of the 93 communities. Eleven of the 46 communities are within a 60-minute drive of downtown Halifax, and both the population and the employment rate of these communities increased. Because of the modest employment growth in most of the remaining 35 communities, employment rates increased while population declined.

Income data for 1991 and 2006 were not available at the time of writing, but information for 1996 and 2001 shows that income per person rose in real terms over the period, i.e., 9.2% among the 93 communities and 14.1% in the rest of Nova Scotia. Therefore, despite the rising employment rate and declining population, income per person in the working waterfront communities did not grow as much as it did in the rest of Nova Scotia. This finding suggests that wage rates and/or hours worked lag behind those in the rest of the province.

On balance, the socio-economic conditions of the working waterfront communities deteriorated between 1991 and 2006:

- conditions in 18 remained above average (and some improved from their 1991 state);
- conditions in 13 working waterfront communities improved markedly;
- conditions in 25 showed markedly worsening conditions; and
- conditions in 37 remained below average (and some declined further from their 1991 state).

The following 18 working waterfront communities were “healthy” Type communities in both 1991 and 2006:

- | | | |
|-----------------------|------------------------|---------------------|
| ➤ Antigonish County, | ➤ Halifax County, | ➤ Shelburne County, |
| • Mahoneys Beach | • Chezzetcook | • Barrington |
| • Malignant Cove | • Eastern Passage | • Clyde River |
| ➤ Cape Breton County, | • Hacketts Cove | ➤ Yarmouth County, |
| • Mira East | • Herring Cove | • Hebron |
| • Mira West | • Hubbards | • Pubnico |
| | • Jeddore | |
| | • Musquodoboit Harbour | |
| | • Sambro | |
| | • St. Margarets Bay | |

The following 13 working waterfront communities improved their socio-economic conditions from 1991 and entered the healthy communities (Type 1) category, which showed incomes per household member, participation rates and population change to be well above average and housing conditions to be moderately above average:

- Cumberland County,
 - Tidnish
- Halifax County,
 - Prospect
 - Terence Bay
- Inverness County,
 - Cheticamp
 - Port Hood
- Kings County,
 - Canning
- Lunenburg County,
 - Blandford
 - LaHave
- Victoria County,
 - Englishtown
- Yarmouth County,
 - Amiraults Hill
 - Port Maitland
 - Wedgeport

The socio-economic conditions of 25 working waterfront communities deteriorated between 1991 and 2006. By 2006, six “healthy” (Type 1) communities that in 1991 had incomes per household member, housing conditions and participation rates well above average and population change moderately above average had dropped into the declining communities (Type 3) category showing housing conditions about average and incomes per household member, participation rates, and population change moderately below average. The six that dropped from “healthy” to “declining” are:

- Cape Breton County,
 - Boularderie Island
- Halifax County
 - Peggys Cove
 - Ship Harbour
 - Lunenburg County, Mahone Bay
- Pictou County,
 - Little Harbour
- Yarmouth County,
 - Arcadia

By 2006, 19 communities that were in the transitional category in 1991 (Type 2), having incomes per household member, housing conditions and participation rates moderately above average and population change well below average, dropped into the declining communities category (Type 3), showing housing conditions about average and incomes per household member, participation rates, and population change moderately below average. The 19 that dropped from “transitional” to “declining” are:

- Annapolis County,
 - Granville Ferry
- Cape Breton County
 - Florence
 - Louisbourg
- Digby County,
 - Saulnierville
- Inverness County
 - Long Point
 - Mabou
 - Margaree
- Lunenburg County,
 - Lunenburg
- Pictou County
 - Pictou
 - River John
- Queens County
 - Liverpool
 - Medway
- Richmond County,
 - Louisdale
- Shelburne County,
 - Shelburne
- Victoria County
 - Baddeck
 - Ingonish
- Yarmouth County,
 - Argyle
 - Port Maitland
 - Yarmouth

Coastal Communities Network (2004) found some signs that suggested that, along with a decline in coastal community populations, some consolidation was occurring. CCN raised the question of the need for a strategy to facilitate consolidation, or for a strategy to aggressively market coastal communities. The following four findings from this study add support to CNN's observation that some community consolidation may be underway. More specifically, data reported in this chapter from the 1991 and 2006 Censuses for the 93 communities that are home to working waterfronts indicate:

- Seventeen communities have above average population growth compared to the rest of Nova Scotia and that nine of these are located within a 60-minute drive of downtown Halifax;
- Employment in 24 of the working waterfront communities grew at rates above the average for the rest of Nova Scotia and that 11 of these are within a 60-minute drive of downtown Halifax;
- Forty-five communities showed above average improvements in employment rates compared to the rest of Nova Scotia and that 11 of these are located within a 60-minute drive of downtown Halifax. It is expected that many of the job increases were due to employment in HRM because Census records record employment based on the residence of the employed person, not their work location;
- Working waterfront communities that showed improvements in their socio-economic conditions tended to be:
 - within a 60-minute drive of downtown Halifax; or
 - in the Pubnico area, which has access to good fishing resources and is far enough from Halifax that commuting is not possible and therefore could establish itself as a sub-centre of activity; or
 - in the Cheticamp area, which has access to reasonable fishing resources, is far enough from Halifax that commuting is not possible and therefore could establish itself as a sub-centre of activity; and has the distinction of being a centre for Acadian culture, which may make Acadians less inclined to out-migrate.

These findings suggest that consolidation may be occurring and that consolidation tends to be towards the Halifax Census Metropolitan Area and select locations at a distance from Halifax, rather than to multiple agglomeration points distributed throughout the province. It is likely that the population growth of the 11 close to HRM is at least in part due to people working in the urban core of HRM and commuting to residences outside of that core.

Coastal Communities Network (2004) reported on the condition of the wharves, the experience with community-based management of the harbours and the benefits that accrued to social and cultural life. The report confirmed that the local authorities had the resources to maintain the wharves, but not the resources, nor access to the resources, needed to undertake capital improvements. Most of the wharves are well-past their half-life, and, therefore, maintenance costs are rising rapidly.

The combination of the age of the wharves, use of larger fishing boats, the accommodation of a wider range of users, e.g., bulk carriers, tourism enterprises and recreational users, increasingly crowded conditions and more frequent and stronger storms is raising safety concerns. There is consensus among the Harbour Authorities that they need resources to expand wharves, or to build new ones, to accommodate larger numbers of users, increased vessel size and a more diverse range of commercial and community uses (Coastal Communities Network, 2004). With respect to the non-economic benefits associated with these working waterfronts, it is acknowledged that they:

- provide necessary infrastructure for a wide range of recreational activities including swimming;
- are the centre of community recreational activity; and
- support social and recreational activity that in turn contributes to the personal health and quality of both residents and visitors.

The following are overarching trends in the status of working waterfronts and their host communities:

- Working waterfronts, wharves and their home communities that either retained their above average state of well being, or significantly improved, tended to be located:
 - within a 60 minute drive of downtown Halifax;
 - in areas with a strong lobster fishery, such as around Yarmouth; or
 - in areas where strong fisheries and cultural and linguistic ties combined to encourage consolidation, such as the communities surrounding Cheticamp and Pubnico;
- Eight (36%) of the 22 working waterfronts and wharves and associated communities that in 1991 showed moderately above average material well-being, but were experiencing population declines that were well above average, improved their material well-being and population dynamics by 2006. Of these eight, five were within a 60-minute drive of downtown Halifax, or in areas with a strong lobster fishery. The balance stayed the same or showed deterioration;
- Only 8% of 39 working waterfront communities that had been characterized by moderately below average levels of material well-being and moderate declines in population in 1991 managed to significantly improve their conditions by 2006, and one of the three is in an area that likely felt the positive influence of the lobster fishery in southwest Nova Scotia;
- None of the working waterfront communities within a 60-minute drive of downtown Halifax showed a significant deterioration in conditions between 1991 and 2006; and
- Anecdotal evidence suggests that the conversion or maintenance of wharves for recreation use occurred predominantly in communities that are within a 60-minute drive of downtown Halifax.

The findings indicate that the sustainability of working waterfronts and the material well-being of their host communities are closely aligned with the health of the lobster fishery and/or their location close to Halifax. In the absence of those factors, working waterfronts and host communities, with the exception of those located in the Cheticamp area, have for the most part experienced deteriorating conditions since 1991.

5.6 Policies, Programs and Initiatives

5.6.1 Legislation and Policy

The overall responsibility for small wharves and harbours lies with SCH. The SCH program supports wharves and working waterfronts in small craft harbours and their Harbour Authorities. The program operates with the help of volunteers to operate and maintain a system of harbours to provide commercial fish harvesters and other harbour users with safe and accessible facilities. The mandate of SCH is to keep the harbours that are critical to the fishing industry open and in good repair.

SCH operates under the following acts and regulations:

- Acts:
 - *Fishing and Recreational Harbours Act*, 1985; and
 - *Federal Real Property and Federal Immovables Act*.
- Regulations:
 - Fishing and Recreational Harbours Regulations;
 - Fishery (general) regulations;
 - Fishing Zones of Canada (Zones 1, 2, 3) Order;
 - Fishing Zones of Canada (Zones 4 and 5) Order;
 - Fishing Zones of Canada (Zone 6) Order; and
 - Small Fishing Vessel Inspection Regulations;

The following federal acts apply to certain aspects of harbour operations:

- *Canada National Parks Act*, 2000;
- *Canadian Environmental Protection Act*, 1999;
- *Canadian Environmental Assessment Act*, 1992;
- *Fisheries Act*, 1985;
- *Fisheries Development Act*, 1985;
- *Navigable Waters Protection Act*, 1985; and
- *Species at Risk Act*, 2002.

The following provincial acts apply to certain aspects of harbour operations:

- *Fisheries and Coastal Resources Act*, 1996; and
- *Environment Act*, 1994-95.

One of the most recent descriptions of policy and program initiatives with respect to working waterfronts in Nova Scotia (wharves and small harbours) is provided in *Between the Land and the Sea - The Social and Economic Importance of Wharves and Harbours in Nova Scotia* (Coastal Communities Network, 2004). With respect to policy and programs, the CCN found that years of budget restraint have resulted in a situation where many wharves are not adequately maintained. Prior to the National Marine Policy and the Port Divestitures Program initiated in the mid-1990s, the federal government began the transfer of ownership of recreational harbours and low activity fishing harbours to community-based groups. SCH retained harbours essential to the commercial fishery and expanded private sector involvement in the management of core harbours. In 1987, SCH introduced the Harbour Authorities system to involve fish harvesters directly in harbour management. SCH retains ownership of core fishing harbours and leases

them to user groups. The non-profit Harbour Authorities then take on most responsibilities for operations and maintenance. If a wharf does not draw community interest, the facilities are slated for demolition, or total divestiture (Coastal Communities Network, 2004).

In 2002 and 2003, SCH spending on small craft harbours stood at \$96.8 million, the highest since the early 1990s. Engineers with SCH estimated that an additional \$50 million per year was needed to maintain the integrity of the core harbours. SCH policy documents indicate that the current asset base cannot be maintained by the current and projected levels of spending on maintenance and major capital renewal (Coastal Communities Network, 2004). Operating costs have been greater than most Harbour Authorities can bear and, as of 2004, many authorities had not become fully effective organizations. Organizational difficulties have been exacerbated by volunteer burnout and conflicts among some user groups. Other researchers (see Knowledge Development Centre, 2006) found burnout rates ranging from about 24% to just over 40%. Most authorities cannot afford capital investments and, because they do not own the facilities, cannot borrow on the asset value. By 2005, SCH expected to reduce its inventory by one-half and have client partnerships for all core harbours (Coastal Communities Network, 2004). Funding constraints have limited the divestitures, and the 2005 target was not achieved.

5.6.2 Current Initiatives

5.6.2.1 NETWORKING AND CAPACITY BUILDING

The CCN continues to work to:

- facilitate communication by bringing divergent points of views and interests together;
- help people to see the bigger picture and work to achieve complementary solutions;
- provide material and moral support for overworked volunteers;
- provide skills and capacity development opportunities; and
- conduct research on issues that are critical to rural development. The research is community based, in that it is undertaken in response to an identified community need, is conducted with community members and the results are given to communities for their use.

5.6.2.2 FISHERIES AND OCEANS CANADA - SMALL CRAFT HARBOURS BRANCH OPERATIONS

Beyond the ongoing operation of the SCH program the bulk of federal government initiatives stem from the *2006 Maritimes and Gulf Harbour Authority Conference Report* (Fisheries and Oceans Canada, 2006). The most common issues raised included challenges related to communications, harbour authority business and harbour planning, investment and operations. SCH has taken steps to promote the Harbour Authority Program through various methods including the development and distribution of pamphlets to coastal communities throughout the Maritime Provinces, collaboration with fishing-related magazines to include articles related to Harbour Authorities, development of a CD-ROM, publishing of articles about Harbour Authorities and the Harbour Authority Program. A National Communications Plan has been developed and is currently being implemented.

Many Harbour Authorities in the Maritimes and Gulf regions are currently collaborating to employ one harbour manager to look after several locations. Given the growing difficulty in attracting volunteers, the SCH is dedicating a portion of its communications strategy to encouraging new volunteers to become involved with their local Harbour Authorities. SCH has also initiated long-range planning to:

- determine the needs of Harbour Authorities;
- determine the funding and project requirements for harbours; and
- facilitate more effective investment planning and reliable funding allocations.

SCH is providing operational planning support to help Harbour Authorities address growing challenges such as having to accommodate larger, transient or recreational vessels while identifying the overall development needs of a harbour. Class C harbours, the smallest wharves and waterfronts, get a higher percentage of projects approved and carried out than other harbour classes, because the project rating system takes into consideration factors beyond the economic impact of the harbour. SCH has created an Environment and Safety Engineer position to improve the efficiency with which projects address environmental and safety issues and has opened lines of communication with Public Works and Government Services Canada to improve the efficiency of interactions with Harbour Authorities. Additional efforts are being focused on training for Harbour Authorities, harbour managers and board members. Funding for the five-year Infrastructure Repair Program, which was due to expire in 2007, will be continued into the future. This has been added to SCH base funding on a permanent basis.

5.7 Sustainability Issues/Key Points

Coastal Communities Network (2004) reported the following suggestions for change that would help Harbour Authorities improve their prospects for sustainability:

- greater integration and coordination among government agencies and between levels of government that have influence over wharf building, maintenance and management;
- more support for capacity building for Harbour Authorities;
- assistance with conflict management;
- expansion of the use of the working waterfronts by non-fishing users to grow revenues;
- broader stakeholder representation on Harbour Authorities to leverage new sources of support and investment; and
- expanded mutual support among Harbour Authorities.

Of the 93 working waterfront communities, only 23 showed an increase in population between 1991 and 2006 and only 29 showed real per capita income growth equal to or greater than the rest of Nova Scotia. Moreover, working waterfront communities that showed population, employment and real income growth are located within a 60-minute drive of downtown Halifax. This suggests that their improving conditions may have a good deal more to do with their proximity to the economic, infrastructure and employment base of HRM than to improvements in the efficiency and effectiveness of their working waterfronts. Therefore, one must question the overall sustainability of working waterfront communities in the face of declining populations and slower income growth than in the rest of Nova Scotia, factors that threaten the sustainability of many community services.

There are six significant issues with regard to the operation and sustainability of wharves and working waterfronts in Nova Scotia and, by implication the socio-economic condition of their surrounding communities (Coastal Communities Network, 2004; Knowledge Development Centre, 2006):

- i) There are indications that the working waterfront communities are consolidating. The findings of this chapter provide evidence that consolidation is taking place and that working waterfront communities within a 60-minute drive of downtown Halifax are more likely to show socio-economic growth;
- ii) “Between the Land and Sea” (Coastal Communities Network, 2004) stated that it is not known how much population and employment a community could lose before it becomes socially and economically unviable. Therefore, the question is whether there is a need for programs to support mobility and adjustment, or for a comprehensive strategy to facilitate the consolidation of viable communities and/or to market aggressively these communities as places to live and do business. The evidence presented in this chapter indicates that changes in the operation and conditions of working waterfronts and the well-being of their host communities are due to structural changes in the economy. In the face of this structural shift, aggressive marketing may be effective only for select communities that have location and resource attributes that are strengths in the context of the new economic structure. A combination of consolidation and targeted marketing may be more in order;
- iii) Coastal Communities Network (2004) states that the significance of the issue of labour supply in the coastal communities remains an open question. It expected that the shortage of supply would increase as populations decline and age, and as workers leave for more attractive jobs in urban centres.

This research found that employment rates in the working waterfront communities are still well below the average for the rest of Nova Scotia. Other things being equal, one would assume that the unemployed and underemployed labour force would be sufficient to meet future labour demands. The out-migration of the younger population and the higher than average proportion of population with less than Grade 9 education suggests that the issue of labour supply in working waterfront communities has less to do with numbers than with education and skill levels;

- iv) Coastal Communities Network (2004) found that the need for waterfront maintenance and capital investment was significantly greater than the availability of resources. The gap was so great that the status quo could not be maintained. Knowledge Development Centre (2006) found that Harbour Authorities recognized the need for alternative funding sources, but few had any idea about where to look. SCH estimates that only half of the resources required for maintenance and investment are available (C. Gaudet, Fisheries and Oceans Canada, Small Craft Harbours Branch, pers. comm., 2008). The funding shortage will likely constrain the working waterfronts’ abilities to broaden their revenue base into sectors beyond fishing. This shortage will increase the difficulties faced by working waterfronts to adapt to the new economic structure;
- v) Harbour Authorities and harbour management groups face huge challenges because the government designed and implemented a community management model for harbours without creating complementary programs to increase the skills and capacity of harbour management volunteers (Knowledge Development Centre, 2006). The absence of institutional strengthening programs weakened the implementation of the community management model. This was likely compounded by the fact that the structure and operation of the world and Nova Scotia economies had begun to change well before the SCH program was designed. Notwithstanding, its implementation appeared to focus almost entirely on maintaining the smaller working waterfronts as fishing harbours. Little attention was paid to assessing the need for diversification to secure new revenue sources. Volunteers

were made up mostly of fishers whose work schedule leaves little time and less flexibility for shore-based harbour management issues. (Knowledge Development Centre, 2006). In addition, given their dominance on management groups it is possible that less attention was paid than should have been paid to diversifying the economic base of the working waterfronts.

Knowledge Development Centre (2006, p.18) reported that:

“Some harbour management groups felt that their group worked well because all of the people on the board were fishermen and it was in their best interest that the wharf be managed and maintained properly. However, running a harbour management organization may sometimes depend on bringing in volunteers from outside of the fishery to share their knowledge and expertise.”; and

- vi) Volunteer burnout is common among the Harbour Authorities and threatens their successful operation. This burnout stems from a combination of:
- lack of institutional strengthening programs to improve the operating effectiveness of Harbour Authorities;
 - declining and aging populations that limit the number of volunteers (Coastal Communities Network, 2004; Knowledge Development Centre, 2006);
 - the stress associated with the responsibilities of waterfront management, making it more difficult to attract new volunteers (Coastal Communities Network, 2004; Knowledge Development Centre, 2006);
 - the increased effort necessary to maintain reasonable income levels as a consequence of the reduction in numbers in the prime labour force years;
 - challenges in accessing information and completing the many tasks necessary to attain success, and the concomitant sense of lack of empowerment (Knowledge Development Centre, 2006); and
 - confusion of volunteer managers with respect to not only their roles and responsibilities and also with respect to the role and responsibilities of SCH (Knowledge Development Centre, 2006).

Data Gaps

The lack of information from case studies is the most significant data gap in this work. The researchers encountered substantial difficulties contacting Harbour Authorities and setting up meetings and interviews. The final product, as reported by the authors, suffered from variances in the depth and scope of available information and from the incomplete range of contacts.

The case studies of exemplars were to have provided:

- a level of ground-truthing of the statistical analyses;
- important context to the findings of the chapter; and
- additional evidence for our assessment of sustainability and trends.

Relative to the inability to make sufficient contacts for case studies, other data gaps had limited affects on the quality of the findings.

5.6 References

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6.1 Introduction

Public coastal access refers to people's ability to view, reach and move along the shoreline of both the mainland and nearby islands. Issues include:

- whether the public can physically use or view the coast;
- whether the public can legally pass over land to reach the coast;
- whether the public can access coastal lands from the water; and
- whether the public can afford to access the coast through fees or other expenses;
- Whether the public can use coastal areas without placing undue stress on ecosystems.

The public accesses the coast through publicly owned land, privately owned land and through the trail networks that are developed over both. Access to the coast and its resources is also important to several industries. For commercial activities, such as fisheries, access is granted through fishing licenses, quotas and permits and according to federal and provincial regulations. This chapter recognizes the broad and multifaceted nature of public access and focuses on access to coastal lands for the primary purpose of recreation and leisure, or tourism-related activities, not commercial activities such as fishing.

Maintaining coastal access supports local economic development and provides valued recreational space for residents and visitors. The Tourism Industry Association of Nova Scotia *et al.*, (2007) has identified public access to coastal waters as a critically important policy objective for the overall success of the sector and sees the coastal region as central to marketing the province's \$1.3 billion tourism industry. Industry leaders recognize that expanding public coastal access is a necessary tool in expanding tourism (Coastal Communities Network, 2004). Coastal access provides residents and visitors with opportunities for passive and active recreational activities including fishing, clam harvesting, swimming, beach walks and recreational boating.

Public coastal access is an issue being considered in coastal management strategies around the world (European Environmental Agency, 2006; Government of South Africa, 2000; Lazarow *et al.*, 2006; Navarro, 2000; Meltzer, 1998; and Pogue and Lee, 1999). Ensuring such access is a concern for many residents because the connection between people and the sea is considered an integral part of the province's identity, history and quality of life. In 2001 a Voluntary Planning Task Force conducted extensive public consultation on issues related to foreign land ownership and property taxes (Nova Scotia Voluntary Planning Task Force, 2001). Surfacing through that process were broader concerns about land use planning, changes in development patterns and the loss of access points to the coast; the latter was raised as a serious concern raised by many Nova Scotians.

6.2 Historical Access Patterns

Access to the coast in Nova Scotia has changed over time as settlements expanded and property ownership evolved to reflect a formal, British system of privatization and land registration. Traditionally, the Mi'kmaq accessed the coast by way of rivers, establishing coastal camps during the summer months then returning inland during colder seasons (Bird, 1955). Acadian settlements were informal, organic, kin-based hamlets expanding over time into larger communities in a linear fashion along the coast. There

was no conscious system of legal title or land organization. Their trademark form of agriculture, dyking and draining of the salt marshes, was accomplished through a high level of cooperation amongst farmers. The Acadians had a different attitude towards land title, privacy, accessibility and living space than the British, and coastal access was informally permitted throughout their settlements (Ennals and Holdsworth, 1988).

Over time a formal British system of land title, registration and private property rights has been established. These changes first came about somewhat haphazardly and were meant to provide settlers with multiple land holdings for a variety of economic purposes including fishing, lumber harvesting, trapping and hunting, pasturing of animals and subsistence farming (Davis and Wagner, 2006; McCann, 1988). This practice of engaging in multiple economic activities, coastal as well as inland, in urban and rural areas, continued into the industrialized period. It was a pattern that secured access to the coast, especially for fishing activities, even though many household members were simultaneously working other jobs, including industrial jobs in urban areas (McCann, 1988).

Settlements across North America during the 18th Century typically placed a Main Street at their centre. Maritime towns differed by developing around harbours and in a linear fashion along the coast (Ennals and Holdsworth, 1988). Most early 18th Century Maritime settlements were informal; fishermen divided beaches among themselves and established small frame houses, sheds, stagings and flakes for drying cod. As population and pressure for land increased coastal land became scarce and highly valued, lots were divided long and narrow to provide property with coastal access to as many settlers as possible (Wynn, 1987, see Chapter 3, Section 3.3.1).

During the settlement of Nova Scotia, the government's goal was to transfer public land into the private hands of settlers to promote agricultural, industrial and commercial development. By the mid-20th Century, there was a shift in this pattern as the federal and provincial governments gradually began to increase public land holdings. Between 1941 and 1971, for example, publicly owned land in the province increased from 3,510 m² to 5,755 m². This was the result of: expanding the national and provincial park system; constructing agricultural and forestry research stations; developing military installations, and former agricultural land reverting to the Crown (McClellan and Raymond, 1973). This history of public land ownership is important as public land is one way that the public can gain access to the coast.

As discussed in Chapter 4, coastal areas face increased development pressures, particularly in terms of residential development on privately owned land. In turn, changing development patterns affect the ways that residents and visitors to Nova Scotia access coastal lands, particularly in the province's most populated and popular locations. How these changes influence public access to the coast are discussed later in this chapter.

6.3 Legal Framework for Coastal Access

Central to the issue of coastal access is land ownership and the legal issues, rights and privileges associated with access to land. The purpose of this section is to highlight key aspects that affect coastal access in Nova Scotia; there are many nuances to how these laws are interpreted in the courts and details about how various laws are enforced that are beyond the scope of this report.

Issues associated with coastal access must be considered within the legal framework established by both statutory and common law; the latter is the body of rules, rights and principles determined by judges through case rulings and decision making (Cameron, 1993; Swaigen, 1993).

In Canadian common law there are legal distinctions between those rights held by property owners relating to water and those held by the public. An owner of land adjacent to a body of water has certain “riparian rights”, which can be classified as the right of access to the water; the right of drainage; rights related to the flow of water; and rights relating to the quality of the water. The right of access is a property right and includes access to and from the water. In the case of coastal or tidal waters, property owners’ rights include being able to go on the land between the high and low water mark to provide access between tidal water and the land. Property related rights of access also apply to land adjacent to bodies of freshwater (La Forest, 2008).

The Canadian general public have three rights to water: the right of navigation; the right of floatability; the right of fishing (La Forest, 2008). If tidal or non-tidal water is *de facto* navigable, it is classified as public water, and the general public have a right to navigation there (Oosterhoff and Rayner, 1985). The federal *NWPA* outlines laws and authorizes regulations related to navigation. The public right of navigation prevails over a property owner’s riparian rights when the two conflict. The public right of navigation can be understood in a similar manner to the public right of passage on a highway. The right provides for “full enjoyment”, such as “the right to pass, to anchor and to moor, and to remain for a reasonable time for loading and unloading” (La Forest 2008: pp.19-23). These rights do not extend to mooring at private docks, and the public has to exercise these rights in a reasonable manner in order to accomplish a public good and not interfere with the rights of others or obstruct navigability (La Forest, 2008; Oosterhoff and Rayner, 1985). The public right of floatability refers to the “right to float logs, rafts or other small craft on rivers and other watercourses which, though not navigable in a strict sense, were capable of bearing such activity” (La Forest, 2008: pp.19-25). The right of fishing gives the general public the right “to fish in all tidal waters up to the point where the tide ebbs and flows” (La Forest, 2008: pp.19-27). This right must also be carried out reasonably, with regard to other people’s rights including the public right to navigation and private rights (La Forest, 2008).

In Nova Scotia a grant of land only extends to the ordinary high water mark of tidal or coastal land (La Forest, 2008). Land between the ordinary high and low water marks of coastal water is “Crown land”, “public lands”, and “public domain”, in other words land that is owned by the Crown in right of the province (La Forest, 2006). On Crown land, the Province of Nova Scotia has the same rights as a property owner, subject to constitutional or legislative restrictions, pursuant to the *Crown Lands Act* (La Forest, 2006). NSDNR manages Crown lands in Nova Scotia. This involves management, use and protection considerations including access and travel on Crown lands, forest recreation, and protection of habitat and wildlife.

Crown land is considered a public asset, for the public to enjoy and explore within the context of certain restrictions and in certain designated areas meant to protect natural ecosystems, and to allow for other activities occurring under license on Crown land. Hunting and fishing in season, with the appropriate permits and licenses is permitted on Crown land. Many recreational trails have also been developed on

Crown land. Economic activities and related developments, such as forestry, power lines, wind turbines, cranberry bogs, peat bogs and mining occur through licensing and other agreements on Crown lands that are not designated as a provincial park, a protected beach, or designated for habitat conservation purposes. Public access to coastal areas cannot infringe on the rights of parties that have entered into agreement with the province for the use of Crown land. Designated wilderness areas and wildlife management zones have additional restrictions on uses such as camping, hunting, trail and vehicle use, which are outlined in the *Wilderness Protection Act* and associated regulations.

Access to the coast can include passage along cliffs, wetlands, dykes and many ecosystems and features in the coastal landscape. Beaches are significant coastal areas to which the public desires access. Two key pieces of legislation relate to beaches in Nova Scotia: *The Beaches Act* and the *Beaches and Foreshores Act*. The *Beaches Act* defines a beach as the “area of land on the coastline lying to the seaward of the mean high watermark and that area of land to landward immediately adjacent thereto to the distance determined by the Governor in Council, and includes any lakeshore area declared by the Governor in Council to be a beach”. The *Beaches Act* provides for the protection of beaches and associated dune systems as significant and sensitive environmental and recreational resources. The *Beaches Act* provides for the regulation and enforcement of the full range of land-use activities on beaches, including aggregate removal, so as to leave them unimpaired for the benefit and enjoyment of future generations. The *Beaches Act* also controls recreational and other uses of beaches that may cause undesirable impacts on beach and associated dune systems. The Provincial power to designate privately owned land adjacent to Crown land as “beaches” means that activities are restricted on designated privately owned land (Cameron, 1993). The *Beaches and Foreshores Act* outlines provisions and restrictions for the granting or lease of any ungranted flat, beach or foreshore upon the Nova Scotia coast.

The *Off-Highway Vehicles Act* and related regulations stipulate where off-highway vehicles can operate. An off-highway vehicle operator requires written permission to operate on private property unless they are the property owner. Off-highway vehicles are not allowed to access or operate invulnerable or protected areas including provincial parks, park reserves, highland or coastal barrens, beaches, sand dunes, core habitat, watercourses and wetlands, protected sites or ecological sites designated under the *Special Places Protection Act*. A permit from NSDNR is required to operate an off-highway vehicle in or on a coastal or highland barren, beach, or sand dune. A permit from NSE is required for the operation of an off-highway vehicle in a sensitive area under the *Off-Highway Vehicles Act* and the operation of an off-highway vehicle in a watercourse or wetland under the provincial *Environment Act*. The *Off-Highway Vehicles Act* gives the Minister of Transportation and Public Works the authority to give a licence to operate an off-highway vehicle on a coastal or highland barren, or sand dune for non-recreational use, if such use is required to access private land and if the off-highway vehicle is operating on a trail or route that is an essential link with a more extensive off-highway vehicle trail network, and only as long as there is no reasonable alternative. The use of sensitive land must also have a minimal environmental impact.

Entering private land without permission or lawful authority is an offence according to the *Protection of Property Act* and trespassers can be fined. The *Protection of Property Act* makes certain exceptions for recreational activities such as hunting as defined in the *Wildlife Act*, fishing, picnicking, camping, hiking, skiing or studying of flora or fauna. The exception from prosecution does not permit access to private land if the property owner has not granted his or her permission. Property owners are within their rights

to privacy by demanding that trespassers leave. Trespassers may be liable for damage to private property and can be sued if necessary to enforce a property owner's right to privacy. Parking a vehicle on private property without permission is also an offence according to the *Motor Vehicle Act* (Cameron, 1993).

In certain circumstances people do have legal access to private land pursuant to several provincial statutes. The *Angling Act* permits people who are engaged in recreational fishing passage on foot along the banks of watercourses, across uncultivated land and across Crown lands. Anglers have the right of entry without interference from property owners. Anglers cannot camp or use a motor vehicle. Hunters do not have the same rights of passage over private land as anglers, and they must get permission from a landowner to hunt on private property. Other statutes give government officials and other professionals permission to enter private land. For example, conservation officers and their assistants are permitted entry to private property at a reasonable hour of the day under the authorization of the *Forests Act* (Cameron, 1993).

Easements are another way that people gain access over private coastal property. An easement is a right that one landowner can exercise over or in relation to another's land. The right is seen as being annexed to the land itself. Easements are typically created on adjacent neighbouring lands (Cameron, 1993; Ginn, No Date). In the past, easements could be created due to long and uninterrupted use according to the rules established through common law. The *Land Registration Act* now guides the creation and registration of easements in Nova Scotia. Easements cannot be used beyond the scope of the original intended use. In Nova Scotia, conservation easements are agreements that are entered into between property owners and eligible bodies, such as conservation organizations, that may impose obligations over the land for the purpose of protecting, restoring and enhancing land according to the *Conservation Easements Act*. Public access to these lands still must be permitted by the property owners.

6.4 Current Status of Public Coastal Access and Trends

The following section analyzes the status of public coastal access in terms of the ability to reach, view and move along the coast. The analysis considers the physical, legal and economic factors that allow or limit public coastal access. Considerations of physical access to the coast, for example, take into account that people with limited mobility face additional challenges and barriers. Economic considerations bear in mind that some means of accessing the coast are free, via a municipal boardwalk for example, while other access points are open to the public for a fee, such as at marinas, museums and restaurants. Federal and provincial parks and historic sites are considered public because they are government-owned and managed, but entry fees are often charged. Public perception of coastal access is discussed. Changes in land use along the coast are also impacting actual and perceived changes in public coastal access.

6.4.1 Status and Trends of Coastal Access Through Publicly-Owned Lands

A primary indicator of public coastal access is government-owned land. In Nova Scotia, for example, access to the coast is available through national, provincial and municipal parks, historic sites, Crown land, harbours and road right-of-ways. Not all publicly-owned properties, however, are open and accessible to the general public.

6.4.1.1 COASTAL ACCESS THROUGH FEDERALLY-OWNED LAND

While the public can access coastal land through federally-owned properties such as national parks, lighthouses and public harbours, other federally-owned coastal property, such as DND properties, are not open to the public in the interests of security and safety.

The federal government owns and manages two national parks in Nova Scotia that provide coastal access, Cape Breton Highlands National Park and Kejimikujik's Seaside Adjunct. There are also many federally-owned and managed historic sites with coastal mainland, island and tidal river locations, such as Port-Royal, Fort Anne, Grand Pré, Fort Beauséjour – Fort Cumberland, Canso Islands, Fort McNab, York Redoubt and the Fortress of Louisbourg. Access to these sites for the purposes of recreation or education is not necessarily free; entry fees are charged at both Cape Breton Highlands National Park and Kejimikujik Seaside Adjunct and at most national heritage sites. The Kejimikujik Seaside Adjunct has a wheelchair accessible visitor's centre, theatre, picnic area and several wheelchair accessible boardwalks and viewing platforms. Cape Breton Highlands National Park has some wheelchair accessible visitor's centres and locations, including Ingonish Beach Day Use Area, Lakie's Head Lookoff and Mackenzie Mountain Lookoff (Parks Canada, 2008). There has been no federal divestiture of national parks or historic sites in Nova Scotia, and, it is possible that over time, additional historic sites in coastal locations may be designated. Access to the coast through national park lands will likely remain stable with a potential for increase.

The federal government also owns lands surrounding certain lighthouses, which can be visited by the public. Some lighthouse properties have been divested by the government and their ownership and maintenance transferred to community organizations. The Nova Scotia Lighthouse Preservation Society makes reference to 150 lighthouses in the province and provides maps and information about their location and details about public access (Nova Scotia Lighthouse Preservation Society, 2009).

The public also has access to the coast via Small Craft Harbours, wharves and ports. Wharves are important points of access to the shoreline and ocean for residents and tourists (MacInnes *et al.*, 2006). As discussed in Chapter 5, in 1995, the Government of Canada began divesting federal harbours and ports to make the marine transportation system more efficient and address over-capacities. By October 2007, all 29 recreational harbours in Nova Scotia had been divested (Fisheries and Oceans Canada, 2008). Some Nova Scotians have expressed concern over the federal government's divestiture of wharves and lighthouses and the effects these divestitures are having on public access (Nova Scotia Voluntary Planning Task Force, 2001). The lighthouse divestiture initiative, however, which was very active in the early 2000s, has become somewhat stagnant, and the wharves and small port facilities have been divested primarily to local governments or to local community organizations that have an interest in maintaining access, albeit sometimes in a different manner than was previously the case.

6.4.1.2 COASTAL ACCESS THROUGH PROVINCIAALLY-OWNED LAND

The public can access coastal land through provincially-owned properties including provincial parks, beaches and Crown lands. This access is valued for many reasons including recreation, cultural significance, aesthetic qualities and the economic value that accrues as a consequence of tourism. These lands are also ecologically significant, provide habitat for endangered species including the Piping Plover, and are vulnerable to human use. Provincially-owned coastal land provides opportunities for the present

generation to use, enjoy, and learn from our natural systems, and must be managed in such a way that those opportunities will remain for future generations. The conservation of sensitive ecosystems and the desire for public access to coastal lands can be conflicting aims; the challenge is finding the sustainable balance and ensuring the integrity of coastal ecosystems.

While NSDNR has the responsibility to manage provincial Crown land in a sustainable manner, but not necessarily to provide or maintain public coastal access. The Department, through the Parks and Recreation Division, is responsible for providing for “a wide variety of outdoor recreational opportunities”, and for providing “resident travellers and out-of-Province visitors with opportunities to discover, experience and enjoy Nova Scotia’s distinctive outdoor recreational and heritage resources” as set out in the *Provincial Parks Act*. NSTIR is mandated to construct required public roads and maintain many public roads and right-of-ways that lead to, or are adjacent to, the coast.

There are 127 operating provincial parks that are actively used by the public, 71 of which are located in coastal areas (see Figure 3.9 and Appendix 3). Daytime access to provincial parks is free, except for access to Cape Chignecto Provincial Park and the Shubenacadie Wildlife Park, where fees are charged. These areas provide important public access to trails, beaches, boat launches, picnic as well as other recreational and leisure facilities. Parks have infrastructure, such as parking facilities, public washrooms, boardwalks, etc., that support public use while managing human impact on coastal ecosystems. Over half of the parks provide some wheelchair accessible facilities. Lawrencetown Beach and Rainbow Haven Beach Provincial Parks provide ramped boardwalks that wheelchair users can access to view the coast and gain close proximity (Harold Carroll, Department of Natural Resources, pers. comm., 2008).

Certain areas in the province, such as the along the Bay of Fundy and the Bras d’Or Lakes, have few provincial parks that provide the public with access to the coast. The Parks and Recreation Division of NSDNR has identified properties in these areas owned by the Province that do not currently have the infrastructure needed to support public use, or increased public use. West Mabou Beach in Cape Breton is an example of an existing small provincial park that, with some investment and improvement, could accommodate additional users and still be managed sustainably. The recently acquired Cape Split is the largest parcel of land on the coast with potential to accommodate infrastructure for public use. Few other provincial parks have sufficient land in proximity to a beach, or other coastal feature, that could support the infrastructure, required to accommodate an increase in users (Harold Carroll, Department of Natural Resources, pers. comm., 2009).



West Mabou Beach (Source: Nova Scotia Provincial Parks, <http://www.novascotiaparks.ca/parks/galleries/westmabou-gallery.asp>)

Trends related to public coastal access through provincially-owned land vary depending on the location. Using the number of people using provincial campgrounds as an indicator of coastal access trends, there

was a peak in the total number of users in 2001, and overall visitor numbers have since declined. Beaches in provincial parks with lifeguard service have also seen a slight downward trend in overall use. Despite trends that show declining use when all user numbers are considered together, there are certain coastal provincial parks with beaches that have had consistent or increased use. The coastal parks with the greatest use are within relatively close proximity to HRM and include Crystal Crescent Beach, Rainbow Haven Beach, Lawrencetown Beach, Martinique Beach and Rissers Beach. As these beaches become increasingly crowded, pressure increases on beaches further along the shores. The delicate balance between what a coastal ecosystem can bear and the public desire for parking facilities and other infrastructure then becomes an issue. The pristine nature of less-used and protected beaches can be attractive to the public and increase use. The Parks and Recreation Division of NSDNR has found that people will travel between 1-1.5 hours, and even up to 2 hours to reach coastal recreation areas (Harold Carroll, Department of Natural Resources, pers. comm., 2009).

Certain properties have recently been acquired by the Province to enhance conservation of coastal lands. Carter's Beach and Dunns Beach, for example, have been acquired to provide them with protected beach status, and specific conservation and management programs. While public access is not prohibited in these areas, the public are encouraged to visit those provincial parks that are designed to accommodate human use and to allow for conservation in sensitive areas that are vulnerable to human use. NSDNR has implemented an integrated resource management (IRM) process for provincially managed Crown lands. IRM is defined as a planning- and decision-making process that coordinates resource use so that the long-term sustainable benefits are optimized and conflicts among users are minimized (Nova Scotia Department of Natural Resources, 2009). Through this process blocks of land have been categorized according to the management approach that will guide future decision making regarding their use. All Crown land falls into the broad IRM management program, although many non-protected, or non-park beaches, that are Crown land, do not have specific management programs. On these beaches there are some concerns about adequate stewardship and damage from public use, particularly harm caused by off-highway vehicles.

6.4.1.3 COASTAL ACCESS THROUGH MUNICIPALLY-OWNED LAND

Municipal parks, boardwalks, boat ramps and piers are an important means of public coastal access and municipal waterfronts are regarded as important locations for community-wide events, festivals, attractions and services that serve as dynamic destinations that draw local residents and tourists. Access to these waterfronts gives people the opportunity to see the coast and to interact with it through swimming, wading, sailing and other activities. Not all municipally owned land is open and accessible to the public; security and safety, for example, are issues in locations such as municipal water treatment plants. Municipal roads that dead-end at the coast provide another way that the public can gain access to beaches and coastal waters, but such locations can raise concerns with respect to public safety if secure access is not provided.

The legal framework with respect to coastal access and municipalities is largely determined through the *Municipal Government Act*. The provincial government recently amended Section 271 of this Act to allow municipalities to create subdivision by-laws that would facilitate the transfer of land to the municipality for public use, e.g., for parks, trails and playgrounds. Where this land has frontage on water, including coastal waters, municipalities can require that public access be provided, so long as the

subdivision meets additional stipulations set out in municipal planning policies. This section of the *Municipal Government Act* gives municipalities a legal mechanism to acquire coastal land for public use. Since coastal lot subdivision in Nova Scotia is small-scale, whereby a single lot is divided into two, there may be limits to the opportunity for rural municipalities to acquire public land along the coast through the subdivision by-law policy.

Trends regarding public access to the coast through municipally-owned public land, and whether or not municipalities are acquiring new coastal public lands, are difficult to determine. Recently, HRM approved the purchase of a property on the coastline of Cow Bay to facilitate coastal access for increased recreational opportunities. Cow Bay is host of the popular surfing location referred to as “Minutes” (Figure 6.1). Surfers had been accessing this site for years by crossing private property. The landowner decided to sell the land and posted “No Trespassing” and “No Parking” signs to discourage surfers from crossing the land. Surfers who used the location asked the municipality to purchase the land so it could continue to be used for recreation (CBC News, November 28, 2008; Surfriders Association of Nova Scotia, 2008). On December 9, 2008 the City Council approved the acquisition (Figure 6.2), drawing on funds from the Park Land Reserve; at the same time, it was determined that HRM would enter an agreement with the surfing community regarding construction and maintenance of the access point (Halifax Regional Council, 2008).

6.4.1.4 COMBINED COASTAL ACCESS VIA PUBLICLY-OWNED LAND

Figure 6.3 shows the location of publicly-owned land with coastal frontage in Nova Scotia; this includes all federal, provincial and municipal land (see Appendix 4b for a complete list of property categories used in this analysis). Highways are also considered publicly-owned land. The map inset shows all publicly owned land shaded in red, including roads, in an area around the Eastern Shore. The properties include national, provincial and municipal parks, other protected areas and all other publicly-owned land. Not all publicly-owned land in the province is accessible to the general public, limiting the usefulness of this as an indicator of public access. Figure 6.3 indicates that approximately 13% of the Nova Scotia coastline is publicly-owned.



Figure 6.1: “Minutes” surfing location, near Cow Bay (Google Maps)

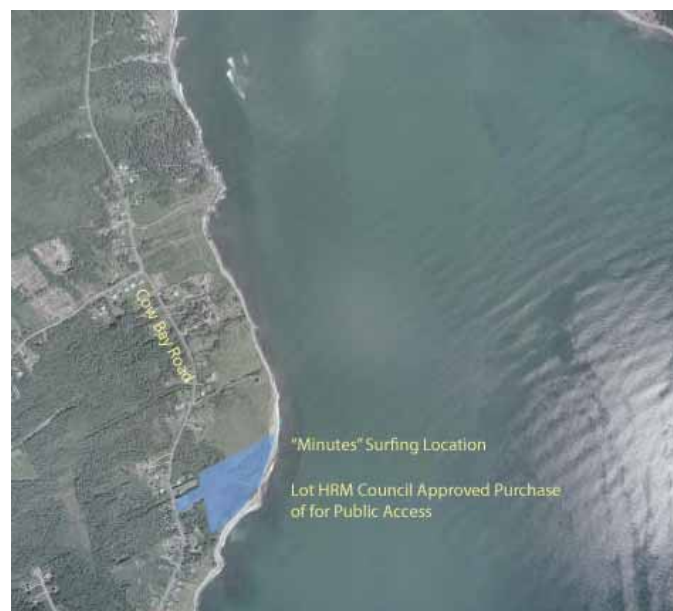


Figure 6.2: The Lot that HRM Council approved the purchase of for public access to the Minutes (Aerial Photo: NS Data Locator 2005)

6.4.2 Status of Coastal Access Through Privately-Owned Land

Crossing privately-owned land is another way that the public can access the coast. This access can be permitted through payment, through a service provided on coastal private land, e.g., accessing the beach through hotel property where one is a guest, or by verbal or written permission. Restaurants, adventure outfitters, shops, golf courses and other facilities and services with waterfront locations, which are open to people who pay for the use of their goods or services, provide comparable opportunities. Those with the economic means and desire can also purchase coastal property, thereby securing private coastal access for their household members and guests.

Views across private property provide an important means whereby the public experiences the coast. Nevertheless valued views can be obstructed, particularly in urban areas. Tall buildings may restrict views from topographical highpoints from which the public may wish to view the coast. In Halifax, views from the Citadel to the Halifax Harbour are a matter of municipal planning policy and great public interest. Through the Halifax Peninsula Land Use By-Law, the city has established viewplanes within which buildings cannot be constructed over certain heights. Figure 6.4 shows the areas of downtown Halifax that fall under the viewplane by-law height restrictions to preserve public visual access to harbour views. Tall buildings constructed at the end of roads, which would otherwise provide coastal views, are also an issue of concern in Halifax. The Maritime Centre, for example, blocks the view of the Halifax Harbour from much of Spring Garden Road, one of Halifax's busiest commercial streets. While restriction of views is an issue in Halifax, coastal views in Nova Scotia are generally plentiful and easily accessible along coastal roads and trails.

People cross land that appears to be undeveloped, yet is privately owned, to reach coastal areas. Informal access across privately-owned land is difficult to inventory and little is known about the extent that this occurs. Some land owners, however, have expressed concern about liability and insurance issues in case of an accident or injury to someone crossing their land to reach a beach and, therefore, want to restrict passage over their land (Toews, 2005); others simply want to protect their rights to privacy. Having an informal pathway to the coast across a piece of property can be a limiting factor for potential buyers, which is another incentive for owners of coastal property to limit access over their land.

As discussed in Chapter 4 and in Section 6.2, there is increased pressure on Nova Scotia's coastline for residential and other land use development. The pattern of such development is increasingly in strips along roads or highways running parallel to oceanfront lots, between towns, villages and cities. This is particularly evident along the South Shore between Halifax and Lunenburg. As more lots are subdivided and land is developed along the coast, areas of the coast that people may have been able to access informally in the past become restricted. Figure 6.5 illustrates this pattern of coastal development through aerial photography.



Figure 6.5: Examples of residential strip development along the coastline between Halifax and Lunenburg counties (Aerial Photos: NS Data Locator 2001-2002)

Sperrys Beach, on the South Shore near Petite Riviere Bridge, is an example where private land was being crossed for several generations in order to reach the beach. In 2004 a landowner asserted his right to privacy of the land and erected a barbed wire fence, padlocked gate and a series of “No Trespassing” signs to prevent the general public from access the coast via his land. In the case of Sperrys Beach there are land boundary disputes and other complications, but the result was that the community lost a point of access to the coast that they had used and to which they felt attached (Canadian Press, 2004).

Reduced opportunities for informal access across privately-owned, yet undeveloped, land have had impacts on the adventure tourism industry. For example, guided walking tours that were accustomed to using trails established through continual use across privately-owned land in coastal areas have, due to changes in landowners, or lot subdivision and subsequent development, been inhibited. Walking tour operators have had to adapt and limit their routes to national and provincial parks (Angela Chisholm, Nova Scotia Adventure Tourism Association, pers. comm., 2009).

Recreational boaters, including kayakers, canoeists and small craft operators, have also experienced a loss of access to put in and take out areas, as well as stops, along their routes. The undeveloped, privately-owned lands that they had previously been using have been developed and, as a result, recreational boaters have had to adapt their routes. This requires tour guides and recreational boaters to have a substantial amount of local knowledge of where they can land, legally and comfortably, in the absence of

a comprehensive formal inventory of public access points, or clear signage facing the water on publicly accessible sites. Even if they could legally stop for breaks on the beach in front of a house, cottage or other coastal development, it is more likely they would travel further in order to stop on a beach with less adjacent development. There are fewer concerns associated with stopping on nearby islands; however some islands near Mahone Bay have been developed and prevent paddlers from access. Several inland canoe routes terminate where the river mouths reach the coast. These are also areas where development in towns has historically clustered, and where there is a lack of public areas to park vehicles and pull-out boats and gear from canoe trips. In many cases, recreational boaters rely on the goodwill of property owners who permit them to use their land. Change in development patterns on the coast, and therefore access points to and from the water, have been subtle and gradual over time, and tour guides and paddlers have adapted to different routes and careful trip planning (Sheena Masson, Outback Kayak Tours, pers. comm., 2009; Dusan Soudek, Canoe Kayak Nova Scotia, pers. comm., 2009). The concerns that adventure tourism operators have regarding coastal access are most acute in HRM, along the South Shore, and in the Bras d'Or Lakes area.

6.4.3 Status of Coastal Access Through Trails Networks

Trails that provide access to coastal vistas, beaches and wetlands are abundant in Nova Scotia. Formal trails are located on private land with conservation easements, on land owned by non-government organizations whose mandate is to provide recreation and environmental conservation opportunities, or on land owned by the federal, provincial or municipal governments. There are also many informal trails in coastal areas that are not specifically managed and maintained by a government department or non-governmental organization. The trails network is used for a variety of activities, such as hiking, off-highway vehicle use, cross-country skiing, cycling, snowmobiling, etc. Some trails accommodate shared uses, whereas others are single-purpose trails, e.g., hiking only. There are over 80 community trails associations in Nova Scotia, plus the Trans Canada Trails Association, who work with various levels of government to develop, maintain and promote certain trails, or sections of broader trail networks. Coastal water trails are also important recreation routes for residents and visitors.

More trails are being developed in Nova Scotia than ever before, and there is demand for additional funding from all levels of government to support such initiatives (Terry Norman, NS Trails Federation, pers. comm., 2009). In the past five years, for example, the trail network has grown by approximately 1,500 km. Funding for trail development from all levels of government has also increased. In the latest federal budget, for example, 25 million dollars were allocated for trail development across Canada, with \$1.3 million directed to such works in Nova Scotia (Department of Finance, 2009; Terry Norman, NS Trails Federation, pers. comm., 2009).

One important example is the Cape to Cape Trail, which is currently being developed and will link Cape Chignecto in Cumberland County to Cape George in Antigonish County (Cape to Cape Trail, 2009). The International Appalachian Trail is another significant new trail that will connect Nova Scotia's trail network, including coastal sections, with trails in New Brunswick, Maine, Quebec and Newfoundland (International Appalachian Trail, 2009). Another addition is the Inverness County Trans Canada Trail which runs from Inverness to Port Hastings in Cape Breton. It officially opened in 2008, but it has been in the process of development since 1998. It adds 92 km of multi-use trail (walking, cycling, ATV, snowmobiles, cross country skiing and horseback riding) to the provincial network. This trail provides

coastal vistas, 26 trestles over wetlands and waterways, historic sites and educational opportunities. Because it is officially part of the Trans Canada Trail, there are additional opportunities for marketing within the recreational tourism industry (MacEachern, 2009).

6.4.4 Public Perception of Coastal Access

The Nova Scotia Voluntary Planning Task Force's (2001) public consultation and reporting on non-resident land ownership and taxes conveyed pertinent information about how the public view coastal land ownership, and the related issue of coastal access. The vast majority of people who communicated with the Task Force maintained the perspective that coastal access is a paramount issue requiring attention. In general, people living in large urban cities like Halifax did not expect to have access to wilderness areas to the same extent as those living in the country; at the same time urban residents thought they had less access to public beaches and other coastal areas than rural dwellers. In rural communities, there was mixed opinion with regard to opportunities for access; some individuals expressed the view that there were ample opportunities for access, while others disagreed.

Figure 6.6 is a detailed look at Cape Breton produced by the Nova Scotia Voluntary Planning Task Force (2001) to illustrate that although there is a large amount of Crown land in Cape Breton, there are only certain areas providing coastal access.

In the public consultations conducted through the Voluntary Planning process, some participants expressed concern over a declining trend in coastal access for recreational purposes due to changing land ownership patterns and increasing coastal property development. Some people placed blame for decreased coastal access on non-resident landowners who disregarded informal patterns of access that had developed in the community over time. Others suggested that permanent residents raised most obstacles to access. The Nova Scotia Voluntary Planning Task Force (2001) was careful to assert in the final report that access, as well as the broader issues regarding land use and property taxes, cannot be solely attributed non-residents. The popularity of certain locations can contribute to the problem. Landowners may not mind if limited numbers of people (especially other community members with whom they are familiar and can speak to about concerns) access the coast across their land, but they often become concerned when large groups of unfamiliar people start crossing their land. There are also legitimate concerns from landowners regarding liability and potential vandalism; damage can occur unintentionally when large numbers of people create well-trodden paths. A lack of comprehensive planning for coastal access and development is also cited as a reason for a decline in public coastal access. The Voluntary Planning Task Forces references a review of non-resident land ownership back in the early 1970s which found that the issue over coastal access was not related to non-resident owners, but was instead a land use planning issue (Nova Scotia Voluntary Planning Task Force, 2001).

The public perception that coastal access is decreasing may in part be a reaction to the change in coastal uses seen in many communities across the province. The perception of coastal access loss is based on local knowledge and localized experiences. The Nova Scotia Voluntary Planning Task Force (2001) found that there is no province-wide database that provides an accurate portrait of current access opportunities, or how they differ from past use. There are various efforts at providing and posting information on the internet, but there is no central, reliable database of information on public access points, nor is there any tracking of changes to access points.

6.4.5 Change in Economic Activities, Land Use and Public Coastal Access

The public perception of an increase or decrease in coastal access is related to how coastal land uses have changed over time. Economic change has resulted in a decline in local fisheries and marked a shift away from coastal activities (such as fisheries activities) that were at one point more conducive to shared ownership and access to coastal resources such as wharves, boat launches and beachfront (see Chapters 3 and 5).

While certain coastal industries have decreased, recreational use and leisure activities on the coast have increased. Tourism-based recreational uses are in many communities replacing the fishery and other commercial activities that previously utilized coastal areas. In Nova Scotia change in coastal land use and a shift towards tourism services and facilities are altering the demands, requirements and means of accessing the coast (Economic Planning Group, 1997). The Nova Scotia tourism industry is aware of the increasing pressures that tourism is placing on the coast and has developed a Strategy for Sustainable Coastal Tourism Development. The strategy seeks to develop the tourism industry in coastal areas while simultaneously protecting the coast's natural and cultural heritage. The industry has also developed a code of ethics to guide sustainable tourism (Tourism Industry Association of Nova Scotia, 2004, 2007).

As the baby boomers age across the province and as visitors to Nova Scotia also increasingly represent the aging baby boomer group, increased regard to mobility challenges and access issues may be needed. Ensuring that the coast is accessible to people with mobility challenges raises particular concerns. Increasing this type of access will become especially salient as the population ages and a greater percentage of the provincial population faces accessibility challenges. Making coastal areas accessible to wheelchairs, however, means developing suitable surfaces, which may conflict with the desire for coastal areas that retain a wilderness and undeveloped feel.

6.5 Current Initiatives

Pogue and Lee (1999) identify several initiatives and tools that can increase public access including: land acquisition, research and public outreach.

6.5.1 Coastal Land Acquisition Initiatives

Land acquisition is the purchase of all legal rights to land by a public or private entity. Coastal land can be acquired by public entities, through public-private partnerships, or through non-governmental, non-profit groups who may or may not receive funding from government (Pogue and Lee, 1999).

A significant program that relates to the acquisition of coastal properties for conservation purposes is the Eastern Habitat Joint Venture partnership, which includes NSDNR, Ducks Unlimited Canada, and the Nature Conservancy of Canada. In addition to inland parcels, NSDNR has acquired 144 land parcels, which amount to more than 2,200 ha, adjacent to the coastline that are under Eastern Habitat Joint Venture management (Glen Parsons, NSDNR, pers. comm., 2009). The Nature Conservancy of Canada for example, has acquired just under 500 ha of properties that contain a coastal component in Nova Scotia; however, many of these properties contain a small proportion of coastline. A rough recent measurement indicated that the Nature Conservancy of Canada has protected more than 25 km of coastline in the province (Craig Smith, Nature Conservancy of Canada, pers. comm., 2009). The Nova

Scotia Nature Trust and the Nature Conservancy of Canada are also currently active establishing conservations easements across private property (Nova Scotia Nature Trust, 2009; Nature Conservancy of Canada, 2009).



Figure 6.7: Kingsburg Peninsula near the mouth of the LaHave River (Google Maps 2009).

In Lunenburg County, Kingsburg Coastal Conservancy (KCC) is an example of a land acquisition initiative taken to protect and provide public access to headlands, beaches and wetlands on the Kingsburg Peninsula. The KCC is a non-government, non-profit community land trust that owns or provides stewardship and conservation easements on 124 acres on Gaff Point, wetlands on Kingsburg and Lily Ponds, as well as coastal properties including Kingsburg Beach, Sand Dollar Beach and an ocean-front meadow Beach Hill Commons (Figures 6.7 and 6.8). A primary goal of KCC is safe public access to the coast, and they provide boardwalks, trails, benches, interpretive signs, beaches safe for swimming and parking facilities (Kingsburg Coastal Conservancy Nova Scotia, 2009).

6.5.2 Research & Public Outreach & Networking Initiatives

Research and public outreach initiatives can assist decisions makers by providing data to inform policy. Such initiatives can improve the public availability of information on access points, as well as where and how public coastal access is changing.

Inventories of public coastal access points that are made available to the general public are one type of outreach initiative that can improve knowledge of and use of public coastal access points. In Nova Scotia, several groups have initiated the process of gathering information on public coastal access and making it publicly available online. Close to the Coast, for example, is an online initiative by the CCN). The website provides a map of the province linked to information about harbours and wharves, including docking fees, nearby restaurants, shops and attractions (Figure 6.9).



Figure 6.8: Kingsburg Peninsula and Surrounding area in which KCC operates (Kingsburg Coastal Conservancy Nova Scotia, 2009)

As an initiative of several departments and community organizations, the Province’s Trails Nova Scotia website provides information about access points to overland trails, coastal water trails, as well as sea kayak and canoe routes (Trails Nova Scotia, 2009). Trails Nova Scotia also has an interactive map, with links to information about the conditions of access points, parking, and other nearby facilities. They also provide maps with information about coastal water trails and coastal access points although the information is not exhaustive, and not all maps and information are available online. Figure 6.10 shows a coastal water trail map denoting access points, emergency take-out points, and other features and amenities along the coast and nearby islands.

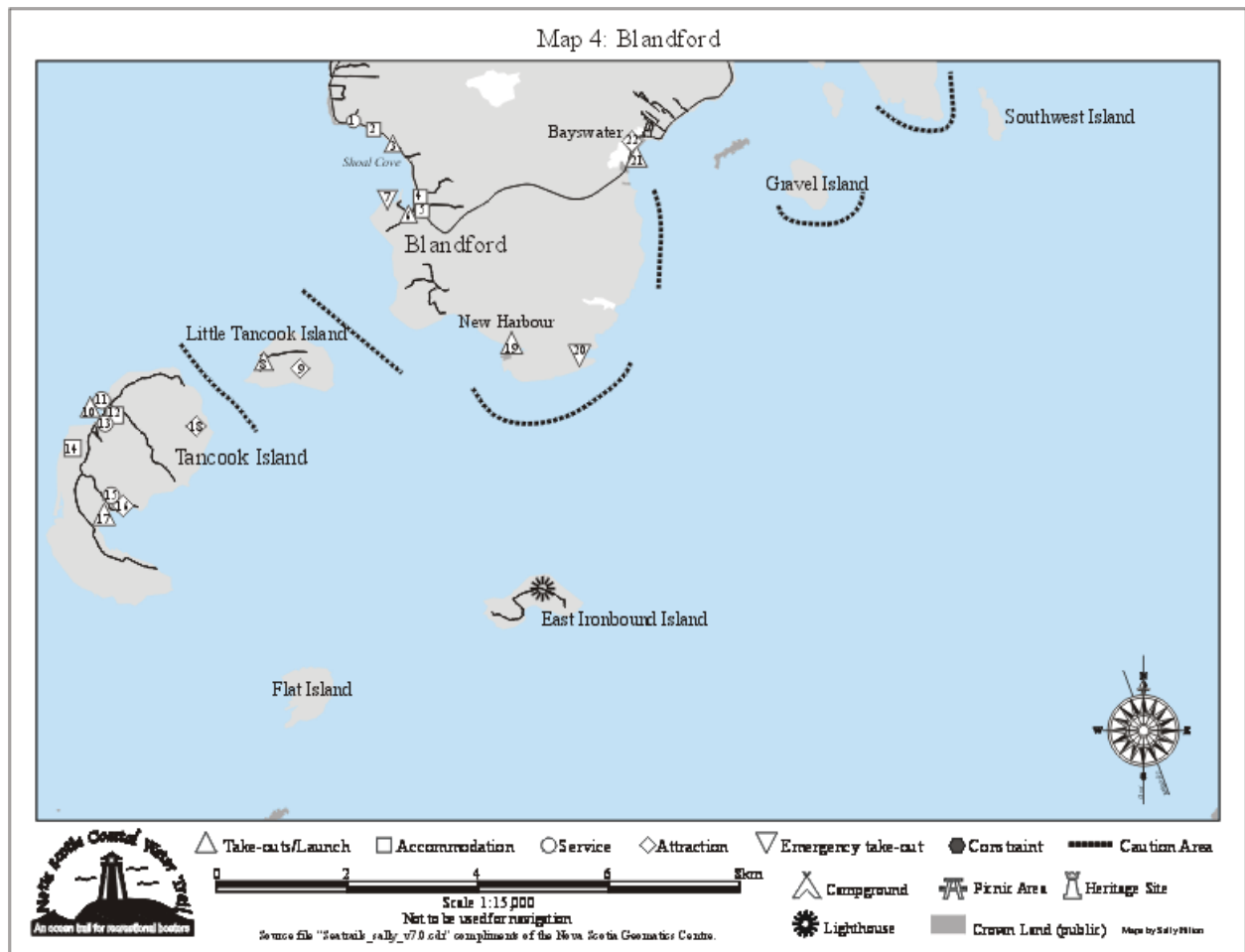


Figure 6.10: Coastal water trail map for the Blandford area along the South Shore (Source: Trails Nova Scotia, 2009)

The Recreation Division of NSDNR has partnered with the Department of Health Promotion in an effort to develop a more comprehensive inventory of the trails network in Nova Scotia. This is identified as a need because many of the informal trails in Nova Scotia are not maintained and mapped as a resource for the public. Regard is being paid in this process to sensitive ecosystems and the reality that, in some cases, informal walking, cycling or off-highway vehicle trails cannot be sustained without causing environmental damage. Formalizing the inventory of trails can help promote trails that are developed and maintained for sustainable use. Water quality monitoring for coastal swimming areas is also on the radar of NSDNR. An initiative to identify provincial parks and beaches used for recreation that need water

quality monitoring and improvements is being developed (Harold Carroll, Nova Scotia Department of Natural Resources, pers. comm., 2009).

As part of its broader environmental mandate, the Ecology Action Centre has a working group who research coastal issues and post information and reports on their website. They also recommend stewardship ideas for the public to keep in mind when accessing and using coastal areas, such as keeping pets on leashes so they do not disturb dune grass or the nests of endangered plovers (Ecology Action Centre, 2008). The Surfriders Association of Nova Scotia has a Coastal Access Committee, which provides a networking opportunity for surfers and a collective for responding to coastal access issues related to surfing (Surfriders Association of Nova Scotia, 2008). In September 2008 CBC initiated an online forum called “Going Coastal: Exploring Nova Scotia’s Threatened Coastline”. On this website people can post their perspectives and opinions about what is happening in coastal areas and link their comments to a particular location on an interactive map. There are also audio and video clips posted by CBC reporters and program hosts on various coastal issues and related interviews. The CBC provides links to other organizations, networking groups, academic research, government publications and other resources for coastal access information (Canadian Broadcasting Corporation, 2009).

6.6 Sustainability Issues / Key Points

As the above discussion of status and trends demonstrates, there is generally a slight increase in public access points through increasing government acquisition of land and the acquisition of land by non-profit groups. On the other hand, increased residential development along the coastline is reducing the public’s ability to informally access the coast by crossing undeveloped private property. Because of the lack of comprehensive data on all coastal access points (formal and informal), it is difficult to make a definitive statement about whether coastal access is increasing or decreasing overall. Certain areas along Nova Scotia’s coast are more desirable for coastal development and recreation; it is in these specific areas that most concern over coastal access has been raised.

Coastal areas in Nova Scotia are highly valued by residents and visitors alike. As a result, more people want to live in coastal areas and visit those places for recreation, leisure and other purposes. As the population grows and migrates to and within it, certain coastal areas will face increased “traffic” and greater human impact on coastal ecosystems and habitats. Public access to ecologically significant areas may not always be desirable from an environmental protection point of view (Navarro, 2000). Carefully balancing the desires of the public, tourists, industries and the environment is, therefore, a sustainability issue that will have to be addressed in coastal management planning efforts focussed on public coastal access.

Data Gaps

- While there are several initiatives that contribute to an inventory of coastal access points (such as the Close to the Coast and Trails Nova Scotia websites) there is no comprehensive and consistently maintained database of public access points. It is therefore difficult to gain a correct overall picture of public coastal access status and trends in the province.
- Publicly-owned properties can provide some indication as to how much land the public own, and where those lands are located. The details regarding public access to each particular site are not, however, collected in a systematic way that can be easily mapped and used to inform decisions regarding public coastal access.
- Much of the conflict and public concern about coastal access relates to informal access across privately-owned land. There is no database or formal inventory of permitted pathways across private land. Without information on permitted pathways being collected and mapped over time, it is difficult to ascertain the status and importance of these locations for coastal access as well as the overall trends in their availability.

Additional Limitations

- Agencies such as Canadian Mortgage and Housing Corporation and Statistics Canada, which do general housing development and demographic research, are not collecting and analyzing data from a coastal perspective and in coastal areas. This makes it difficult to gain a full appreciation of the context within which coastal issues, like access, are taking place.
- There is currently no coordinated government-directed communications strategy to improve the level of knowledge and provide information to Nova Scotians and visitors about existing opportunities for access to coastal recreational venues.

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Chapter 7 **Sea-Level Rise and Storm Events**

7.1 Introduction

A long-term rise in sea level is occurring in Atlantic Canada and is projected to accelerate due to climate change. Reduced sea ice coverage and increased storm intensities are additional consequences of climate change. As a result, storm events will have ever increasing impacts on people, property, infrastructure, wildlife and ecosystems along the coast. Adaptation, protection and planning for the sustainable use of coastal land in Nova Scotia must, therefore, take into account the risks arising from sea-level rise and coastal storms.

This topic is currently one of intense scientific research. A future coastal zone management strategy and its associated policies should integrate science on an ongoing basis. To help towards such a future integration, this chapter summarizes the present state of knowledge and describes the potential impacts from sea level rise and storm events. Current management actions and initiatives to deal with this issue are also presented.

7.2 Sea Level Rise

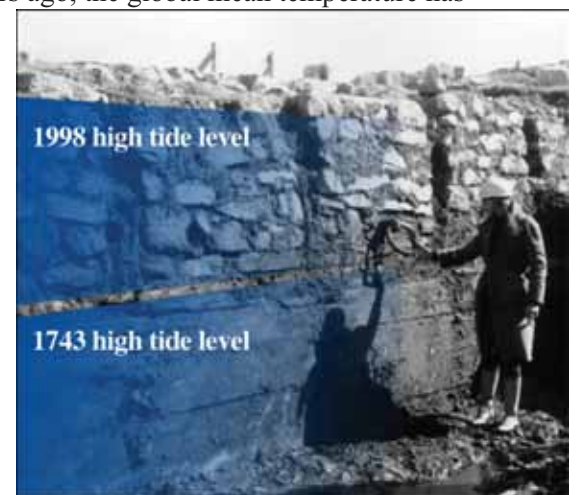
7.2.1 Driving Forces

The rise in relative sea level, i.e., the water level relative to fixed points on land, experienced by Atlantic Canada is due to a combination of processes including:

- Long-term global mean sea level rise since the end of the last ice age;
- Regional land subsidence; and
- Climate warming that will accelerate global sea level rise in the future.

Post-glacial warming of the Earth is causing long-term global mean sea level rise due to the thermal expansion of ocean waters and the melting of the ice sheets (the process is referred to as “eustatic” sea level rise). Since the peak of the last ice age, about 20,000 years ago, the global mean temperature has risen 4°C to 7°C and sea level has risen about 120 m (Rhamstorf, 2007). During the 20th Century, the global mean sea level rose 17±5 cm (an increase over the rate in the 19th century), (Intergovernmental Panel on Climate Change, 2007).

In Nova Scotia, the present rates of relative sea level rise are higher than the global mean; during the 20th Century the increase was about 30 cm. This trend is further exemplified at Fortress Louisbourg where a 1740s ship’s mooring ring is located half a meter below today’s high tide level. Time series of mean annual water levels from tide gauge records and the associated sea level rise trends are shown on Figure



Sea level rise at Fortress Louisbourg
(Source: Taylor *et al.*, 2000).

7.1 for six harbours in Nova Scotia and neighbouring provinces.

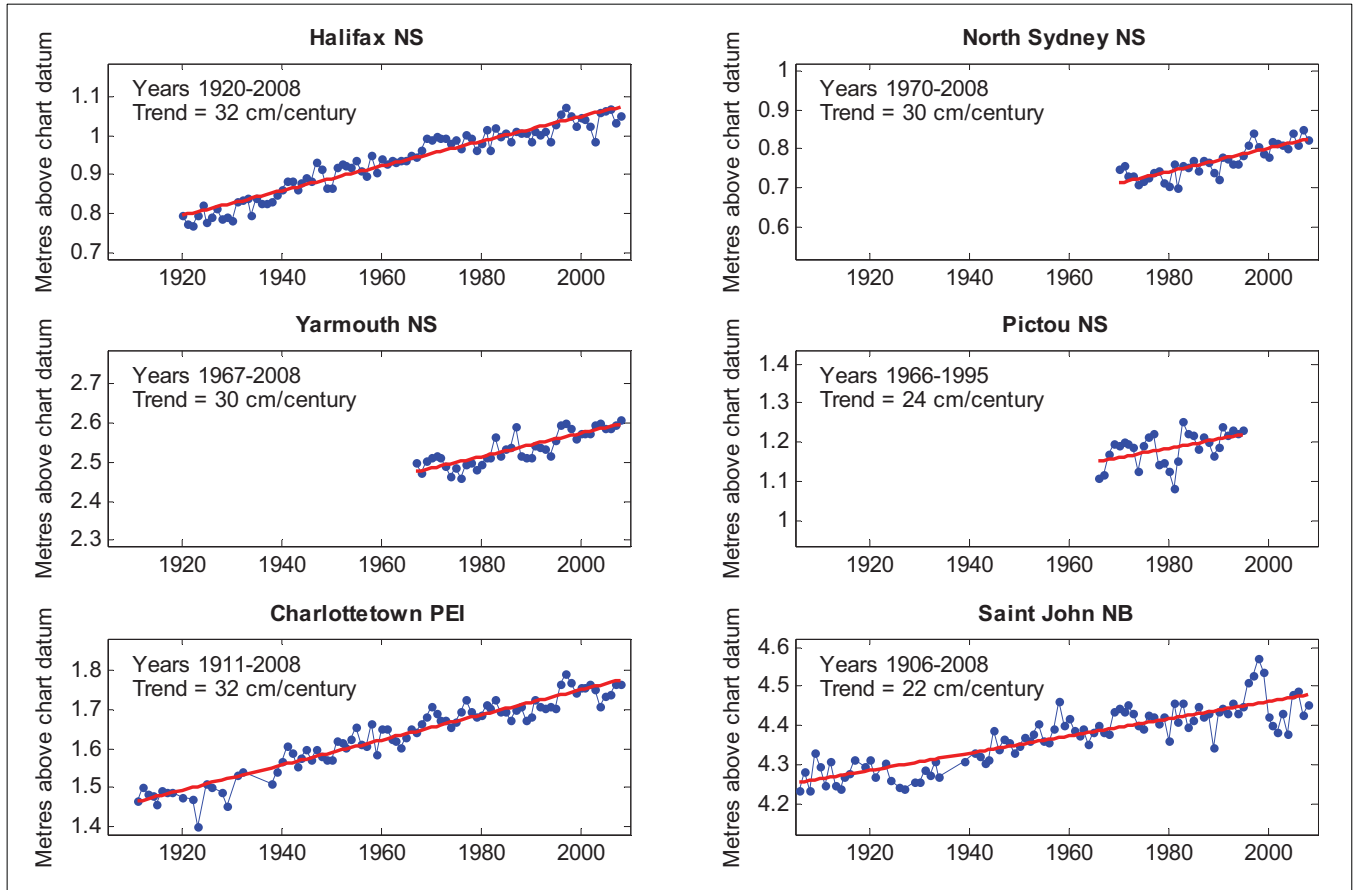


Figure 7.1: Mean annual water levels at six harbours in Nova Scotia, Prince Edward Island and New Brunswick (Source: Marine Environmental Data Service, Ottawa)

Sea level rise in the province is due to the combined effect of an increased global mean sea level and the additional effect of regional subsidence of the Earth’s crust. The subsidence is a manifestation of the crust’s long-term response to the end of the last ice age, referred to as the “glacial isostatic adjustment”. It is caused by the gradual collapse and migration of an area of uplift that developed around the margins of the North American ice sheets and by additional water loading on the seabed in the Gulf of St. Lawrence as global mean sea levels rose (Forbes *et al.*, 2006). In Nova Scotia, subsidence rates are not uniform and are estimated to be up to 20 cm/century (Peltier, 2004; Koozmare, 2005). Reliable data are lacking, and only models can be used for estimates (see Figure 7.2). Most of Atlantic Canada is subsiding, whereas the north shore of the Gulf of St. Lawrence in Quebec and Labrador is rebounding.

Starting in 2001, measurements using a continuous land global positioning system (GPS) site at the Bedford Institute of Oceanography show that land in the Halifax area is subsiding at 17 ± 15 cm/century; the uncertainty will diminish as the record length is extended (Forbes *et al.*, 2008). The 32 cm/century relative sea level rise value measured from tide gauge records at Halifax is consistent with the sum of 17 cm for 20th Century global mean sea level rise and 17 cm for subsidence.

7.2.2 Projections

7.2.2.1 GLOBAL PROJECTIONS

Scientific findings summarized by the Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (AR4) (Intergovernmental Panel on Climate Change, 2007) indicate that global warming, due in large part to human releases of GHGs, will accelerate global mean sea level rise. In particular:

- Projected warming due to the emission of GHGs during the 21st Century will contribute to sea level rise for many centuries;
- Sea level rise due to thermal expansion and the melting of ice sheets could continue for centuries or millennia, even if greenhouse gas emissions were to be stabilised;
- Sea level rise was not geographically uniform in the past and will not be in the future; and
- There is a great uncertainty associated with the magnitude of global warming. If sustained, it could lead to the elimination of the Greenland Ice Sheet. In recognition of this uncertainty, IPCC AR4 sea level rise projections do not account for the accelerated outflow of ice sheets.

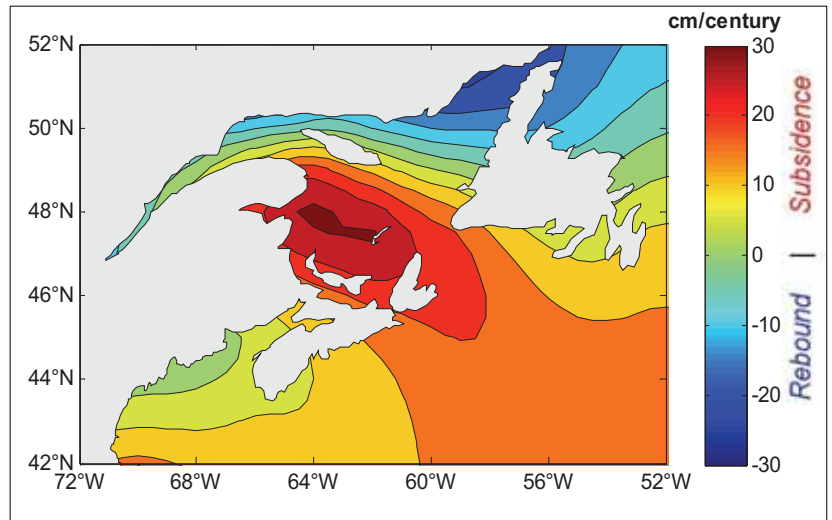


Figure 7.2: Regional rates of relative sea level rise due to glacial isostatic adjustment according to the Ice-5G model (Peltier, 2004) (The effect of global mean sea level rise is not included)

Climate scenarios examined by the IPCC project a global mean temperature increase of 1.1°C to 6.4°C by 2100. The corresponding sea level rise, excluding future rapid dynamical changes in ice flow, is 18 cm to 59 cm by 2100. However, the post-AR4 analyses of observed sea ice extent indicate that the Arctic Ocean is losing sea ice 30 or more years ahead of model projections (Stroeve *et al.*, 2007). In addition, the recent global sea level rise trend appears to be already at the upper end of the AR4 projections. Based on strong empirical correlations between global mean air temperature and sea level rise in the 20th Century, Rhamstorf (2007) estimates that a global mean sea level rise of up to 120 cm by 2100 for strong warming scenarios cannot be ruled out. This would nearly double the maximum IPCC AR4 projection.

7.2.2.2 NOVA SCOTIA PROJECTIONS

Local sea level rise projections must account for:

- Global mean sea level rise – the range for the next century may be 18 cm to 59 cm based on IPCC AR4, but could be up to 120 cm (Rhamstorf, 2007); and
- Regional land subsidence – a representative value of 20 cm/century may be used for the province at a preliminary stage.

Based on the above assumptions, relative sea level rise in Nova Scotia for the next century could range from 70 cm (Forbes *et al.*, 2006) to double that value (140 cm). It is, however, recognised that the exercise of making projections for Nova Scotia is hindered by significant uncertainties associated with the following factors (Forbes *et al.*, 2008):

- IPCC projections, which depend on future global emissions' scenarios and model error bars;
- Accelerated ice melting in Greenland and Antarctica;

- Regional sea level response to the global mean sea level (there is currently no reason to use a different value for Nova Scotia than the global mean); and
- Regional land subsidence.

Projections will be updated as climate models improve and more data are collected. The planning process should, therefore, be informed by science on an ongoing basis.

7.3 Storm Events

Sea level rise is a concern because the mean sea level acts as a carrier wave for the tide, carrying storm surges and waves generated by marine storms. A rise in sea level would allow storm surges to reach further inland.

7.3.1 Storm Types

Nova Scotia is subject to a wide range of storms, including extratropical (mid-latitude) and tropical cyclones. Extratropical cyclones form as eastbound cold, dry air originating over the continent meets warm, moist air originating over the Caribbean Sea. The temperature difference between these air masses is greatest during winter and late fall, which leads to the most intense extratropical cyclones. In winter, the most common are extratropical cyclones that form offshore of the southeastern United States and track northeastward towards the Maritimes. Year-round, these storms can also form over the continent east of the Rocky Mountains, or farther north in the Arctic (Parkes *et al.*, 2006). The Atlantic storm of January 21-22, 2000, is an example of an extratropical storm when the storm surge coincided with high tide in the Gulf of St. Lawrence, causing extensive damage (see http://gsc.nrcan.gc.ca/coast/storms/atlantic_storm_e.php).

Tropical cyclones, i.e., hurricanes and tropical storms, form during the tropical weather season in the Atlantic (June to November). They originate in the tropical and subtropical North Atlantic and may track northeastward along the eastern coast of the United States. They then typically weaken and dissipate over colder ocean waters north of the Gulf Stream current, south of Nova Scotia. During infrequent occurrences of warmer-than-usual water temperature, however, they may continue on and make landfall in Nova Scotia, as did hurricanes Hortense in 1996 and Juan in 2003 (Meteorological Service of Canada, 2005). These tropical cyclones can be very powerful and occur before the formation of sea ice, which would typically protect the Northumberland shores of Nova Scotia from direct wave attack. During a tropical storm's transition to post-tropical, the strongest winds

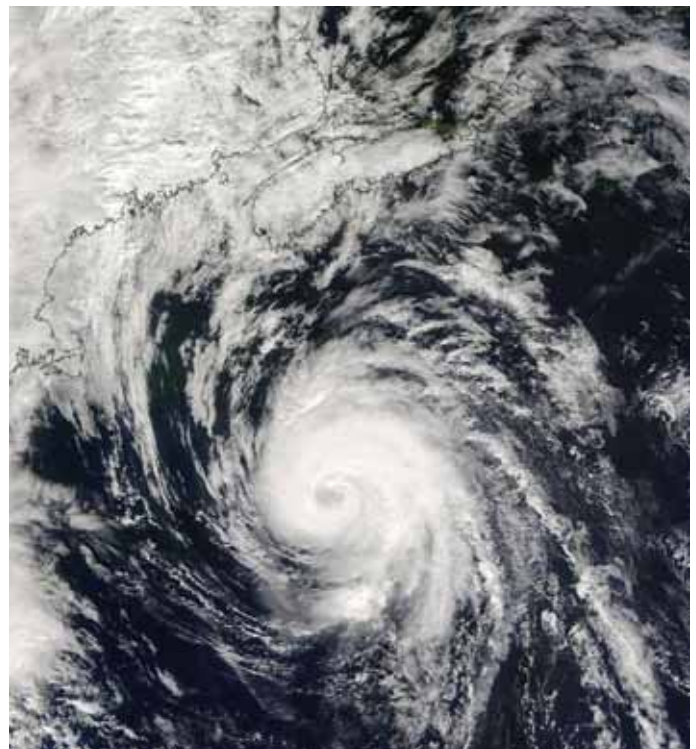


Figure 7.3: Hurricane Juan approaching Nova Scotia (Source: Environment Canada, www.atl.ec.gc.ca/weather/hurricane/)

spread out from the core and the storm then resembles an extratropical system. Post-tropical Storm Noel (November 2-3, 2007) is a recent example that caused damage along the Atlantic coast of Nova Scotia (see http://gsc.nrcan.gc.ca/coast/storms/atlantic_storm_e.php).

7.3.2 Storm Surges

The storm surge is the height difference between the water level due to astronomical tides and the total water level at the peak of the storm. It is due to storm winds piling water onshore, low atmospheric

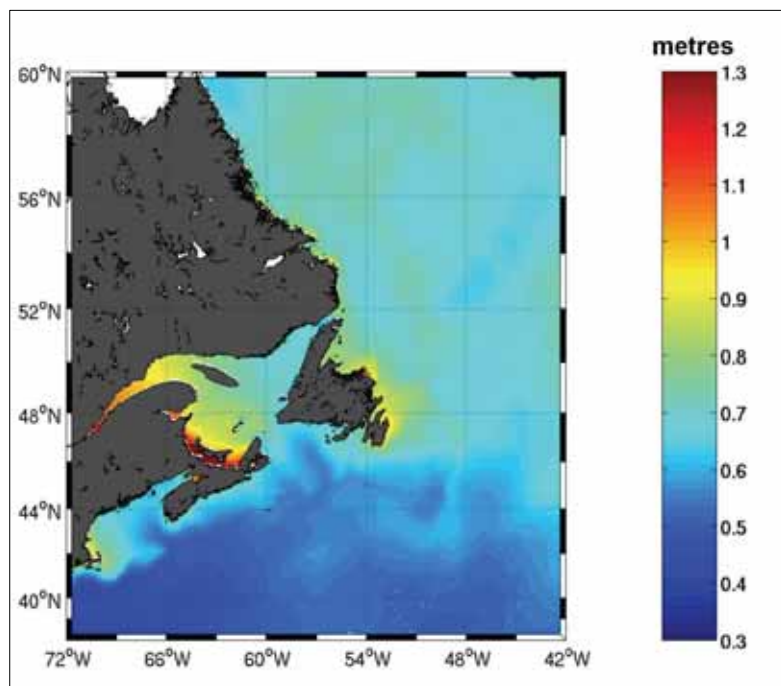


Figure 7.4: 40-year Return level of extreme storm surges based on a hindcast (reproduced from Bernier *et al.*, 2006). Note: The colourbar indicates the 40-year surge levels independent of tidal elevations. Estimates for other return periods are available on Environment Canada's atmospheric hazards website (<http://atlantic.hazards.ca>).

pressure, wave setup, possible resonant effects within a bay and the coastal response to these factors (Parkes *et al.*, 1997). Storm surges are typically associated with large-scale weather systems and affect large areas. The surges mostly occur during extratropical storms in the fall and winter, but can also be caused by tropical cyclones reaching Nova Scotia in the summer and fall. Figure 7.4 shows positive storm surge heights that are exceeded on average once in 40 years. The highest surges around Nova Scotia tend to occur along the North Shore, western Cape Breton Island and the head of the Bay of Fundy (the map does not include potential surge amplification in bays and harbours). The tidal phase during the storm peak determines the total water level. The most damaging storms are those occurring at high tide, or storms of long duration (over several tidal cycles) coinciding with spring tides.

7.3.3 Future Trends

It is expected that climate change will cause an increase in the intensity of storms in the northern hemisphere, as well as a possible northward shift of storm tracks (McCabe *et al.*, 2001; Wang *et al.*, 2006). This northward shift will increase Nova Scotia's exposure to the warmer southeastern side of storm tracks, which may alter local wind patterns and cause increased precipitation. Trends in hurricane frequency are difficult to extrapolate in the long-term because of the cyclical nature of their occurrence. Still, intense tropical cyclone activity has increased since approximately 1970, with a trend towards longer lifetimes and greater storm intensity, and such trends are strongly correlated with sea surface temperatures. Based on 1981–2000 averages, the number of hurricanes in the North Atlantic has been above normal in nine of the last 11 years, culminating in the record-breaking 2005 season (Intergovernmental Panel on Climate Change, 2007).

For coastal Nova Scotia, the consequence of rising sea levels will be far greater than that of increased storms, i.e., storm intensity and/or frequency. To illustrate this point, the probabilities of extreme water levels in Halifax from sea level rise alone, and from a combination of sea level rise and increased storms, are shown on Figure 7.5. This figure also shows that the impact of sea level rise is so important that extreme water levels with a current return period of 100 years, as during Hurricane Juan, are expected to become regular events by the end of the century.

7.4 Impacts of Sea Level Rise and Storm Events

7.4.1 Biophysical Impacts

Sea level rise will allow storm events to have increasing impacts on the coast of Nova Scotia. Physical impacts to the coast such as flooding, erosion, increased frequency of overtopping or beach migration are the most obvious consequences. Figure 7.6 depicts the broad regional scale sensitivity of Atlantic Canada to such physical impacts. Sensitivity is defined here as the likelihood of physical changes at the coast due to sea level rise. The index is based on general relief, rock type, coastal landform, sea level rise trend, shoreline displacement, tidal range and wave height using large-scale 1:50,000 maps (Shaw *et al.*, 1998). There is no accounting for small areas of very high or low sensitivity, so the map should not be used for developing local, site-specific policies.

A summary of likely biophysical impacts is provided in Table 7.1. In addition to direct sea level rise impacts, climate change, through increased temperatures and changing precipitation patterns, will also impact coastal biophysical systems (DeRomilly *et al.*, 2005). Sensitivities of marine ecosystems and fisheries are summarized by Vasseur and Catto (2008).

Direct climate change impacts on biological species are difficult to quantify at this point. Such change, for example, will arise from changes in water temperatures (a sensitive parameter for aquatic species), changes in sea ice patterns and physical changes to coastal habitat used for spawning and feeding.

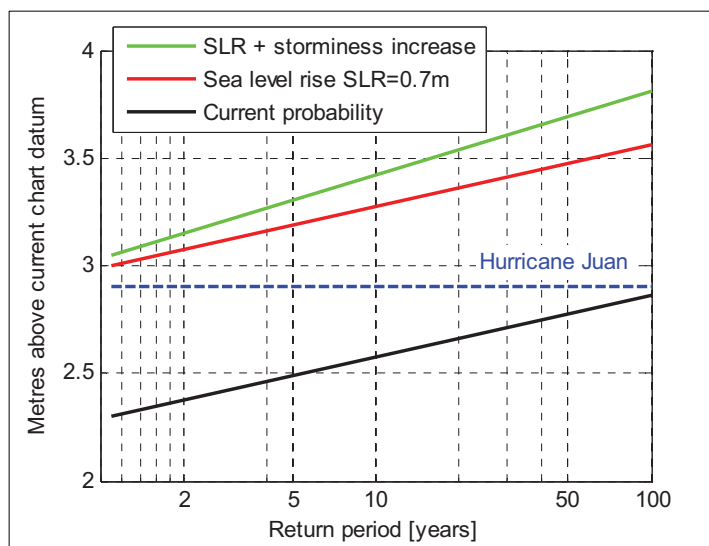


Figure 7.5: Return period of extreme sea levels into the next Century at Halifax (from Bernier *et al.* 2007)

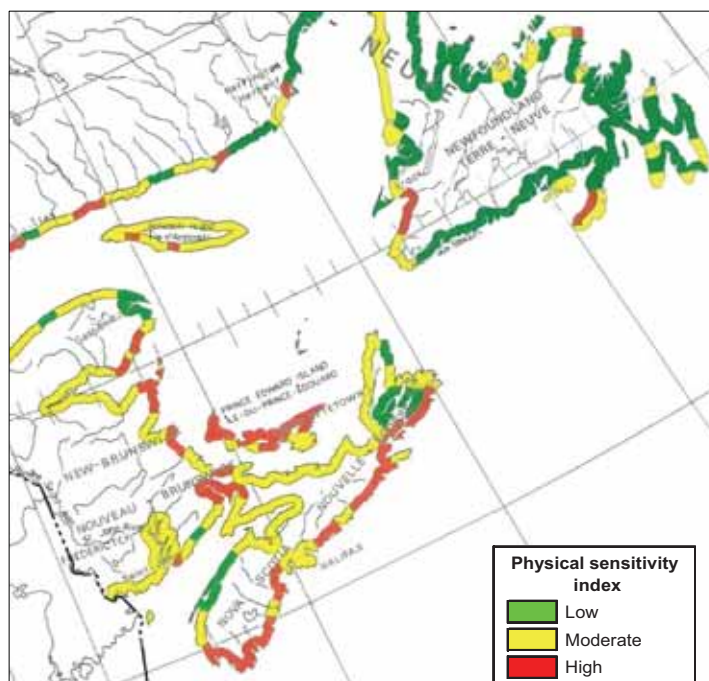


Figure 7.6: Regional physical sensitivity of coastlines to sea level rise in Atlantic Canada (after Shaw *et al.*, 1998)

Notably, the extent and duration of winter ice cover along the North Shore of Nova Scotia and Cape Breton Island will be much reduced by climate change. Results from climate models, for example, indicate that by the year 2045, the Gulf of Saint Lawrence may be free of ice (McCulloch *et al.*, 2002). The main consequences will be an increased frequency of wave events and associated sediment mobilization in the winter. The loss of ice will also contribute to accelerate sea level rise, due to both the lack of the albedo effect (reflectively) of the ice, and the capture of heat by the dark body of water.

Table 7-1: Summary of Qualitative Impacts of Increased Sea Level Rise and Storm Events on the Natural Coastal System

<i>Element of Natural Coastal System</i>	<i>Impacts of Increased Sea Level Rise and Storm Events</i>
Beaches	Large-scale morphologic adjustments to absorb the wave energy, including: - Overwashing and increased erosion - Potential formation of new beaches downdrift of erosion areas - Landward migration of barrier beaches (Geological Survey of Canada, 2008)
Unconsolidated cliffs	Accelerated erosion
Estuaries and tidal rivers	Increase in tidal volume and exchange Further saltwater penetration
Freshwater marshes	Gradually become salt marshes or migrate landward
Salt marshes	More frequent tidal flooding Sedimentation and possible landward migration at a rate commensurate with sea level rise depending on sediment and organic matter supply (Van Proosdij and Baker, 2007; Chmura and Hung, 2004)
Small islands	Submergence
Aquifers	Potential saltwater intrusion affecting potable and agricultural groundwater supplies. In some areas this may be mitigated by recharge from increased annual precipitation (Grant Ferguson, St Francis Xavier University, pers. comm., 2008)
Species and ecosystems	<i>Sea level rise and storm impacts:</i> Modification of coastal habitat as listed above <i>Other climate change impacts:</i> Threatened viability from changes in numerous factors including, but not limited to, water temperature, salinity, sea ice patterns (e.g., seals), runoff and water quality.

The Bay of Fundy is another area at greater risk. Sea level rise and land subsidence will increase the water depths in the Bay of Fundy-Gulf of Maine region. As a result, the tide will propagate faster and the natural oscillation period of the Bay, presently close to 13 hours, is expected to decrease towards the 12.4 hour period of the semi-diurnal tidal forcing. This will bring the system closer to resonance and thereby amplify the range of the tides in the Bay. The increase in tidal range may be in the order of 10% of the sea level rise, e.g., 0.1 m for a 1 m sea level rise over the next century. In such an area where flooding levels are already close to the present high tides, any increase in high water will cause considerably greater flooding risks (Greenberg, 2001).

7.4.2 Socio-Economic Impacts

Coastal property and infrastructure will be increasingly at risk from sea level rise and storm events. Risk is the combination of hazard, e.g., flooding from storm surge, wave attack, erosion, etc., and vulnerability, e.g., from being located too low or close to the water, or on soft geology. The costing of socio-economic impacts is a challenging exercise. It must take into account the elements listed in Table 7.2, including natural systems that provide ecological services valuable to coastal communities (MacCulloch *et al.*, 2002).

Table 7-2: Summary of qualitative socio-economic impacts of sea level rise and storm events

<i>Socio-Economic Element</i>	<i>Impacts of Sea Level Rise and Storm Events</i>
Coastal land	Shoreline erosion
Property, transportation infrastructure and municipal waste treatment facilities	Flooding, structural damage caused by loss of substrate, wave attack or rafting ice
Dykelands	Saltwater flooding of dyked areas (Van Proosdij and Baker, 2007), with impacts on agricultural crops (especially if during growing season), property and infrastructure Upstream freshwater flooding due to higher downstream tidal elevations Structural damage to dykes from overtopping and erosion
Sewer systems	Increased frequency of backups and associated upstream flooding
Human health and safety	Spread of water borne illnesses during flooding Isolation of communities due to infrastructure damage Storm-related injuries or deaths
Aquaculture	Disruption of operations from increased storminess, coastal erosion of protective barrier dunes and changes in water temperature and salinity impacting species
Ports and harbours	Access for deeper draft vessels (if no sedimentation) Storm damage to coastal structures Increased length of shipping season due to climate change
Beaches, dunes, coastal trails and boardwalks	Erosion resulting in loss of coastal protection value, and loss in tourism revenue for recreational areas
Wetlands and forests	Loss of coastal protection and associated ecosystem services (e.g. water filtration, removal of air pollutants, control of runoff and erosion)
Heritage resources	Loss due to flooding



Storm damage at Prospect from Hurricane Juan in September 2003 (photo: Doug Mercer), and at Queensland Beach from post-tropical storm Noel in November 2007

Hurricane Juan in 2003 caused the greatest recent storm damage recorded in Nova Scotia. The total loss reported by the Insurance Bureau of Canada (2008) was \$130 million. For this event, \$35 million were eligible costs submitted to the federal Disaster Financial Assistance Arrangements (DFAA) program. These values would be biased towards wind damage, which is unrelated to direct storm surge damage. Under the DFAA, in the last 10 years, the value received by claimants in Nova Scotia (private property owners, small businesses, fishermen and not-for-profit organisations) for all storm surge damage was \$3.3 million (Adam Rostis and Paul MacNeil, Emergency Management Office, Nova Scotia Department of Public Safety, pers. comm., 2008). These figures do not include damage to public infrastructure. For federal infrastructure, repair costs are generally tallied within yearly maintenance budgets (Paul Davison, Public Works and Government Services Canada, pers. comm., 2008). Gross repair costs to provincial coastal infrastructure (mostly roads and shoreline structures) after hurricane Juan (2003) and post-tropical storm Noel (2007) were \$2 million and \$580,000, respectively (Shawn Ramey, Financial Services,

NSTIR, pers. comm., 2009). It is also noted that Canadian insurance companies in general only cover sewer-back-up related flooding and not coastal flooding, or gradual erosion damage (Insurance Bureau of Canada, 2008).



Storm impacts on February 1, 2006 at the Avonport Dyke (Source: Van Proosdij and Baker, 2007)

Of particular concern to Nova Scotia are the Acadian dykelands (Andrew Cameron and Ken Carroll, Nova Scotia Department of Agriculture, Land Protection Section, pers. comm., 2008). Sea level rise will cause the dykes to be more exposed to damage, and the protected dykelands to flooding as described in Table 7.2. Dykelands were first constructed by the French settlers in the 1700s

to expand agricultural land along the Bay of Fundy, where marine sediments deposited by high tides form fertile soils. At low tide, rivers drain through aboiteaux (culverts with a flap gate on the downstream end). The Province today has responsibility for the maintenance of 17,519 hectares of land protected by the 243 km of dykes, with an annual budget of just over \$1 million in recent years. The dyke elevations are maintained to reflect current sea levels, based on surveys conducted every five years. In 2002 the construction elevation was raised by 30 cm for all dykes. “Topping” (the addition of material to the height) is done if the dyke elevation has fallen some critical value below construction elevation; several factors are taken into consideration including dyke location (upriver versus coastal, storm exposure, land use), topping length (spot locations, or full dyke length) and topping material. Construction elevations are generally set at 60 cm above high tide for exposed dykes, with adjustments based on local factors, e.g., settlement rate, or frequency of past overtopping. The last significant storm event to damage dyke protected lands was in 1976 when the dyke in St. Mary’s Bay was completely destroyed. In addition to agricultural crops and property, a few critical transportation links are particularly vulnerable, e.g., the Trans Canada Highway across the Tantramar Marsh at the New Brunswick–Nova Scotia border, which this was flooded during the great ‘Saxby Gale’ of 1869 (Desplanque and Mossman, 2004).

Strategic decisions will be required by communities and governments, and funds will be needed for programs to protect key public infrastructure and flood and hazard-prone communities, e.g., dyke lands, transportation systems. Impacts of sea level rise and storm events will be very site-specific, in that the flood lines depend on the local terrain and exposure to the key driving forces.

7.5 Policies, Programs and Initiatives

7.5.1 Legislation and Policy

Generally, coastal risk needs to be dealt with at a municipal level with assistance from the Province. Existing coastal legislation and policies have been summarized in Section 3.4 with further detail provided in Appendix 3. A recent extensive review of the challenges and opportunities associated with regulatory standards for coastal development in Nova Scotia is provided by Burbidge (2008). As an example of local ongoing work, HRM’s recent planning policies include coastal setback requirements (Halifax Regional Municipality, 2006), and further initiatives are underway as described in Section 7.5.2. One of the important lessons learned from other jurisdictions, such as New Brunswick, is that regulations restricting coastal development must be enacted immediately to prevent a building rush (Vasseur and Catto, 2008).

7.5.2 Current Studies and Initiatives

The following sections reference representative examples of current initiatives being undertaken to better understand and prepare for impacts of sea level rise and storm events in Nova Scotia.

7.5.2.1 FEDERAL INITIATIVES

Federal initiatives include:

- Environment Canada’s Atlantic Storm Prediction Centre, which issues storm surge forecasts based on a meteorologically-driven ocean model developed at Dalhousie University (used to produce the map shown on Figure 7.3) and validated by water level data;

- The Geological Survey of Canada which maintains an array of coastal monitoring sites that provide information on shoreline position, morphology and the impact of storms (Geological Survey of Canada, 2008);
- The Canadian Hydrographic Service (CHS) that operates tide gauges in Nova Scotia at Yarmouth, Halifax and North Sydney. Data for the Bay of Fundy and Northumberland Strait are collected at Saint John NB and Charlottetown PEI, respectively. The gauges were recently upgraded to be part of a real-time storm surge and tsunami warning system, in recognition of the fact that tsunamis, although rare, can happen in the Maritimes as occurred in 1929 in Newfoundland (O'Reilly *et al.*, 2007). CHS is also responsible for managing vertical datums, which are being updated to reflect sea level rise; and
- A GPS system that was installed to monitor land subsidence at the Bedford Institute of Oceanography (Forbes, 2008).

7.5.2.2 PROVINCIAL INITIATIVES

The *Environmental Goals and Sustainable Prosperity Act* passed by the Province in 2007 sets its long-term environmental and economic agenda, under which the 2009 Climate Change Action Plan (Nova Scotia Environment, 2009) specifically addresses the following:

- Provision of funding to municipalities to plan for the consequences of climate change focusing on the impacts of sea-level rise, land use planning and wastewater treatment plant design;
- Release of a Sustainable Coastal Development Strategy by 2010 to address increased coastal risks; and
- Taking sea level rise into consideration and placing priority on conserving coastal wetlands in preparing a policy to prevent the net loss of wetlands.

Current examples of site-specific provincial initiatives include (Philip Finck and Garth Demont, Nova Scotia Department of Natural Resources, Geological Services Division, pers. comm., 2008):

- Coastal Hazard Assessment Project, St. Margaret's Bay – This involves the preparation of paper and GIS maps (1:10,000 scale) to classify coastal areas based on a range of natural and man-made factors relating to existing and future hazards. These factors include bathymetry, morphology, angle of wind and wave attack, coastal structures or armouring, location of infrastructure and property, etc. These maps will provide essential, basic information for a wide range of stakeholders including property owners, planners, infrastructure engineers and coastal zone managers;
- Central Antigonish County Land-Use Planning and Climate Change Risk Assessment Pilot Project – Geoscience and elevation (LiDAR) data are being collected. The end products will be maps of geology, groundwater, mineral resources, flood risk and coastal risk (as for St Margaret's Bay), to be used in developing policies and procedures for sound land use planning towards year 2010; and
- Tide gauge and meteorological station at the Windsor Avon River Causeway operated by Saint Mary's University (SMU) and NS Agriculture, and environmental assessments and flood risk models prepared by SMU and Acadia University in cooperation with NS Agriculture and DFO to support NSTIR's plans to twin Highway 101 (Van Proosdij and Baker, 2007 and other publications from <http://www.gov.ns.ca/tran/publications/publication.asp>).

7.5.2.3 HALIFAX REGIONAL MUNICIPALITY

The HRM is currently leading a project on coastal risks to integrate science into land use planning including setback guidelines, standards for minimum foundation levels and security for critical

infrastructure as input to the forthcoming Halifax Harbour Plan (Halifax Regional Municipality, 2008). Digital elevation models are being combined with sea level rise and storm surge projections to estimate risks in flood-prone areas (see Figure 7.7).



Figure 7.7: Flooding scenarios for downtown Halifax. The peak water level during Hurricane Juan was 2.9 m chart datum (left panel). It could have been 3.4 m had the surge coincided with the high tide 2 hours earlier, or it could have been 3.6 m (right panel) had it coincided with the 'higher high water large tide' (the average of the 19 annual predicted highest high waters) (Source: Manson *et al.*, 2008).

7.5.2.4 OTHER INITIATIVES

In Annapolis Royal, the Tidal Surge Study conducted by the Clean Annapolis River Project, a citizen-based group, is an example of what can be accomplished with relatively few resources (Belbin and Clyburn, 1998). The community is located on low-lying, vulnerable reclaimed land. Risks were assessed from 2 m elevation maps and historical storm records including the 1869 Saxby Gale used as the extreme storm benchmark. The study showed that the fire department would be located on an island during a flood (Figure 7.8). To increase



Figure 7.8: Example of flood risk mapping for Annapolis Royal (Belbin and Clyburn, 1998)

the community's adaptive capacity to the risk of increased coastal flooding, the emergency rescue equipment, previously stored at the fire department was relocated around town, and the fire department acquired a boat (Vasseur and Catto, 2008). The results of this case study are currently being used to develop a desktop kit for land-use planners that includes tools for the analysis of climate change scenarios, coastal and inland flooding, hydrogeology, cost-benefit and policy implementation (Parks, 2006).

7.6 Key Points and Sustainability Issues

Nova Scotia has experienced sea level rise since the peak of the last ice age, about 20,000 years ago. Global warming and regional land subsidence, however, will increase the rate of relative sea level rise, from about 30 cm over the last century to possibly above 1 m this century. This will dramatically increase the occurrence of extreme water levels. Storms are also likely to become more intense. The biophysical impacts (flooding, coastal instability, changes to biophysical systems) and the socio-economic impacts (damage to property, infrastructure, human safety risks, etc.) will increase. In terms of sustainability, this represents a significant socio-economic challenge to coastal areas.

The greatest risks are associated with the following elements (Parkes *et al.*, 1997):

- Low-lying areas, especially those with small tides relative to storm surge potential;
- Areas with frequent storm conditions and high storm surge levels;
- Areas of coastal infrastructure and property;
- Areas of sensitive ecology;
- Areas of rapid coastal erosion; and
- Perigean spring high water, i.e., the largest monthly tides.

Dealing with this long-term problem requires strategic decisions for key public infrastructure and flood and hazard-prone communities. General strategies for adaptation towards sustainability include the response options summarized in Table 7.3.

Table 7-3: Summary of response options to sea level rise and storm events (after McCulloch *et al.*, 2002)

<i>Response</i>	<i>Examples</i>
Protection	Hard structures, e.g., dykes, seawalls, breakwaters Soft options, e.g., beach nourishment, wetlands, vegetation strips, allow beaches and salt marshes to migrate inland
Accommodation	Upgrade infrastructure, raise buildings, improve emergency response systems
Retreat or avoidance	Establish setback lines for coastal development from the landward limit of coastal features

In coastal zone management, these options should be considered in combination and at a local level where public outreach and community engagement are critical. Response options should be adapted to the resource being considered. For heritage resources, for example, increased documentation is an option for areas where extensive protection is not practical. The planning process should be informed by science on

an ongoing basis and should take into account the following points regarding local scientific data in Nova Scotia:

- Mapping of flooding hazards associated with rising sea levels requires high-resolution topography, which is not available from current provincial elevation maps. Airborne laser altimetry (LiDAR) surveys, in conjunction with estimates of future extreme water levels, are one of the tools available to produce flooding risk maps for low-lying areas;
- Data gaps with respect to ground elevations and historical erosion rates should be further addressed to inform the planning process; and
- Existing data on coastal risks, e.g., elevations related to water levels, erosion rates and wave climate, are presently disseminated across various government levels and universities. The process of collecting these data and making them publicly available would be enhanced if one central agency was mandated with the responsibility.

As awareness of the threats increases, more initiatives are being conducted and more data are being collected. There is, however, no single coordinating agency responsible for collecting and maintaining data on coastal hazards such as surge return periods and flood maps, so studies are presently done on a voluntary basis when funds can be obtained. To be useful, these data have to be publicly available (to municipalities, property owners, insurance companies, etc.) from a central archival site or website.

Data gaps

- High-resolution topography for flood mapping;
- Local erosion rates and geology;
- Socio-economic value of exposed property, infrastructure and natural systems; and
- Uncertainties in rates of land subsidence and relative sea level rise.

Additional limitations

- Existing data on coastal risks disseminated across government levels and universities, not easily accessible by public; and
- No government entity presently mandated to study coastal risks or do flood-mapping.

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8.1 Introduction

Water quality describes the physical, chemical and biological characteristics and conditions of water and aquatic ecosystems that influence the ability of water to support designated uses. The focus of this chapter is the quality of Nova Scotia's coastal waters including estuaries, salt marshes, inter-tidal areas and embayments, as well as the open marine waters that may be influenced by freshwater runoff.

Coastal water quality is influenced by natural geological and oceanographic processes, as well as by both marine and land based human activities (Environment Canada, 2000). It is estimated, however, that 80% of coastal pollution results from land based activities. Water quality issues arise from both organic, e.g., nutrients and hydrocarbons, and inorganic, e.g., metals, pollutants. This chapter discusses: threats to coastal water quality; the current status of inshore marine water quality and associated trends; the impacts associated with poor water quality; and some of the policies, programs and initiatives that the federal, provincial, and municipal governments have put in place to more effectively manage coastal water quality.

8.2 Threats to Nova Scotia's Coastal Water Quality

The major threats to Nova Scotia's coastal water quality are land based, including both point and non-point, sources of pollution. Potential point source threats to the quality of coastal waters have been identified as (Stewart and White, 2001):

- **Municipal effluents** including bacterial, metal, organic and chemical contaminants emanating from municipal infrastructure. Nova Scotia Department of Environment (2009) states that 50% of the population is serviced by central water treatment facilities and 45% by domestic (septic) systems, while 5% do not have access to wastewater treatment;
- **Pulp and paper effluents** including the release of wood fibre, other suspended solids, metals and other contaminants. These effluents have a high biochemical oxygen demand (BOD). There are currently four pulp and paper mills in Nova Scotia;
- **Petroleum refining**, which can potentially release oil and grease, sulphide, ammonia, phenol, suspended solids and polycyclic aromatic hydrocarbons (PAHs);
- **Food processing**, including fish processing activities, which generate effluents having a high BOD, suspended solids, oil and grease, bacteria and organic and inorganic contaminants;
- **Thermal generating plants**, which can potentially release thermal pollution from cooling operations, PAHs from coal ash and leachates, and PAHs and metals from atmospheric deposition; and
- **Mining** and associated industries, which can release acid mine drainage, and metals, organics and arsenic from sources such as gold tailings.

Other activities that generate discharges that may directly or indirectly impact coastal water quality if not adequately managed include the following marine activities and related industries (Stewart and White, 2001):

- **Dredging and ocean dumping** of contaminants such as sediments, PAHs, polychlorinated biphenyls (PCBs), trace elements, oil and organic matter, e.g., fish offal;

- **Wharves and coastal structures** and the activities that use this infrastructure causing metals and organic compounds in paints, creosote and preservatives, e.g., from wolmanized lumber, to be released into coastal waters;
- **Aquaculture** activities that may release organic matter and trace metals into the water column and associated sediments, causing nutrient enrichment and eutrophication;
- **Shipyards** and their activities, such as vessel maintenance, that can potentially release organic metals and antifouling chemicals, e.g., tributyltin, lead, etc., into the environment; and
- **Offshore oil and gas production**, which involves a range of works that may lead to hydrocarbon and heavy metal contamination in inshore waters.

In addition to current discharges from the above and other sources, severe contamination has been created by past industrial activity. This includes, but is not limited to, the lands and waters associated with the steel mill and related coking facilities that operated for many years in Sydney, currently known as the Sydney Tar Ponds. Others include the sites of past gold mining activities. The total number of point sources of discharges into coastal waters is difficult to determine; Table 8.1 identifies some of the principle sources.

Table 8-1: Point and potential point sources of coastal water contamination in Nova Scotia

<i>Source</i>	<i>Total</i>
Point Sources	
Municipal Wastewater Treatment Plants ¹	126
Industrial Discharges	n/a
Fish Processing Plants ²	260
Potential Point Sources	
Wharves (Fishing, Recreational and Other) ³	316
Aquaculture Sites ⁴	319

Sources:

1 – Nova Scotia Environment Municipal Wastewater Treatment Plant Permit List

2 – Nova Scotia Department of Fisheries and Aquaculture (2008)

3 - Gardner Pinfold (2005)

4 – Nova Scotia Fisheries and Aquaculture (2008b)

Most coastal water pollution, however, results from non-point sources that are not confined to discrete locations; such pollution results from water travelling over or percolating through large areas before entering a waterway, estuary or coastal area. There are many non-point sources of contamination that threaten our coastal waters (see Figure 3.7). These include agricultural and forestry activities, urban runoff and atmospheric deposition (Table 8.2). The majority of pollutants from non-point sources enter the coastal waters via the province's river systems, which drain into the Bay of Fundy/Gulf of Maine, into the Atlantic Ocean, and into the Northumberland Strait/Gulf of St. Lawrence from the 46 primary watersheds in the province.

Table 8-2: Sources and Impacts of Non-Point Pollution

<i>Activity</i>	<i>Resulting Threats</i>	<i>Impact</i>
Forestry <ul style="list-style-type: none"> • Road construction and maintenance • Timber harvesting • Pesticide and fertilizer application • Fire management 	<ul style="list-style-type: none"> • Increased nutrients • Increased erosion and associated sedimentation • Habitat loss / degradation (wetland, seagrasses) • Increased toxic chemicals (pesticides, heavy metals, oils) • Increased water temperature • Increased pathogens (bacteria, viruses) 	<ul style="list-style-type: none"> • Loss of species abundance • Loss of species diversity • Shellfish bed closures • Decline in species health • Fish kills • Algae blooms, including toxic algae • Human disease outbreaks • Flooding • Low dissolved oxygen in water
Agriculture <ul style="list-style-type: none"> • Contaminated animal feeding lots • Soil tillage • Grazing activities • Fertilizer and pesticide application • Irrigation 		
Urbanization <ul style="list-style-type: none"> • Land clearing • Road and building construction • Hardening of surfaces • Fertilizer and pesticide application • Road salt application • Destruction of natural vegetation • Wetland and riparian destruction • Septic tank use • Pet wastes 		

8.3 Status of Coastal Water Quality

There is no single source of data that provides an overall picture of Nova Scotia’s coastal water quality. Most current monitoring programs have been initiated either because of the identification of specific contaminants posing a threat to human health, or because the locations that have been identified as contaminated as a result of historic or inappropriate handling of industrial or municipal waste products, e.g., the Sydney Tar Ponds, Halifax Harbour and Pictou Harbour. Figure 8.1 indicates areas where there are known levels of contamination in coastal waters, and the location of some of the larger industrial complexes in the province including the paper mills and thermal generating plants.

8.3.1 Water and Sediment Quality

There has been no systematic, planned monitoring of coastal water quality that would enable a spatial or trend analysis to be undertaken of the quality coastal marine waters around the province. The database is, at best, geographically sporadic and often dated. Nevertheless, contaminant concentrations in water, sediments and/or biota have been measured in several of the province’s harbours and estuaries as well as in the open waters of the Scotian Shelf, the Bay of Fundy and Gulf of St. Lawrence. For most sites, contaminant concentrations are low, i.e., at or near background concentrations, and there is little or no indication that environmental harm can be attributed to the contaminants. There are exceptions. More environmentally significant levels of contamination have been found in several locations including the South Arm of Sydney Harbour, the Strait of Canso, Clam Harbour and Halifax Harbour, with a few isolated instances of seriously elevated concentrations in other areas. Both Halifax and Sydney harbours

have been well studied and provide a level of detail on the impacts to the coastal environment from both land-based and marine sources.

Table 8-3: Representative contaminant concentrations from surface sediments in areas within HRM

Contaminant	Concentration (g/g)												
	Halifax Harbour (grab samples)	Halifax Harbour (cores) 1900-present)	Tuft's Cove	Central Bedford Basin	Northwest Arm	Sackville River Mouth	Bedford Basin	Dartmouth Cove	Eastern Passage	Three Fathom Harbour	East Chezzetcook	East Jeddore	West Jeddore
Copper	91	88	323	96	109	15-19	15-19	151-223	26.4-38.0	11.6-33	9-30	18.9	8.9
Cadmium	85.2	-	1.4	0.8	-	<0.02-1.7	<0.02-1.7	1.51-1.87	0.32-0.38	0.06-0.45	0.009-0.5	0.56	<0.001
Lead	160	206	281	231	231	17-37	17-37	418-590	26.4-35.4	5.2-50	2-10	17.4	2.08
Manganese	663	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	0.92	1.6	12.3	1.3	1.25	0.05-0.07	0.05-0.07	1.52-2.99	0.15-0.27	-0.1-<0.2	0.1-0.08	0.08	<0.01
Zinc	226	249	9,582	273	274	41-68	41-68	402-436	75.8-107.6	17.5-74	4-22	74.5	7.78
Organics (g/g)													
PAHs (Total)	-	-	14.4	8.8	20-27	-	-	-	-	-	-	-	-
Aliphatic hydrocarbons	-	-	-	-	1,770	-	-	-	-	-	-	-	-
Chlorinated Organics (ng/g)													
PCBs (Total)	-	-	-	-	-	40-110	40-110	<1.7	54-92	<0.5-<5	<0.5-6	<0.5	<0.5
DDTs (Total)	-	-	-	-	-	<5	-	140-410	31-36	<0.3-<1.7	<0.35-<1	<0.35	<0.35

Source: Adapted from McCullough *et al.*, 2005

Table 8.3 illustrates contaminant concentrations that have been measured (at different times and for different purposes) in Halifax Harbour as compared to other locations within HRM, but at some distance from Halifax Harbour (see Figure 8.2). The results for those sites located either directly in, or connected to, Halifax Harbour, show significant impacts arising from wastewater effluent and industrial and commercial discharges into the harbour. The recorded concentrations reflect, not only the direct discharge of industrial and commercial effluents and domestic sewage into the harbour, but also surface storm water and the seepage of groundwater transporting non-point sources of sedimentation, hydrocarbons and grit. These are contrasted by the significantly lower concentration of metals (copper, lead and zinc) at those locations further away from Halifax Harbour, i.e., Three Fathom Harbour, East Chezzetcook, East Jeddore and West Jeddore. These locations are located far away from the major industrial, institutional and commercial discharges to Halifax Harbour; the majority of discharges to such rural waters consist primarily of municipal wastewater and septic tank seepage. Levels for all

contaminants are lowest at the West Jeddore sample site; the levels at this location are representative of coastal waters that have not been impacted by land based contaminants.



Figure 8.2: Location of sampling sites

There has been a long history of PCBs, PAHs, lead, copper, mercury and zinc contamination in the sediments of Halifax Harbour together with observations of elevated concentrations of PCBs, lead, copper and zinc in harbour waters (P. Yeats, Fisheries and Oceans Canada, pers. comm., 2008). As a consequence of the measures taken by HRM, contaminant levels in general have been declining, but the decline in copper and silver has been less pronounced than that associated with other parameters. The main source for these specific elements is sewage. Sewage inputs have not been decreasing as rapidly as inputs from industrial sources, and until the full commissioning of the new treatment plants associated with the Harbour Solutions Project occurs little change can be anticipated.

Sydney Harbour provides another example of a harbour that has been significantly impacted by historical industrial activities. The waters, sediments and biota in Sydney Harbour have been contaminated mainly from the coking facility and adjacent tar pond that was associated with the steel mill (Ernst *et al.*, 1999), but also from marine transportation and municipal discharges. Numerous field programs have been conducted over the past 20 years including those undertaken by Environment Canada in 1983 and 1988. In 1995, Environment Canada again initiated a comprehensive monitoring program; selected results with respect to the distribution of PAHs and PCBs are indicated in Figures 8.3 and 8.4 respectively.

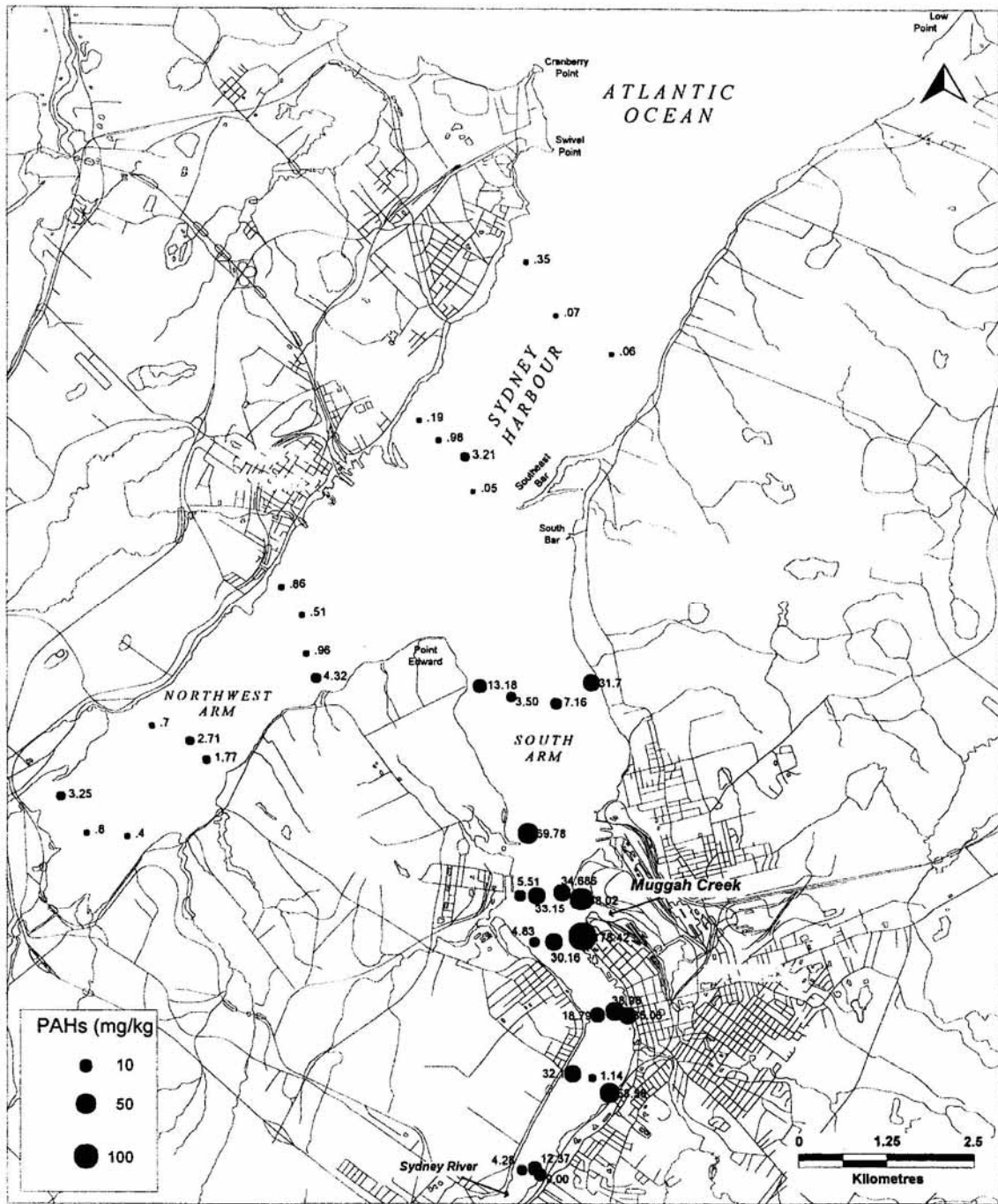


Figure 8.3: Distribution of PAHs in top layer of sediment (0.0-1.5 cm) in samples obtained in December 1995 (Source: Ernst *et al.*, 1999)

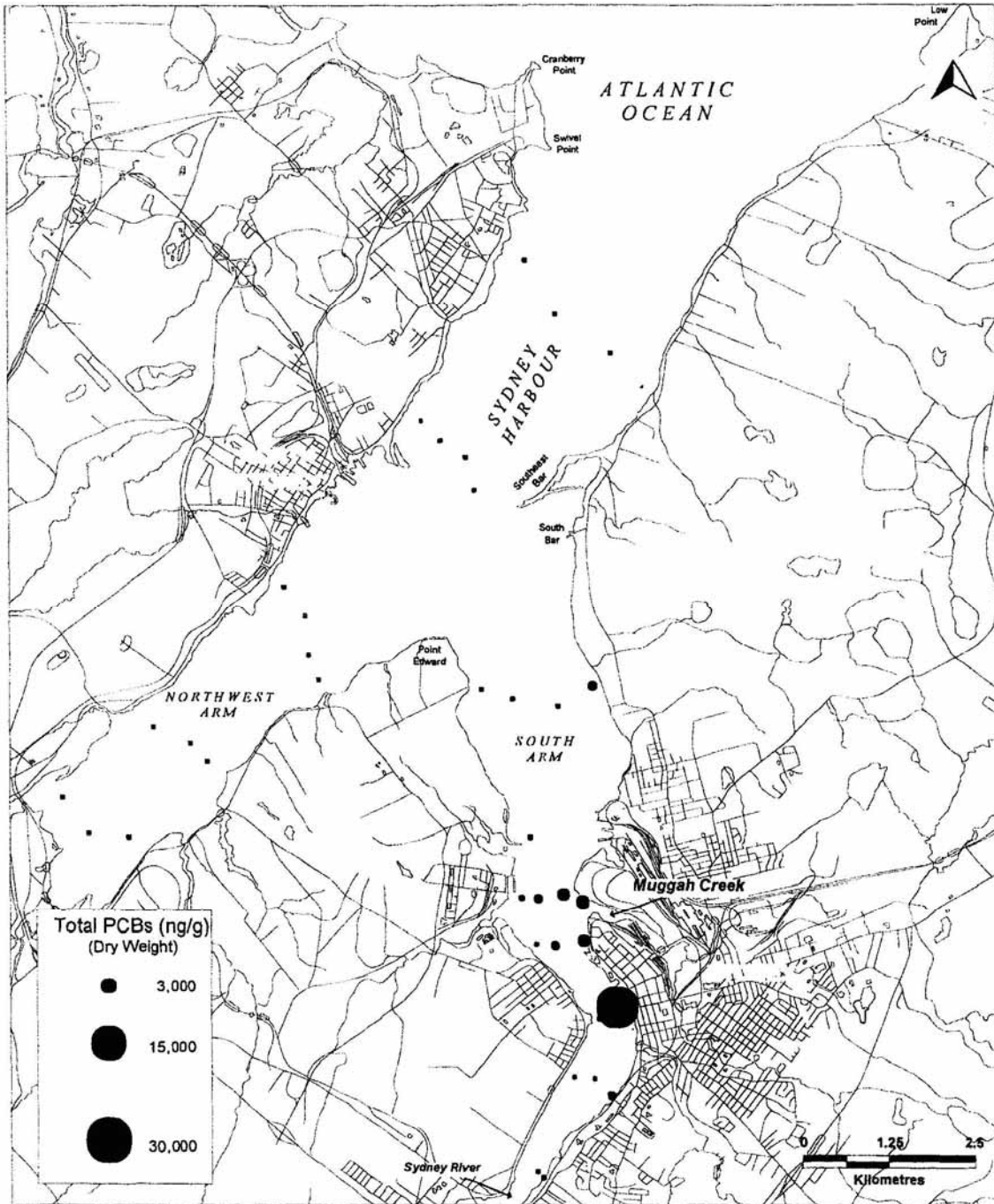


Figure 8.4: Distribution of total PCBs in sediment (Source: Ernst *et al.*, 1999)

The field investigations undertaken (Ernst *et al.*, 1999) support the following general conclusions:

- The Tar Ponds situated on Muggah Creek, were likely to be the most important source of PAHs in Sydney Harbour;
- While there had been an overall decrease in PAH concentrations in sediments since the closure of the steel mill, some stations (14 of 38) had higher concentrations in 1995 than in 1986, indicating that Muggah Creek was still a significant contributor to PAH concentrations;
- Concentrations of PAH in sediments remained higher than any measured in North America and exceeded the Canadian Council of Ministers of the Environment probable effects levels for marine biota;
- The highest concentrations of PCBs were at stations approximately 1,500 m south of the mouth of Muggah Creek, suggesting that Muggah Creek was probably not the major source of PCBs entering the harbour; and
- Distribution patterns of metals such as chromium, copper, sodium, phosphorus, lead, vanadium and zinc indicated that Muggah Creek was not the only, and may not have been the most important, source of metals entering Sydney Harbour.

These findings illustrate the long lasting consequences of the uncontrolled discharge of effluents and wastes from large industrial undertakings and the fact that it was not a single source of contamination that caused the widespread degradation of the marine sediments in Sydney Harbour, but many point and non-point sources.

Substantial remediation work is underway in Sydney to address not only the lands and waters associated with the Tar Ponds and Coke Oven sites, but also other industrial and abandoned mining properties in the region controlled by the Cape Breton Development Corporation. It is a multi-year effort, the results of which are being monitored.

Rural coastal waters are not exempt from pollution. Some historical gold mining operations in stream headwaters along the eastern shore have had an adverse impact on the coastal marine waters. Tailings left behind by these mining operations have, over time, migrated downstream. This material is high in arsenic and, in some cases, mercury; this has resulted in shell fish closures. High concentrations of arsenic and mercury, for example, attributed to gold mining activities, have been measured in several areas including Clam Harbour and Isaacs Harbour (P. Yeats, Fisheries and Oceans Canada, pers. comm., 2008). The consequential arsenic contamination of clams has resulted in the closure of the recreational clam fishery in several locations on the Eastern Shore.

The Historic Gold Mines Advisory Committee was formed in April 2005 to determine the human health risks associated with legacy gold mining sites. The committee is made up of five provincial and five federal departments. One significant finding of the initial studies was that arsenic levels in clam tissue that been collected in Seal Harbour were 160 times higher than a reference site not receiving mine contaminated water (Environment Canada, 2007).

Unregulated gold mining earlier in Nova Scotia's history (1860 to the mid-1940s) has left a legacy of environmental contaminants

"For nearly a century, gold was produced from 64 mining districts in Nova Scotia, from Guysborough to Yarmouth County. Wastes from milling processes using mercury amalgamation techniques were high in mercury and naturally occurring contaminants such as arsenic.

Although use and release of arsenic and mercury are now controlled by federal legislation such as the *Canadian Environmental Protection Act* (1999) and the *Fisheries Act*, historically this was not the case. Sand-like tailings were deposited directly in or near natural water bodies and are still a potential source of contamination today. The tailings pose risks to freshwater ecosystems and nearshore intertidal marine environments in some harbours along the eastern shore.

Such risks to the environment cause concern for the health of nearby human populations and ecosystems."
(Environment Canada 2007: pp.1)

8.3.2 Biota Tissue Quality

Sydney Harbour, known to be severely polluted by PAHs, PCBs and metals from the Tar Ponds and Coke Oven sites and other sources, also has distinct biotic communities that change with distance from Muggah Creek, a major source of the referenced contaminants (Figure 8.5). As a consequence, the lobster fishery has been closed in this harbour for many years.

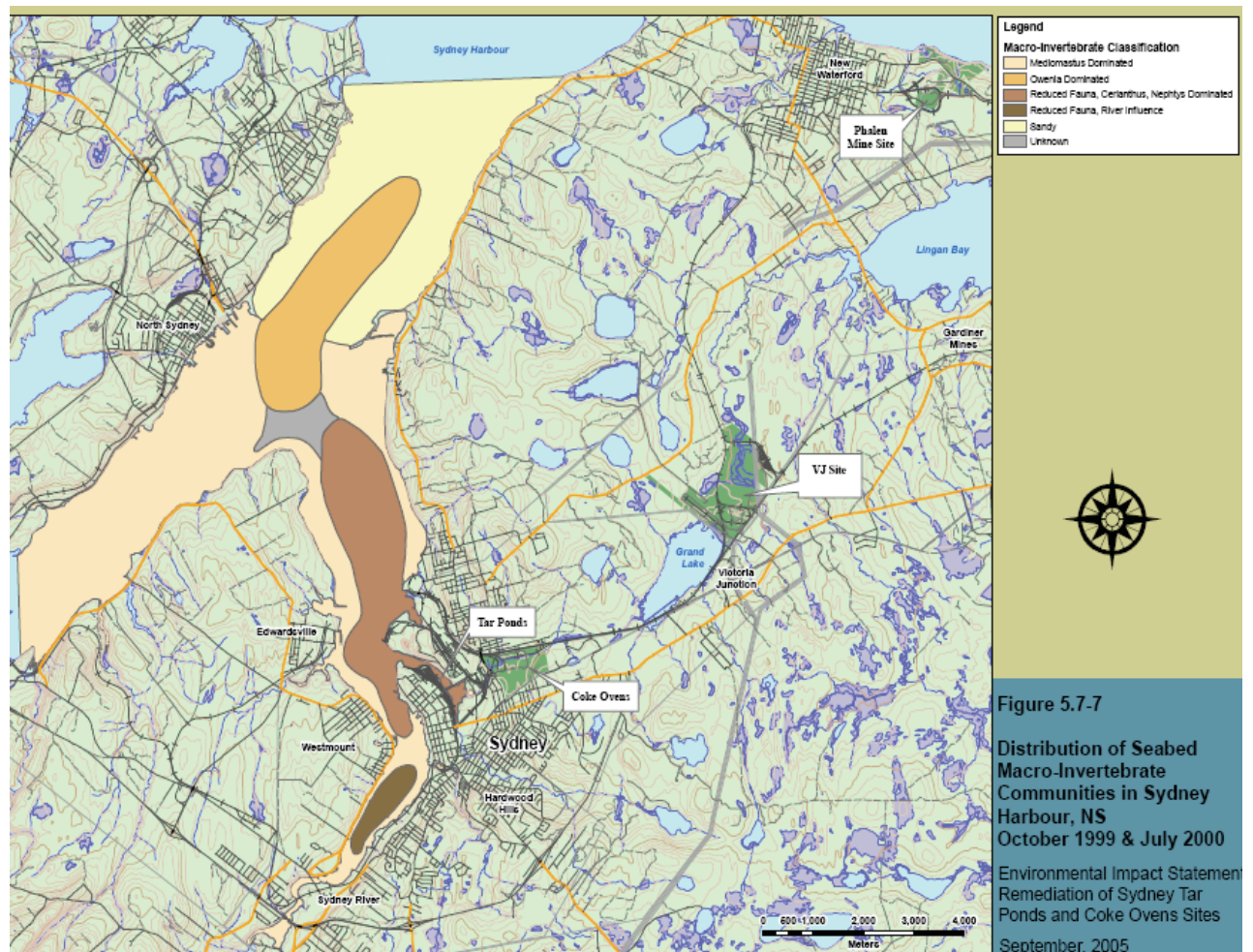


Figure 8.5: Distribution of Seabed Macro-Invertebrate Communities in Sydney Harbour NS (Lee *et al.* 2002)

Sydney Harbour, however, is not the only location where contamination has impacted biota tissue quality. High PAH concentrations have been found in mussels and periwinkles near creosoted wharf pilings throughout the Atlantic provinces (Environment Canada, 2008); Table 8.4 provides data on concentrations of contaminants in mussels from selected locations within Halifax Harbour. The table compares the harbour results both to a background location, Beaver Harbour, and average concentrations within the Gulf of Maine. The values show that the levels of lead and zinc in Halifax Harbour were elevated compared to Beaver Harbour and that levels of copper, lead and zinc were elevated compared to levels within the Gulf of Maine. These findings may indicate that the elevated levels within Halifax Harbour are a result of the proximity of the sample collection point to the source (McCullough *et al.*, 2005).

Table 8-4: Concentrations of Contaminants in Mussels at Selected Locations

Contaminant	Concentration (g/g wet weight unless otherwise specified)					
	Dartmouth Cove	Bedford Basin	Halifax Inlet, 1988, range from various locations	Halifax Harbour (3 locations)	Undeveloped Nova Scotia site (Beaver Harbour, 1989)	Gulf of Maine, 1994
Arsenic (As)	1.1	0.83		1.9-2.5	1.6	
Cadmium (Cd)	0.44	0.17		0.06-0.29	2.1	1.1-3.1
Chromium (Cr)	0.57	0.31		0.14-0.30	0.48	0.8-3.13
Copper (Cu)	1.3	1.9	13.1-154.3	1.5-2.4	1.2	4.5-9.3
Iron (Fe)	57	32.0				170-1033
Lead (Pb)	2.4	3.9	0.4-12.1	0.11-2.2	< 0.5	1-8.3
Mercury (Hg)	0.039	0.11		0.008-0.038	0.064	0.11-1.31
Silver (Ag)	< 0.3	< 0.3		0.007-0.22	< 0.3	ND-1.05
Zinc (Zn)	41	24	92.1-280.6	17-27	11	54-153

Source: McCullough, 2005: 70

8.4 Impacts

8.4.1 Impacts on Biota and Ecosystems

Contaminants in water and sediments can have several effects on benthic communities, pelagic species, marine mammals and marine birds. Biological effects on local species, imposex (the development of sex organs that are in contrast to the actual sex) in dog whelks and analogous endocrinological effects in other organisms have been noted in Sydney Harbour and in other areas. Imposex was also identified at 13 of 34 sites throughout the HRM region. At Portuguese Cove on the outskirts of Halifax Harbour, all females tested were affected. At sites where imposex occurred, tributyltin (TBT) concentrations ranged from 1-75 ng/g wet weight whereas imposex-free sites had concentrations <11 ng/g, or not detectable (McCullough *et al.* 2005). Such effects are considered a direct result of TBT contamination (Prouse and Ellis, 1997, cited in McCullough *et al.*, 2005). TBT was an active ingredient used in marine paints as a biocide to discourage growth on the hulls of ships and boats, and dock structures. Its use is now rigorously regulated, and discharges of the substance to the marine environment largely eliminated. TBT, however, is a persistent contaminant, and TBT contamination and imposex remain a problem.

8.4.2 Beach Closures

Beach closures due to bacteriological contamination have both direct human health consequence and less direct economic consequences depending on the timing of the closures. If a beach is closed, for example, there can be ramifications for local tourism and recreation which, in turn, may reduce the money flowing into the local economy from visitors. Sources of bacteriological contamination include wastewater effluent from sewage treatment plants, birds, and animals, malfunctioning septic systems and runoff from agricultural areas. More specifically, fecal contamination is transported to the beaches both directly from adjacent point sources, e.g., coastal treatment plants, and indirectly in the runoff from non-point sources in watersheds that ultimately feed into the streams and rivers that discharge into the coastal waters.

Beach closures around the province are due mainly to impacts from untreated sewage and typically occur after rain events when storm water empties into beach areas, resulting in high levels of fecal coliform posing a health risk. The CCME guidelines for beach closures is 200 counts/100 mL.

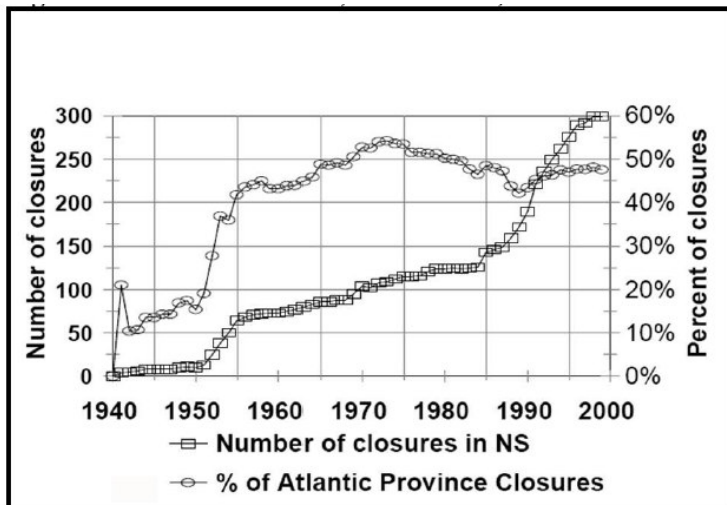
One of the main barriers to effectively reporting the impact of coliform bacteria on beach closures is the inconsistency in sampling protocols and programs in the province and the delays in getting meaningful results. Sampling for fecal coliforms in Nova Scotia, for example, typically takes two days. This represents a serious time lag between the taking of the water samples and an announcement of a beach closure. In contrast, in the Great Lakes region, local authorities, through real time monitoring of coliform levels, are working to provide and identify water contamination and to advise of necessary beach closures promptly (Great Lakes Information Network, 2006).

HRM has taken several initiatives to establish a program to monitor bacteriological contamination in local lakes and rivers. Another program, known as the Halifax Harbour Water Quality Monitoring Program, monitors the water quality of Bedford Basin and the Halifax Harbour. The latter is generating a database that will be used in part to monitor the affect of the Halifax Sewage Treatment Plant and other measures taken to clean the waters of the harbour and to better control and treat both point and non-point sources of pollution. Halifax Harbour was opened for swimming in August 2009 due to the reduction in coliform counts within the harbour after the start up of the Halifax wastewater treatment facility in February 2008 as part of the Harbour Solutions Project (CBC News, 2008). Elevated coliform levels before the end of the summer bathing season again closed the city's beaches. This resulted from untreated wastewater being released into the harbour from high rain events. This clearly demonstrates that coastal water quality can be changed by effective point source treatment systems, but can deteriorate quickly if the treatment system fails, or cannot accommodate abnormal rain events.

8.4.3 Shellfish Closures

The closure of shellfish harvesting areas is another indicator of the health of our coastal waters. Shellfish are highly sensitive to the quality of the marine environment and, if the water is contaminated with bacteria, toxic algae or chemical pollutants, these substances will accumulate in the flesh of the crustaceans making them hazardous to human health. Two naturally occurring toxins are particularly dangerous: paralytic shellfish poison (PSP) and amnesic shellfish poison (Environment Canada, 2004).

Figure 8.6 indicates the number of shellfish closures in Nova Scotia for each year between 1940 and 2000. The number of closures remained stable until around 1950, at which point closures began to increase steadily. Since 1985, there has been a rapid increase in the number of shellfish closures, with the number more than doubling between 1985 and 2000. In 2000, for example, there were 278 shellfish closures representing 939 km² and 3,314 km of coast line (Environment Canada, 2000). More recent data from Environment Canada (2004) indicates that this trend continued in the period between 2001 and 2004. It is possible that these results reflect both the increase in water quality monitoring that has occurred over this time period (Rick Young, DFO, pers. comm., 2009) and other factors such as higher health standards (Wilson, 2000), but they



Sources: Figure: Adapted from Wilson (2000).

Figure 8.6: Shellfish closures, Nova Scotia, 1940-2000

also illustrate a problem. In terms of overall shellfish landings, including scallops, lobster, crabs, and clams, numbers have decreased slightly, but remain relatively stable. (Table 8.5).

Table 8-5: Commercial Landings of Shellfish in Nova Scotia

Year	Quantity (Metric Tonnes)	Value
2006	127,969	\$517.5 million
2005	133,199	\$602.6 million
2004	155,990	\$596.5 million
2003	155,338	\$679.1 million

Source: Nova Scotia Fisheries and Aquaculture, 2009

8.4.4 Eutrophication

Eutrophication is a natural process, but it can be aggravated by human activities. Eutrophication is excessive plant growth in water bodies receiving excess nutrients. Impacts include increased algal blooms, including harmful algal blooms, decreased oxygen levels, increased turbidity and loss of seagrasses (National Oceanic and Atmospheric Administration, 2007). There is a significant link between land-based activities and the contribution of nutrients, including nitrogen and phosphorous, to coastal waters. Nitrogen is the more limiting nutrient required for algal growth in marine environments, but all nutrients contribute to the problem. Sources of nutrients include sewage, urban runoff, discharges from agricultural practices, and the burning of fossil fuels (Bricker *et al.*, 1999).

The implications of eutrophication to Nova Scotia's coastal waters include reduced enjoyment of beaches, reduced productivity of the inshore fishery and increased production of unwanted algae, both harmful and

non-harmful. An increase in the nutrients entering coastal waters can also result in the production of harmful algal blooms, which can result in negative impacts on the shellfish industry (see Section 8.4.3).

Figures 8.7 and 8.8 show the increased risk of freshwater contamination from agricultural activities in 1996 and 2001 (Agriculture and Agri-Food Canada, 2009). Nitrogen levels entering the coastal water bodies increased significantly over the five year time interval. These results may be due to increased fertilizer usage or lower crop yields (Lefebvre *et. al.*, 2005). While parts of the Cumberland, Pictou, Antigonish, Inverness, Colchester, Kings, Annapolis and Digby Counties indicate an increased risk of contamination from nitrogen, the risk in other localities, based on these data, declined. Although these data may not directly indicate poor coastal water quality, the data are illustrative of the risk and the linkage between the more productive agricultural lands and nitrogen levels.

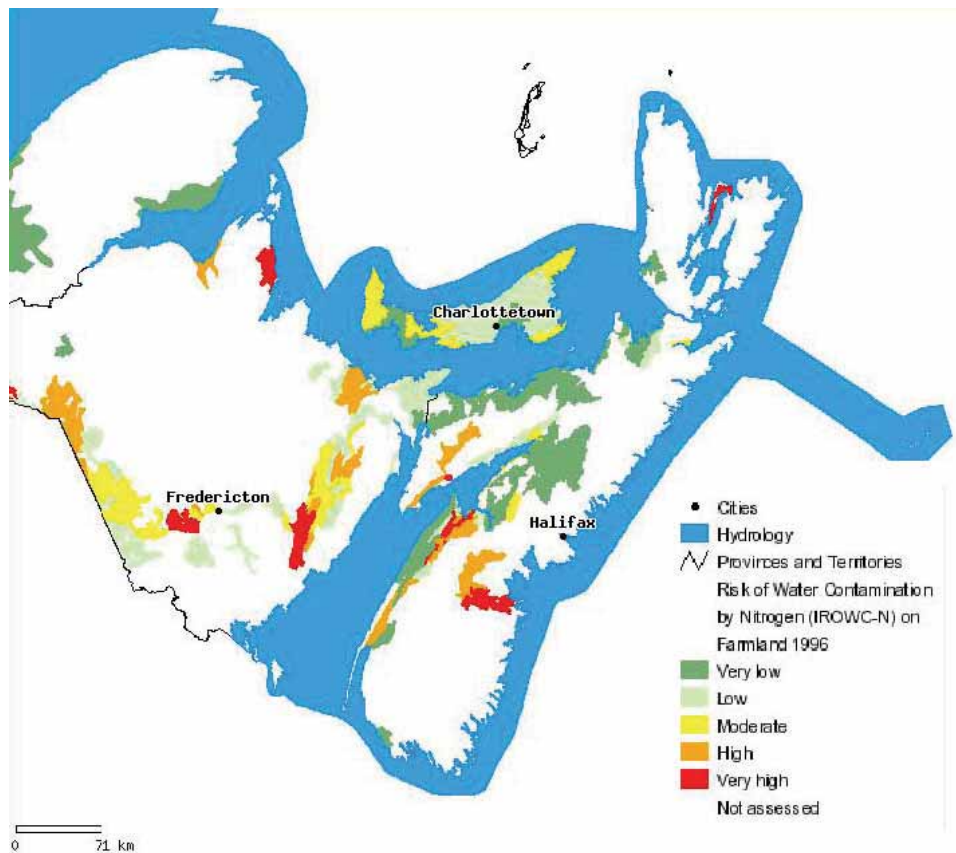


Figure 8.7: Risk of water contamination by nitrogen, calculated in 1996
Source: National Land and Water Information Service, Agriculture and Agri-Food Canada.
nlwis@agr.gc.ca; <http://nlwis-snite1.agr.gc.ca/ind2001/?lang=en-CA>

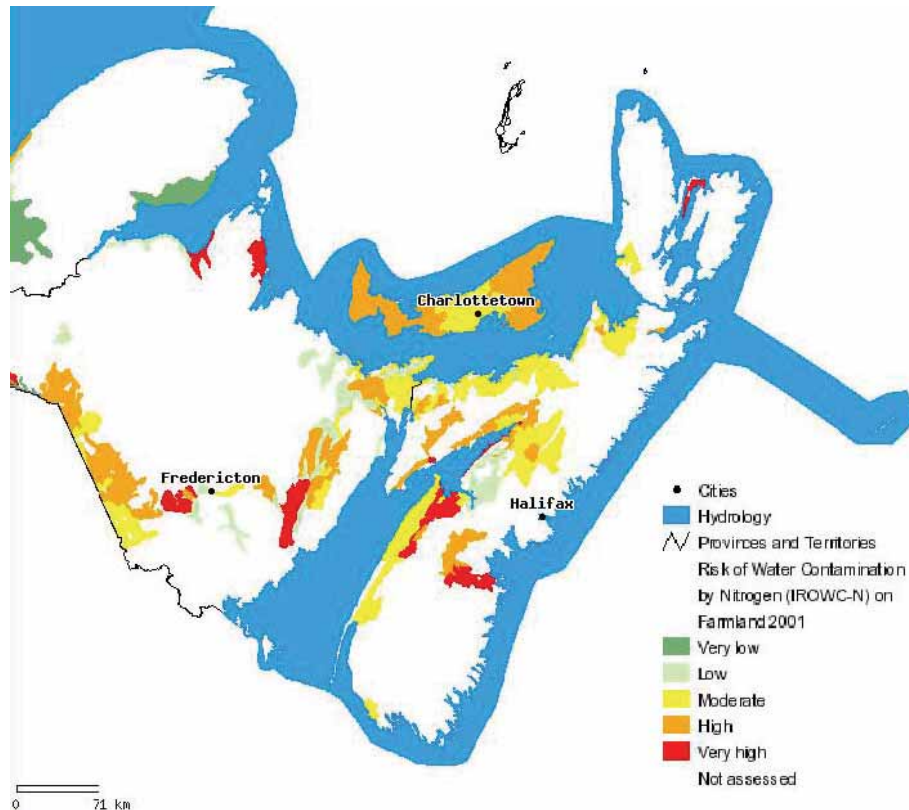
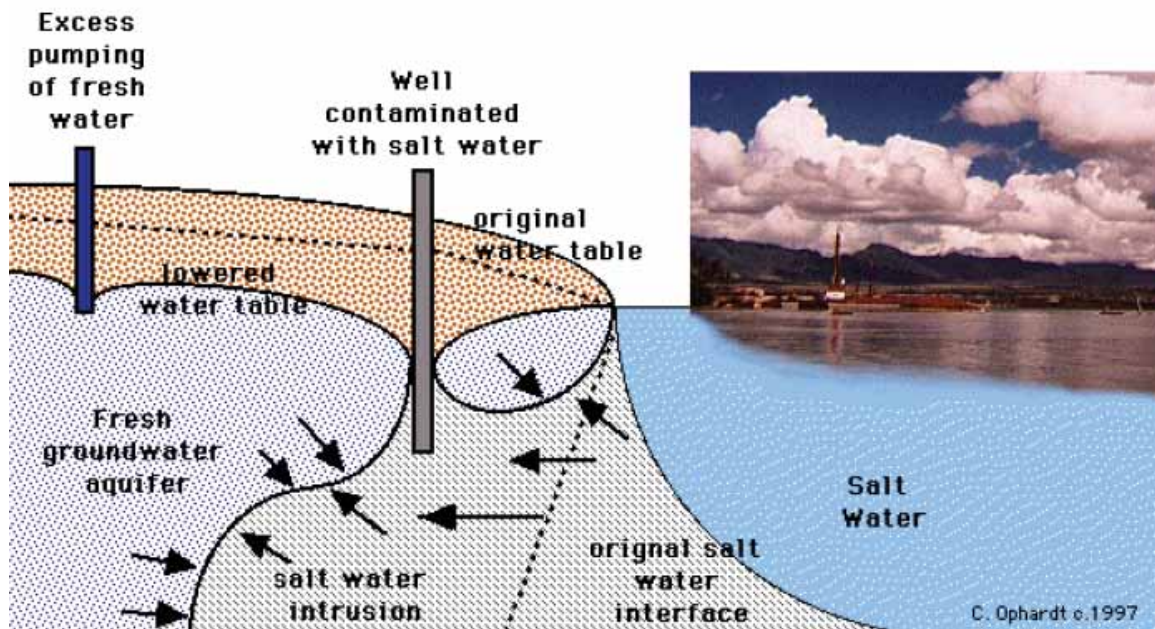


Figure 8.8: Risk of water contamination by nitrogen, calculated in 2001
 Source: National Land and Water Information Service, Agriculture and Agri-Food Canada.
nlwis@agr.gc.ca; <http://nlwis-snite1.agr.gc.ca/ind2001/?lang=en-CA>

8.4.5 Saltwater Intrusion

Climate change, as discussed in Chapter 7, will accelerate a rise in sea level. Two likely consequences are the destruction of coastal wetlands and estuaries, and salt water intrusion into coastal sources of fresh groundwater. Salt water intrusion is of concern in some parts of Nova Scotia. Wells that extract groundwater close to the sea periodically experience salt water intrusion, but if there are either significant changes in the amount of water extracted overtime, or a change in sea level, saltwater intrusion may become a more serious problem (Figure 8.9). There have been no confirmed cases of saltwater intrusion to date in the province, but the issue is being followed in communities, such as Wolfville, that rely on a groundwater wellfield that is located close to the coast (John Drage, Nova Scotia Environment, pers. comm., 2009). Nova Scotia Environment, in collaboration with St. Francis Xavier University, has initiated a provincial study to identify the existence and potential of salt water intrusion.



Saltwater Intrusion

Saltwater intrusion can be a problem in coastal areas where rates of groundwater pumping are high enough to cause sea water to invade freshwater aquifers. The problem can be avoided by appropriate well field design and by drilling relief wells to keep the salt water away from the fresh groundwater source.

Figure 8.9: Saltwater intrusion

8.5 Policies Programs and Initiatives

8.5.1 Legislation

Both federal and provincial governments have jurisdiction to address matters in legislation that have a bearing on coastal water quality. Federally, this includes the *Oceans Act*, the *Fisheries Act* and *CEPA*. Environment Canada, under *CEPA*, can prepare guidance on environmental quality and the management of land-based sources of pollution and DFO can prepare guidance on marine water quality. Provincially the *Environment Act* and the *Water Resources Act* are the most important pieces of legislation, and Nova Scotia Environment is the lead agency with respect to the management and protection of provincial sources of water. Nova Scotia Environment has a drinking water strategy in place and, pursuant to the *Environmental Goals and Sustainable Prosperity Act*, has committed to the preparation of a comprehensive water resource management strategy by 2010.

Legislation and associated regulations have been developed to address and control the many point sources of pollution, e.g., from industrial activities, sewage treatment plants, etc., that exist across the province. Effluent standards related to the quality of the receiving water quality have been established, can be monitored and over time can be made more stringent should circumstances warrant. For non-point pollution, such as contamination embedded in sediments that has originated from agriculture, forestry activities and land development, such regulatory controls are more difficult to define. Effective management techniques for these circumstances include codes of practice, such as the definition and maintenance of buffers adjacent to streams and wetlands embedded in watershed management strategies, and stewardship protocols developed for the agriculture, mining and forestry sectors. The application and

enforcement of such codes and guidelines can in part be addressed through legislation, e.g., as a condition of release from an environmental assessment process, and through education and direction. The key is to encourage landowners and developers to prevent potential contaminants reaching the water resource. Water resource stewardship initiatives along riparian zones are perceived by many involved interest groups to be an effective method to achieve this (Atlantic Planners Institute, 2008).

The province also oversees the approval of septic systems and issues permits for wetland alteration, both of which affect the quality of coastal water. Over 400,000 Nova Scotians, i.e., by far the greatest percentage of the non-urban population, depend on private wells and on site septic systems. To address issues arising from the proliferation of such systems, Nova Scotia Environment has initiated the Environmental Home Assessment Program designed to inform Nova Scotians about the importance of their on-site water wells and septic systems. Such programs combine government subsidies with strategies to increase awareness of the need to maintain the efficiency and effectiveness of such systems by facilitating and developing a culture of self monitoring and self managed. The successful execution of this program will serve to protect the quality of the waters that eventually percolate or flow into coastal waters.

In recognition of shared federal and provincial environmental responsibilities, the CCME is a recognised body comprising environmental ministers from the federal, provincial and territorial governments. They focus on issues, such as water quality, that are national in scope and seek consistency across Canada in how matters, such as standards by which to measure water quality, are determined and administered. Their Environmental Quality Guidelines for water, for example, not only provide the benchmark for regulatory standards nationally, but have been distributed internationally by bodies such as the United Nations Environmental Program and the World Health Organization. Guidelines that are pertinent to the control of coastal water quality in so far as they address matters pertinent to both freshwaters and marine waters include the following:

- Canadian Water Quality Guidelines for the Protection of Aquatic Life;
- Canadian Sediment Quality Guidelines for the Protection of Aquatic Life; and
- Recreational Water Quality Guidelines and Aesthetics.

Municipalities retain regulatory authority over land use planning and development under the *Municipal Government Act*. This legislation enables the municipalities to control the location, type, density and servicing of development, but does not facilitate mechanisms to control the long term management of individual lots, vegetation or the use of chemicals. Such activities by individual land owners can have significant negative impacts on groundwater and on adjacent surface water resources, and consequential adverse impacts can eventually percolate or flow to the coast. It has been argued that improved awareness is more effective than stringent regulations; when land owners understand and assume responsibility for effective stewardship practices, many negative impacts can be minimized. Complementary regulatory and stewardship initiatives may achieve the sustainable development patterns that Nova Scotians seek (Atlantic Planners Institute, 2008).

The province provides direction and guidance to the municipalities in several ways. As referenced in Section 3.4.3.3, there are five statements of provincial interest associated with the *Municipal Government Act*, one which pertains to drinking water and one to flood risk areas. Nova Scotia Environment has also

developed a model sewer use by-law that can be utilized by municipalities to control the materials that are discharged to their respective sewer systems. The cities of Halifax and Sydney, the Village of New Minas, the Towns of Mulgrave and Yarmouth and the Municipality of the County of Annapolis have sewer use by-laws in place that serve as a mechanism to control contaminants entering the receiving water bodies and ultimately coastal waters.

8.5.2 Water Quality Monitoring

Protection of the quality of water resources requires both the determination of baseline conditions and the long term monitoring of key parameters to determine change over time. Well designed and executed monitoring programs provide the information necessary both to establish baseline conditions and to identify the causes and sources of impairment. The evaluation of predetermined parameters enables trends in water quality and the effectiveness of management measures to be made. It allows the determination to be made as to whether water quality standards are being met.

Monitoring refers to the collection of data about the status of the physical, chemical, and biological characteristics of the environment over time. For the aquatic environment, monitoring generally includes documenting the chemical status of the water column and underlying sediments and the biological status of the marine animals associated with them. Coastal water quality monitoring initiatives are generally designed within the context of a specific protection program to assess ambient conditions in the coastal environment, or in response to an identified problem. The long-term collection and evaluation of data can help to identify historical trends in the status of water quality in a specific coastal area. Such monitoring is important to the success of regulatory programs and informs government departments, resource users and the public about the health of the area being monitored.

There are several government and community based coastal monitoring programs in place around the province; many involve collaborative arrangements among different parties and interests. Some, such as the Agriculture and Agri-Foods Canada program, address land-based point sources of contaminants, others more broadly monitor the coastal environment in a specific area and yet others are focussed on a specific geographical area. A brief overview of some of these programs is presented in the sections that follow.

8.5.2.1 NATIONAL AGRI-ENVIRONMENTAL HEALTH ANALYSIS AND REPORTING PROGRAM

This is a multi-year water quality monitoring initiative undertaken by Health Canada and Agriculture and Agri-Foods Canada (Edge and Schaefer, 2006). The initiative focuses on a number of key agri-environmental indicators to measure the environmental effects of agriculture in six thematic areas including water quality. Research began in 1993 and an initial report was published in 2000 followed by a second in 2005. Only the potential *risk* of water contamination by nitrogen and phosphorus were evaluated for agricultural regions across the county. In Nova Scotia the risk assessment was primarily limited to the drainages of the Bay of Fundy, some areas along the Northumberland Strait and the LaHave River watershed. Future monitoring is expected to assess the potential for pathogen and pesticide impacts to water quality.

8.5.2.2 ATLANTIC ZONE MONITORING PROGRAM

The Atlantic Zone Monitoring Program (AZMP), administered by DFO, was initiated in 1998 with the aim of collecting and analysing biological, chemical and physical field data to support the sound development of ocean activities. Its sampling strategy includes: seasonal and opportunistic sampling along “sections” to quantify the oceanographic variability in the northwest Atlantic Shelf Region; higher frequency temporal sampling at more accessible fixed sites; fish survey and remote sensing sampling to provide broader spatial coverage, and data from other existing monitoring programs to compliment the findings of AZMP. The program is not specifically designed to focus on the state of the coastal waters, but its findings contribute to the overall marine knowledge base in the region.

8.5.2.3 CANADIAN SHELLFISH SANITATION PROGRAM

The Canadian Shellfish Sanitation Program (CSSP) is a program run collaboratively by Environment Canada, DFO and the Canadian Food Inspection Agency (Fisheries and Oceans Canada, 2005). Each of the departments has a specific role in the execution of the program: Environment Canada monitors the water quality for bacterial levels; the Canadian Food Inspection Agency monitors for toxin levels in shellfish and DFO is responsible for administration of the closures and openings of shellfish harvesting areas.

8.5.2.4 NOVA SCOTIA FISHERIES AND AQUACULTURE ENVIRONMENTAL MONITORING PROGRAM

Initiated in the fall of 2003, this is the first time that a comprehensive environmental monitoring program has been carried out for the aquaculture industry in Nova Scotia. Using the most current sampling techniques, monitoring is conducted on both aquacultural leases and at reference stations and involves the collection of both qualitative (video) and quantitative data (sediment and water quality data) from coastal areas throughout the province (Figure 8.10).



Figure 8.10: Nova Scotia Fisheries and Aquaculture Environmental Monitoring Program Sampling Locations

8.5.2.5 ATLANTIC COASTAL ACTION PROGRAM

The ACAP program was started in 1991 to address deteriorating coastal environments in Atlantic Canada. Each established organization undertakes programs, including studies and initiatives, to improve the coastal environment in their own area. They work to identify causes of contamination and to determine effective ways to ameliorate identified problems. There are four ACAP sites in Nova Scotia:

- Clean Annapolis River Project (CARP);
- Bluenose Coastal Action Foundation (BCAF);
- Pictou Harbour Environmental Protection Project; and
- ACAP Cape Breton.

Each of these ACAP groups has completed water related studies within their coastal communities, and in the watersheds that influence the quality of the coastal waters. For example, both CARP and BCAF have done extensive work within the Annapolis River and its watershed and the LaHave River and Mushamush River watersheds respectfully. In all ACAPs, research, education and action are pursued to address and enhance coastal water quality.

8.5.2.6 COMMUNITY AQUATIC MONITORING PROGRAM

Run by the DFO Gulf Region since its inception in 2003, the Community Aquatic Monitoring Program (CAMP) program offers guidance and protocols to community-based groups to enable them to monitor the health and productivity of their watersheds and estuaries in the southern Gulf of St. Lawrence. The actual collection of samples is carried out by the membership of local NGOs, and the information gained provides all parties with the baseline data necessary to assess changes in the aquatic environment, helps to identify the causes of change and seeks appropriate remediation. There are four CAMP locations in Nova Scotia, River Philip-Pugwash, Pictou, Antigonish and Mabou and, at each location, there are six sites sampled in accordance with the protocols provided by DFO.

8.5.2.7 MONITORING IN HALIFAX HARBOUR AND BEDFORD BASIN

Over the past two decades several programs have been undertaken to monitor the waters of Halifax Harbour and the Bedford Basin. Two important ongoing programs are the Halifax Harbour Water Quality Monitoring Program and the Bedford Basin Plankton Monitoring Program. The former was started in 2004 to monitor changes within Halifax Harbour resulting from the construction of wastewater treatment plants by HRM for the Harbour Solutions Project. The program is scheduled to run until at least 2009, at which point all three of the new Harbour Solutions sewage treatment plants will be built and operating (Halifax Regional Municipality, 2009)

The Bedford Basin Plankton Monitoring Program has been in place since 1991, monitoring the quality of the plankton environment in the Bedford Basin. This program includes the collection of data for parameters including nitrate, ammonia, chlorophyll *a*, temperature and dissolved oxygen as well as data related to plankton communities.

Mabou Harbour Stewardship Plan

Community groups can provide critical local input and assistance to government in making water resource management decisions. Many voluntary groups have been complementing the activities of government agencies for years by contributing significantly to monitoring water quality, promoting stewardship initiatives and providing education to the community. The value of this kind of partnership should be recognized to ensure its continuing effectiveness.

The Mabou Harbour Stewardship Plan is a two-year planning project that aims to address water, coastal and aquatic resource issues in the Mabou Harbour Watershed. The main goals of the plan is to ensure that a clean water supply and a healthy watershed are present for the benefit of all users (including the agricultural, fishing and forestry sectors, residential users and wildlife). This will be achieved by working together as a community to find positive and constructive means to maintain a healthy watershed, and a sustainable community within it.

(Source: <http://mabouwatershed.com/>)

8.5.2.8 MONITORING OF THE BRAS D'OR LAKES

In Cape Breton the Bras d'Or Lakes are recognised as a unique open water ecosystem within the province. Several initiatives have been undertaken to collect information to better understand this system from a scientific perspective and to monitor changes that are occurring within it. There are several fundamental issues being addressed, including the status of the fishery in the lakes, the quality of the water and issues associated with sewage handling. The Unama'ki Institute of Natural Resources at Eskasoni is playing a lead role in these initiatives. As part of the Bras d'Or Collaborative Environmental Planning Initiative, a shellfish monitoring program in the lakes has been undertaken and a report prepared on the state of the water quality (Unama'ki Institute of Natural Resources, 2007). The quality indicators discussed in this report include bacteria levels, biological health, chemical contaminants and sedimentation. Another important initiative is that undertaken by the Pitu'paq Committee to seek answers to effective sewage management in and around the lakes with respect to sewage treatment plants, on-site sewage disposal systems and boating.

8.5.2.9 VALUE OF RELATED DATA

There are other monitoring programs that compile data on specific areas, topics or programs. The pulp and paper environmental effects monitoring program, directed by Environment Canada, assesses the effects of mill discharges on fish and fish habitat, and the Sydney Tar Ponds Agency is monitoring the remediation of Sydney Tar Ponds and Coke Oven sites in Sydney. These examples represent some of the many monitoring initiatives being executed by agencies that are generating data on the myriad of parameters related to water quality. The design of comprehensive monitoring programs are, however, challenged by the length of the coastline and the limited financial and personnel resources available to monitor all areas and elements that need to be watched. As many parties participate in the monitoring of coastal water quality, there is also an inevitable inconsistency in the form the monitoring takes and problems related to information access and sharing. There is an immediate value of the data to the party collecting it, but that value would be substantially enhanced if the resultant materials could be more readily shared.

One potential solution would be the preparation and maintenance of an inventory of the major coastal water quality monitoring programs so that the information collected could be more readily available to environmental managers, regulators, educators, citizen groups and the general public. The State of California, for example, has prepared the California Coastal Water Quality Monitoring Inventory

(<http://www.sfei.org/camp/>) to address this issue; the site may serve as a guide to work at providing a central point for all organizations to come together and collaborate with the available information.

8.6 Sustainability Issues/ Key Points

Coastal water quality varies considerably by location. Factors impacting the quality of coastal waters include human activities such as agriculture, urban development and point sources of pollution such as sewage discharges, failing septic tanks and industrial discharges. Data from the CSSP indicates a trend towards declining water quality associated with areas of traditional shellfish harvesting; this perhaps reflects an overall trend with respect to coastal water quality.

The coastal environment is important for ecological, economic and social reasons, and all uses that depend on the quality of the marine water quality will be adversely impacted if the quality of that water deteriorates. Local communities need to work with all levels of government and other resource users to define water quality objectives and to identify those activities that are most valued within their areas. Out of this collaboration can come effective management plans and coordinated efforts to improve the quality and enjoyment of the coastal environment.

Key issues of concern with respect to the maintenance and enhancement of coastal water quality through the implementation of regulatory standards and community involvement include:

- Effective control of point sources of pollution;
- Application of effective integrated watershed management;
- Insufficient resources, i.e., personnel and finance, to administer existing regulations and ensure compliance;
- Fragmentation of monitoring results, i.e., data exist in a variety of forms, but are not readily accessible and are not necessarily consistent;
- Little consideration given to the economic cost of poor water quality; and
- Challenges associated with non-point sources of pollution that are particularly difficult to identify, quantify, control and manage.

Data Gaps

- Lack of information and data on the presence and frequency of contaminants in coastal waters;
- Lack of information and data on the cumulative impacts of multiple contaminants that are present in discharges to coastal environments especially estuaries and high productive areas, including additive and synergistic toxic effects; and
- Availability of long-term data from many of the existing monitoring programs.

Additional Limitations

- Lack of a dedicated government body or agency to oversee or inventory coastal water quality monitoring programs in Nova Scotia;
- Lack of coordination between government departments at all levels for water quality monitoring programs, especially between land based and coastal environment monitoring programs;
- Lack of water quality goals for various areas based on levels of land and marine development to aid in developing management objectives and goals; and
- Changes in the water quality monitoring sampling procedures and analysis methods, especially when trending data over periods of time, lead to variations in long-term trend analysis.

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9.1 Introduction

Thirteen ecosystems have been identified in Nova Scotia including: rocky shore; boulder/cobble shore; sandy shore; dune system; coastal forest; coastal barrens; estuaries; mud flats; coastal fresh water wetlands; tidal marsh; dykelands; coastal islands, and open water (rivers, streams, lakes and ponds) (Figure 9.1). Each has habitat features that are important for a range of flora and fauna. There are 47 primary watersheds and associated estuaries in the province that provide aquatic habitat for diadromous, freshwater and marine species (Fisheries and Oceans Canada, 2006). Benthic (ocean bottom) communities are to be found in the near shore ecosystems; these ecosystems often lie adjacent to each other reflecting the geology, coastal dynamics and meso-climate of Nova Scotia’s provincial eco-regions (see Chapter 3). Numerous habitats for flora and fauna occupy these ecosystems, making Nova Scotia’s shores a biologically rich asset that the province strives to protect and preserve (Davis and Browne, 1997).

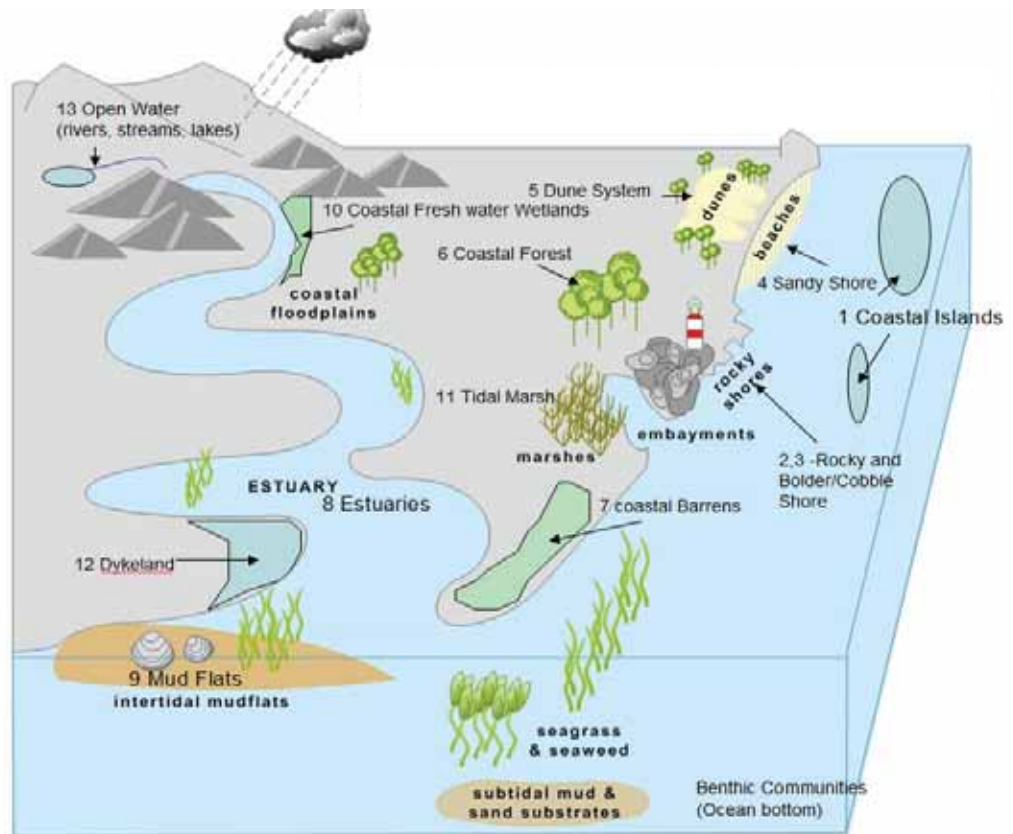


Figure 9.1: Thirteen coastal ecosystems of Nova Scotia

Each ecosystem is sensitive to different anthropogenic pressures and threats. A brief description of these ecosystems and the habitats within them and a summary of the programs, policies and initiatives that have been developed to manage and protect them are presented in the sections that follow. For the purposes of this report, the 13 ecosystems have been aggregated under eight main headings to facilitate discussion and avoid redundancy. In some cases, stand alone data describing the abundance, distribution, and present state of each ecosystem are not available or must be inferred from other reasonably similar datasets.

Nevertheless, where possible, the ecosystems have been mapped to show their general distribution around the coast of Nova Scotia.

Wherever possible, databases maintained by government departments are referenced as authoritative sources for describing the spatial distribution of the described ecosystems and habitats. Although some of the nomenclature used to describe the habitats and ecosystems identified within these databases differs slightly from that used in Davis and Browne (1997), there is, in most cases, a high level of agreement. The databases used included the following:

- NSDNR Forest Cover GIS Database: this database provides detailed land cover information at 1:10,000 scale for the entire province, including tidal areas;
- NSDNR Significant Habitat GIS Database: this database provides location information pertaining to critical habitat for various species of conservation concern, including unique or uncommon habitats;
- NSDNR Wetlands Inventory GIS Database: this database provides location information at 1:10,000 scale for all documented freshwater and saltwater wetlands in Nova Scotia; and
- NSDNR Restricted and Limited Land Use Database: this database provides location information for various designated areas, political and natural boundaries; most notably, this dataset includes protected and managed areas such as national parks, wilderness protected areas, protected beaches and other conservation and natural resource related boundaries.

Extraction of data from these datasets was based on a 2 km buffer from the 1:10,000 scale coastline (Nova Scotia Topographic Database, 2008) of Nova Scotia, and spatial calculations for protected areas are based on those areas falling wholly or partially within this 2 km buffer.

9.2 Policy, Programs and Initiatives

9.2.1 Legislation and Policy

As detailed in Appendix 3, the Nova Scotia coast is protected by both federal and provincial legislation, policies and designations. Habitat, flora, fauna and birds are protected through the provisions of the *SARA*, the *Migratory Birds Convention Act*, the *Fisheries Act*, the *Provincial Parks Act*, the *Wildlife Act*, the *CEPA*, the *CEAA*, the *Beaches and Foreshores Act* and the *Off Highway Vehicles Act*. Some islands like Pearl Island and Ship Rock Island are protected by the *Wilderness Areas Protection Act* and the *Special Places Protection Act*. These acts are also used to protect other ecological features such as Haunted Bog in Queens County and Long Lake in Lunenburg County. Shorelines are protected from unregulated harbour development by the *Fishing and Recreational Harbours Act*.

Except for federal land, the provincial government has primary jurisdiction over the land and land use of the coastal zone. NSDNR, Nova Scotia Environment and NSDFA review and issue permits for most of the ‘reviewable’ activities that impact coastal land and water. Nova Scotia Environment’s Protected Areas Branch administers Nova Scotia’s wilderness areas, nature reserves and nationally designated heritage rivers. NSDNR manages provincial Crown land, provincial parks and game and wildlife sanctuaries, as well as the 92 protected beaches in the province. NSDFA manages dykelands and, together with private landowners, is responsible for protecting these lands and associated infrastructure and adapting to climate change and sea level rise.

A stated intent of the *Environmental Goals and Sustainable Prosperity Act* is “international leadership by having one of the cleanest and most sustainable environments in the world by the year 2020”. This Act also sets a goal of protecting 12% of the province’s landmass by 2015. Except for the development of a no net loss of wetlands policy, the marine or coastal environment is not specifically addressed.

Municipal governments, under the *Municipal Government Act*, have powers to develop and regulate land use plans, which can significantly affect coastal management including the management and protection of floodplains, estuaries and mud flats. Nova Scotia Environment oversees the approval of septic systems and issues permits for wetland alterations; the latter has particular relevance because effluent releases into estuaries and onto mudflats are among the primary causes of closure for beaches and shellfish harvesting. The future health of coastal ecosystems is dependent in large measure on effective land use planning by municipal authorities and the execution of parallel responsibilities by the provincial government.

9.2.2 Coastal Protected and Managed Areas

Currently the main conservation mechanisms to protect sensitive ecosystems and habitats is the designation, both federally and provincially, of protected areas and parks. Several protected areas have been established to conserve specific ecosystems and protect wildlife (see Figure 3.9 and Appendix 3). The current area of land protected in Nova Scotia is 8.2% or 452,581 ha (with existing commitments for a further 0.5% or 33,552 ha, (Nova Scotia Environment, 2008)). There are two national parks in the province covering a total of 135,400 ha. In addition, there are another 172 protected area sites covering 302,018 ha, which include 31 wilderness protected areas designated between 1998 and the present, 64 recreation sites, 11 nature reserves and approximately 16,200 ha of private land that has been donated for conservation (Nova Scotia Nature Trust, 2008). Table 9.1 summarizes the areas protected and managed under different designations; a full listing of the sites involved is provided in Appendix 3, Table A3.3.

Table 9-1: Summary: federally and provincially protected and managed land areas

<i>Category</i>	<i>No. of Areas Involved</i>	<i>Area Covered (ha)</i>
Provincial Wilderness Protected Areas	10	86,421
National Parks and Adjuncts	2	96,870
Provincial Parks	70	11,785
Provincial Wildlife Management Areas	9	20,585
Federal Wildlife Management Areas	6	2,397
Federal Migratory Bird Sanctuaries	7	5,000
Total		233,058

Source: NSDNR RLUL Database

Nova Scotia is also home to two UNESCO world heritage sites, Old Town Lunenburg and Joggins Fossil Cliffs. The Lunenburg site was designated for historic anthropogenic features and is not protected or considered pristine habitat. Joggins Fossil Cliffs is a 689 ha palaeontological site encompassing 14.7 km of sea cliffs. This protected area was recently expanded to include areas 500 m seaward of the mean high water mark. The area surrounding Grand Pre in Kings County is currently an area of interest for UNESCO designation (Canadian Broadcasting Corporation, 2009).

Under the *Oceans Act*, Canada is required to identify MPAs to protect fauna and flora in oceans, coastal areas and estuaries. Thus far seven MPAs have been designated across Canada. The Gully MPA, 200 km offshore of Nova Scotia, is the only such designation in the vicinity of Nova Scotia. Over the next five years, it is anticipated that six new MPAs will be designated by DFO across Canada. DFO in partnership with NSDNR and Nova Scotia Environment, is currently in the planning stages for a MPA on the Eastern Scotian Shelf (Gromack, 2008). At this stage it is not known whether this will be coastal or not.

Although Parks Canada administers the National Marine Conservation Areas and Environment Canada designates Marine Wildlife Areas as part of a national network of MPAs, there are no such areas in Nova Scotia. Parks Canada, however, is currently examining areas of interest in the Bay of Fundy Region (Gromack, 2008).

Under the *Migratory Birds Convention Act* there are seven designated migratory bird sanctuaries (MBS) in coastal Nova Scotia. This includes Sable Island, about 290 km offshore of Nova Scotia; the island is also being considered for designation as a national wildlife area which would afford it greater protection (Gromack, 2008).

Nova Scotia Environment creates and manages protected areas pursuant to the *Wilderness Areas Protection Act* and the *Special Places Protection Act*. There are also several federal and provincial wildlife management areas, legislated under the *Canada Wildlife Act* (1989) and *Nova Scotia Wildlife Act* (1989) respectively, and a number of federally managed lands that protect various elements of the coastal ecosystems, including wildlife and wetlands. MPAs are areas that are legally designated to provide long-term protection of marine ecosystems, processes, habitats, and species. None of these protected areas are MPAs, although they do protect coastal ecosystems to varying degrees.

9.3 Coastal Islands

9.3.1 Current Status

Nova Scotia has nearly 5,500 islands of various sizes off its coast (Table 9.2). For many species these islands are sanctuaries from predators and provide ideal nesting grounds for shorebirds, particularly on their leeward sides. By their nature, islands can provide protection against fire, disease and pests, which in turn, may result in relatively high biodiversity. Islands are, in many cases, also refuges for species that are sensitive to human disturbance, which makes them valuable areas for conservation and academic research.

Table 9-2: Number of islands off the coast of Nova Scotia by size

<i>Size of Island</i>	<i>Number of Islands</i>
<i><.1 hectare</i>	2,498
<i>.1 - 1 hectare</i>	1,895
<i>1 - 10 hectares</i>	769
<i>10 - 100 hectares</i>	275
<i>100 – 1,000 hectares</i>	44
<i>> 1,000 hectares not including Cape Breton Island or Boularderie island</i>	9
Total	5,490

Data obtained from Wayne H. Burt, Nova Scotia Department of Natural Resources, Graphic and Mapping Services (includes: coastal river islands and other features that have a measurable area of coastline - does not include Cape Breton or Boularderie Islands).

There is little information available on the fauna and flora of Nova Scotia’s islands, and few studies have been undertaken to inventory the biota of the islands. Notable exceptions include islands like Sable, Scatarie, Cape Sable, Oak Island, Boularderie, Pictou and McNabs. Some of the more exhaustive inventories compiled have been under the auspices of the *Wilderness Areas Protection Act*.

9.3.2 Threats and Impacts

The two major threats to island ecosystems are sea level rise and development. Sea level rise has been described in detail in Chapter 7. It is likely that many islands will be impacted to some degree by future sea level rise. The extent of this impact is largely undetermined, but is currently being investigated and modelled by researchers.

The development of islands as resort destinations, or the development of residential properties or other uses, e.g., wind farms, on islands are other possible threats to the integrity of their ecosystems. Interest in coastal real estate has increased in recent years, and a growing number of islands have been purchased privately. Protected area legislation and other related programs, such as those implemented by Nova Scotia Environment, NSDNR and the NS Nature Trust, can be effective methods of limiting the impact of such development within these ecologically significant areas. Where development does occur, municipal



Nova Scotia Islands Photo by Department of Natural Resources (cited from Nova Scotia Nature Trust, <http://www.nsnt.ca/ourwork/campaigns/coast/>)

Islands like Great Island and Selig Island shown in this picture can be protected from development through the work and generous donations of dedicated individuals. Bill Zimmerman and Susan Hauer are the owners of these two islands. Through the work of organizations like the Nature Trust, permanent conservation agreements can be put in place to protect such islands. Great Island will be one of the largest coastal islands to be protected in Nova Scotia. Together, Selig and Great Islands are home to salt marshes, tidal flats and rugged rocky shore. They are also in proximity to important nesting habitat for the endangered piping plover. The preservation of these islands represent a tremendous step forward in the preservation of Nova Scotia’s coastal legacy.

zoning by-laws can place further onus on developers to proceed responsibly, thus better protecting the natural attributes of the islands.

9.3.3 Protection Status

A small number of islands are formally protected under the provincial Protected Wilderness Areas Program. These include Scatarie Island, Hay Island, just offshore of Scatarie Island, and Dover Island. In the Cape Breton Highlands National Park, there are several very small unnamed islands off the eastern coast, as well as a number of islands in the Cheticamp River estuary, on the west coast, that are protected. Provincial parks (under the *Provincial Parks Act*) also serve to protect several island ecosystems, e.g., McNabs-Lawlor Islands in Halifax Harbour. Summary statistics are provided in Table 9.3.

Table 9-3: Numbers and sizes of protected islands off the coast of Nova Scotia

	<i>Coastal Protected Area</i>	<i>Island</i>	<i>Size (ha)</i>
Provincial Wilderness Areas	Scatarie Island	Scatarie Island	1,502.4
		Hay Island	12.1
	Canso Coastal Barrens	Dover Island	94.4
	TOTAL		1,608.9 ha
National Parks and Adjuncts	Kejimikujik Seaside Adjunct	5 Unnamed	3.8
	Cape Breton Highlands National Park of Canada	15 Unnamed	8.8
	TOTAL		12.6 ha
Provincial Parks	Cape Chignecto	1 Unnamed	0.1
	Cole Harbour - Lawrencetown	1 Unnamed	0.3
	McNabs - Lawlor Islands	McNabs Island	372
		Lawlor Island	58
	Caribou – Munroes Island	Munroe’s Island	134.5
	Five Islands	Moose Island	77.5
	Graves Island	Graves Island	46.5
	West Mabou Beach	2 Unnamed	2.1
	Taylor Head	1 Unnamed	0.05
	Boylston	Priest Island	3.4
TOTAL		694.5 ha	
All Protected Areas TOTAL			1751.5 ha

There are also 10 small islands, totaling 3.7 ha in land area, that fall within the boundaries of the Port Hebert and Sable River migratory bird sanctuaries on the south shore of Nova Scotia.

9.4 Rocky, Boulder and Cobble Shores

9.4.1 Current Status

The rocky, boulder and cobble shore ecosystem is ubiquitous along all shores of Nova Scotia and provides habitat for many species of flora and fauna. Rockweed (*Ascophyllum nodosum*), bladderwrack (*Fucus vesiculosus*) and kelp (*Laminaria digitata*) grow prolifically, contributing to a highly productive ecosystem and creating complex habitats for other marine species. In some areas, rock-boring bivalves such as American piddock (*Petricola pholadiformis*), oval piddock (*Zirphaea crispate*) and Atlantic mud-piddock (*Barnea truncate*) create habitat for species such as snails, various bivalves and crabs.

Due to their productivity, these ecosystems provide habitat for many marine bird breeding colonies (McCullough *et al.*, 2005), which feed upon the rich assortment of marine invertebrates found in the intertidal zone. Terrestrial species also frequently access the rocky shore habitat at low tide to feed (Davis and Browne, 1997). Examples of such high productivity systems are found in St. Margaret's Bay, at the mouth of the St. Mary's River, along the Atlantic coast to the east of Halifax and along the rocky shores of the Northumberland Strait.

In many places along the Atlantic coast, these rocky, boulder and cobble shores provide critical barriers that protect the inland ecosystems from the high energy of coastal wave action; they provide erosion control and shelter many coastal communities (Costanza, 1997). These shores also have a strong aesthetic appeal and are appreciated by thousands of tourists and local residents for their rugged beauty.

9.4.2 Threats and Impacts

The principal threats to these rocky shore ecosystems include human disturbance through tourism, and residential and industrial development. Such activities, if not appropriately managed, can disrupt their ecological function. For example, marine plants such as rockweed (*Ascophyllum nodosum*) and Irish Moss (*Chondrus crispus*) have been commercially harvested from rocky intertidal zones for the past 50 years, but if not managed by the federal and provincial governments, the harvest could have negative impacts on the ecosystem. Recreational activities in proximity to water bird and shorebird wintering sites have been shown to lead to poorer quality roosting and foraging habitat (Canadian Parks and Wilderness Society-NS *et al.*, 2008), and coastal eutrophication, as referenced in Section 8.3.4, can lead to toxic algal blooms and decreased algal community diversity. Despite the threats, however, this ecosystem is considered secure overall due to its ubiquity throughout the province.

9.4.3 Protection Status

There has not been an accurate assessment as to the physical extent of protected areas of rocky, boulder and cobble shores. This is due to: the lack of mapping of these ecosystems; the fact that they are not considered unduly sensitive; and to the fact that the boundaries of protected areas are typically restricted to terrestrial areas.

9.5 Sandy Shore and Sand Dunes

9.5.1 Current Status

There are sandy shores throughout the length of the Nova Scotia coast, but the most prominent concentrations are located along the coasts of the Northumberland Strait and the Minas Basin (NSDNR Digital Data, 1998-2008) (Figure 9.2). These shores vary in nature based on the local geology and eco-climates. For instance, those affected by the high energy of the Atlantic Ocean form predominantly storm beaches, while the less energized waters of the Northumberland Strait form beaches, sand flats and sandy shoals.

With an estimated area of 5,520 ha, these ecosystems are well represented in Nova Scotia (NSDNR Digital Data, 1998-2008). Exceptions include areas along the Bay of Fundy and western Cape Breton, where cliffs drop precipitously into the ocean (Figure 9.2). Sand-dune systems occur in the more exposed

coastal areas where there is an adequate sediment supply. Where this occurs, sand is deposited on the upper levels of the beach by both wave and wind action and becomes stabilized by the growth of American beach grass (*Ammophila breviligulata*); such areas are in turn colonized by later successional woody vegetation. New dune ridges are developed successively on the seaward side. The best examples of sand dunes in the province are found along the Northumberland Strait, in Cape Breton and along the Atlantic Coast. Pomquet Beach Provincial Park, Antigonish County, is the best provincial example of a prograding dune system (Owens and Bowen, 1977), where the dune system progresses inland with increasingly diverse and mature vegetative cover (Davis and Browne, 1997).

The biodiversity of both terrestrial plant species and marine algae in these sandy coasts is generally limited, due to the mobility of the substrate, as well as the exposed nature of these environments. In sheltered situations, and above the surf line, biodiversity typically increases toward the landward side (Davis and Browne, 1997).

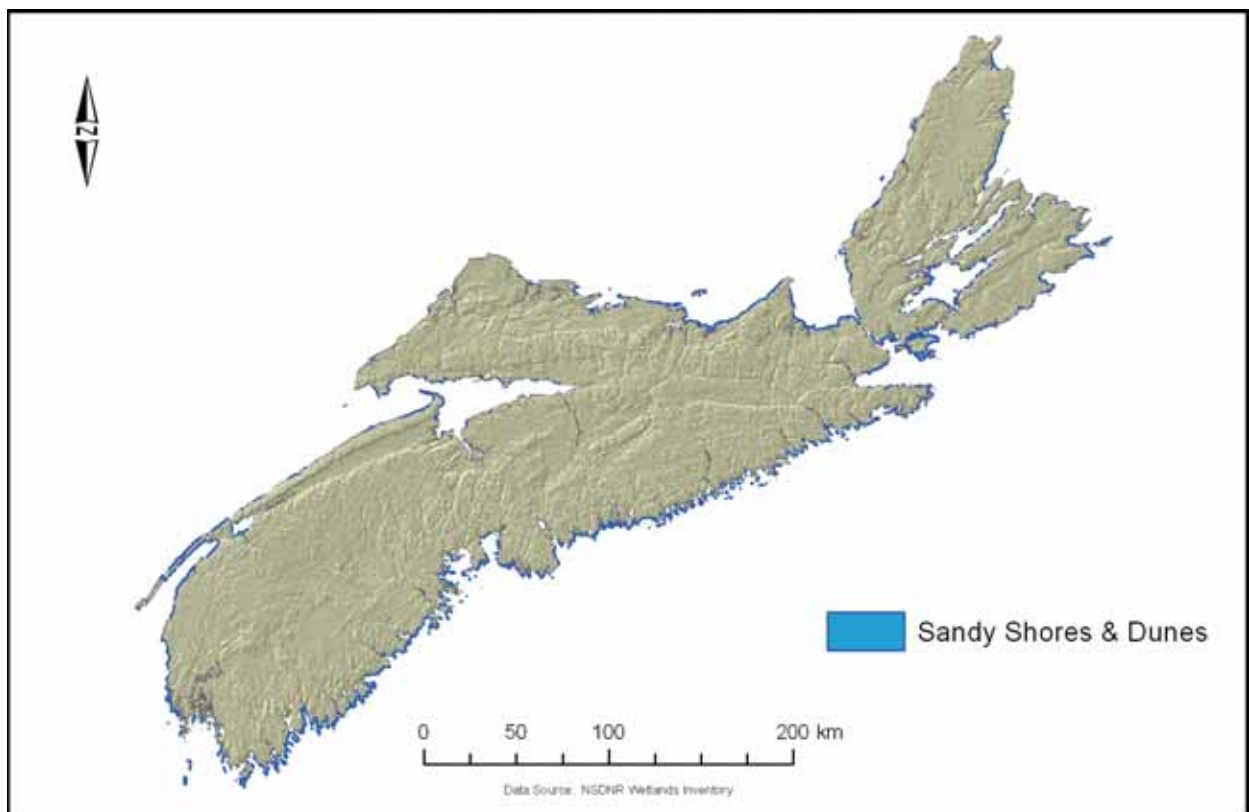


Figure 9.2: Distribution of sandy shores and dunes
Note: Scale exaggerated in order for features to be visible

Coastal sandy shores and sand dunes provide food and habitat to many shore birds and other fauna, flora, microorganisms and crustaceans. Some, such as the Piping Plover, are endangered, and are under threat from human activities, particularly all-terrain vehicle (ATV) use. The previously mentioned dune system at Pomquet is one of the more significant areas of habitat for Piping Plover along the Northumberland Shore (Dietz and Chiasson, 2000). Due to the fact that these environments are also valuable recreation and aesthetic assets, there is a fine balance to be maintained between ecological conservation and recreational use.

9.5.2 Threats and Impacts

Sandy shores, beaches and sand dunes are particularly sensitive to human disturbance. As a result of sand and gravel extraction, the inappropriate placement of roads, buildings and coastal structures and recreational ATV usage, these ecosystems have suffered losses of structure, critical habitat and biodiversity. Such practices, in conjunction with anticipated sea level rise and storm events of greater frequency and severity, will continue to impact vegetative cover and exacerbate erosion processes (Brown and McLachlan, 2002). This in turn may impact the abundance of those endangered species that are critically dependent on this type of ecosystem, such as the Piping Plover (Burger, 1991).

In efforts to protect these naturally dynamic and changing environments, attempts have been made to armour these shorelines with breakwaters, rip-rap and other structures. Such engineered structures in turn change the natural processes of sand transport and, while potentially minimizing erosion at a very localized scale, exacerbate erosion in other areas. Worldwide, changes in natural sand transport commonly result in severe, permanent erosion (Brown and McLachlan, 2002).

9.5.3 Protection Status

There is currently a relatively small area of these ecosystems protected within the system of federal and provincial parks and protected areas (Table 9.4). While the most significant single area harbouring a significant amount of sandy shore and dunes is the Kejimikujik Seaside Adjunct (102.6 ha), provincial parks in total protect 354.2 ha.

Table 9-4: Area of Protected Sandy Shores and Dunes Along the Coast of Nova Scotia

	<i>Coastal Protected Area</i>	<i>Size (ha)</i>
Provincial Wilderness Protected Areas	Canso Coastal Barrens Wilderness Area	1.8
	Gabarus Wilderness Area	73.2
	Polletts Cove-Aspy Fault Wilderness Area	1.1
	Scatarie Island Wilderness Area	14.8
	TOTAL	90.9 ha
National Parks and Adjuncts	Kejimikujik Seaside Adjunct	102.6
	Cape Breton Highlands National Park of Canada	8.4
	TOTAL	121 ha
Provincial Parks	31 provincial parks	
	TOTAL	354.2 ha
	All Protected Areas TOTAL	556.1 ha

There are currently 94 beaches totalling 2,302 ha of land protected by the *Beaches Act* (Nova Scotia Department of Natural Resources RLUL Database, 2008); this affords protection to many areas of sandy shore and dune ecosystems in the province. These protected beaches exist in every county in the province (Figure 9.3). Some fall under multiple designations, i.e., they are also located within the boundaries of national parks or provincial wilderness protected areas.

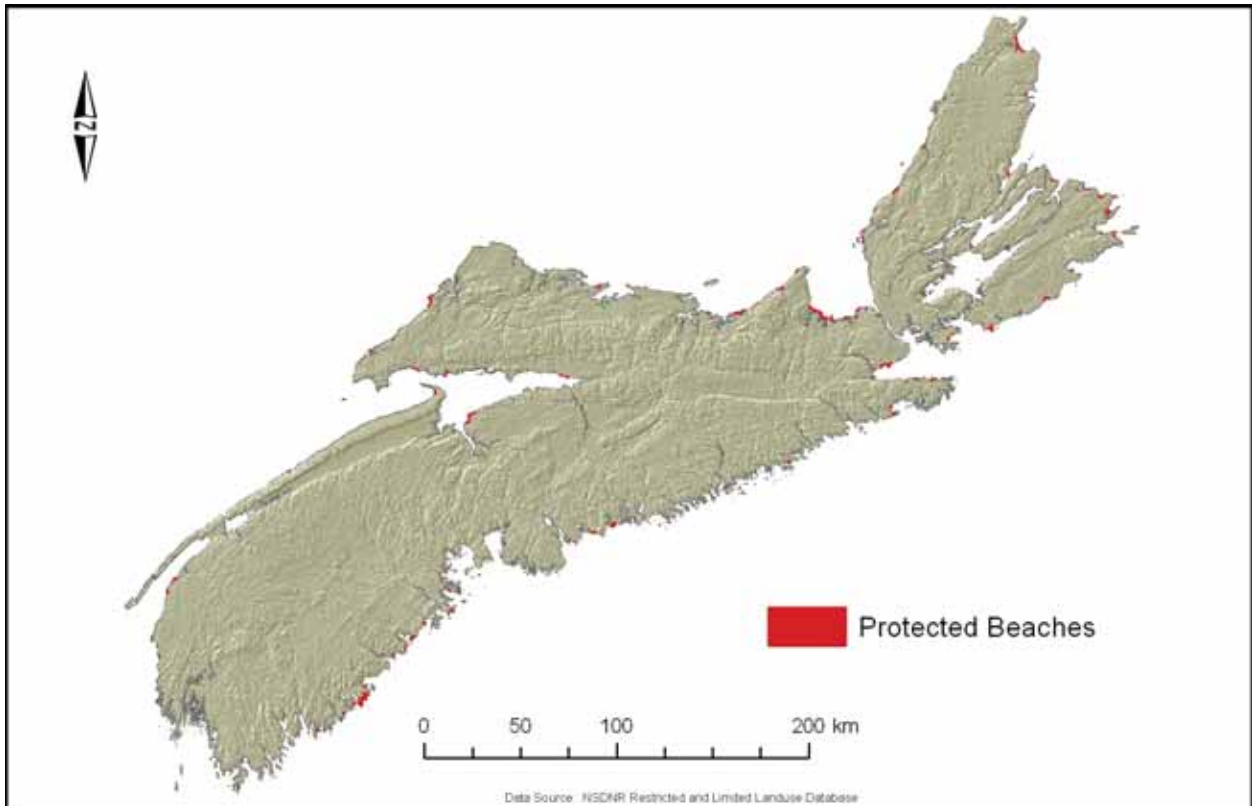


Figure 9.3: Distribution of protected beaches
 Note: Scale exaggerated in order for features to be visible

9.6 Coastal Forest and Coastal Barrens

9.6.1 Current Status

Coastal forests are supported along much of Nova Scotia’s coast. Where growing conditions allow, the climax forest associated with this ecosystem is a mixed-wood forest composed of white spruce, fir, red maple, and white birch. Pure stands of both coniferous and deciduous species, however, are also found. Often the forest immediately adjacent to the coastline is characterized by krummholz, a stunted growth condition found in conifers such as white and black spruce, that results from severe wind exposure and salt spray (Neily *et al.*, 2007). As distance from shorelines increase, tree species generally depart from the krummholz condition to reach their full stature. The breakdown of the forest cover within 2 km of the coastline is presented in Table 9.5.

Table 9-5: Summary of coastal zone forest cover

<i>Forest Type</i>	<i>Area (ha) Within 2 km of Coast</i>	<i>%</i>
Deciduous	57,913 ha	10%
Coniferous	340,479 ha	60%
Mixed	171,444 ha	30%
Total	569,836 ha	100%

Source: NSDNR Forest Inventory, 1998-2008

Coastal barrens, prevalent along the Atlantic shore, are characterized by thin rocky tills, exposed bedrock and often glacial erratics. Generally the shoreline is rocky, but in places it has been swept clear of all sediment and is bordered by a boulder and cobble shore. Classic examples of these ecosystems are the Pennant Barrens, Peggy’s Cove Barrens and the Bonnet Lake Barrens. The distribution of these ecosystems is presented in Figure 9.4; their relative abundance is summarized in Table 9.6.

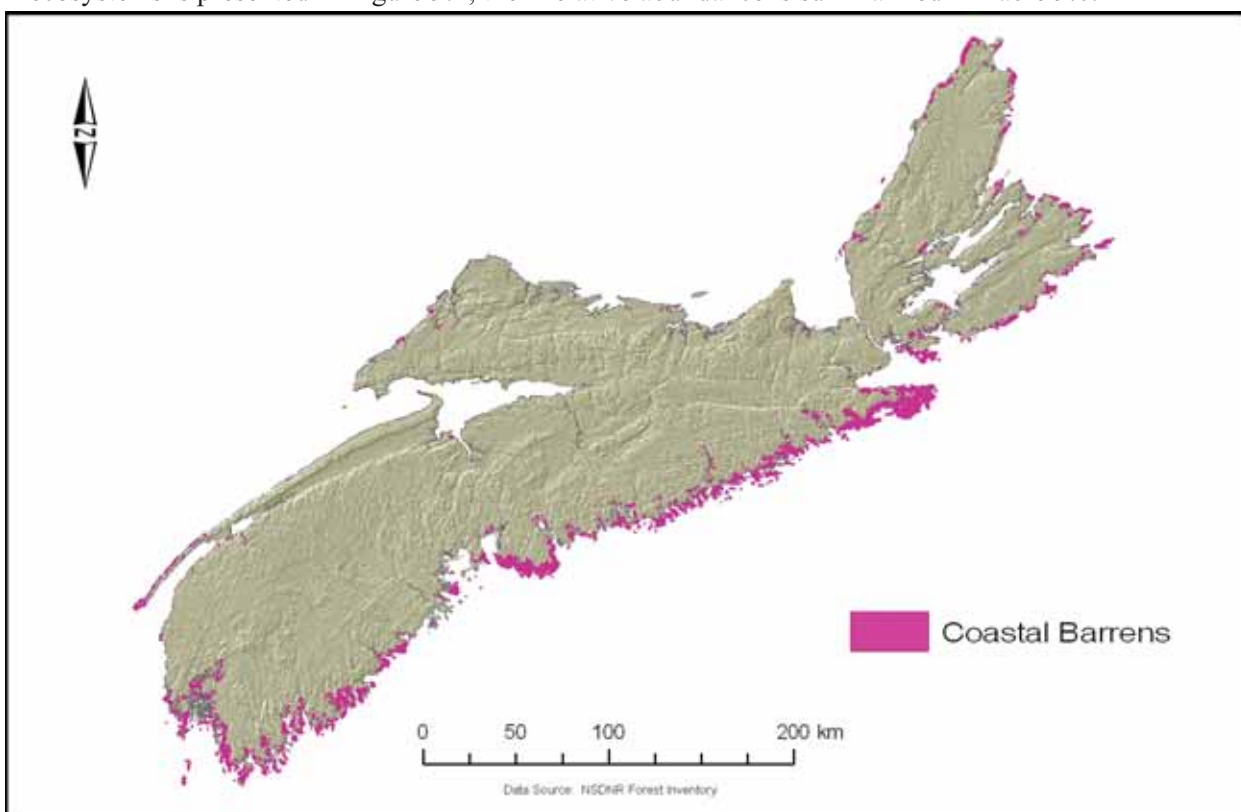


Figure 9.4: Distribution of Coastal Barrens
 Note: Scale exaggerated in order for features to be visible

Table 9-6: Summary of Coastal Barrens and Rock Barrens

	<i>Number</i>		<i>Area (ha)</i>	
	<i>Province Wide</i>	<i>Within 2km of Coast</i>	<i>Province Wide</i>	<i>Within 2km of Coast</i>
Barrens	8,239	2,431	91,573 ha	28,508 ha
Rock Barrens	2,624	1,373	28,625 ha	18,409 ha

Source: NSDNR Forest Inventory, 1998-2008

Ground vegetation associated with the barrens tends to be drought resistant, or acid tolerant ericaceous species, such as broom crowberry (*Corema conradii*), sheep laurel (*Kalmia angustifolia*), blueberry and cranberry (*Vaccinium spp.*). In areas of exposed rock, there tends to be a high incidence of lichens, such as reindeer lichen (*Cladonia spp.*), which are the primary colonizers of these areas. This type of vegetation is essentially self-perpetuating, as it interferes with tree regeneration through competition (Gray, 1956). Many of the barren areas in Nova Scotia have been in existence, largely unchanged, since well before the first detailed land cover surveys conducted in Nova Scotia (Fernow, 1912; Smith, 1802).



Proposed Prospect Coastal Wilderness Area

The Proposed Prospect Coastal Wilderness Area lies on the south coast of the Chebucto Peninsula, between Pennant Point and Peggy's Cove, extending north to Route 333. The total area is approximately 2,250 hectares.

If protected, the Prospect area would connect with and effectively expand the size and integrity of the existing Terence Bay Wilderness Area.

The landscape around the Prospect coastline is composed of spruce forest tapering to stunning granite barrens. Nearly all lands proposed for protected lie in the "Pennant Granite Barrens" natural region.

(Cited from <http://www.publicland.ca/prospect.html>)

The coastal forests and barren lands provide a variety of critical ecological services (Costanza, 1997), including: food and habitat; erosion control; storm protection; water quality protection; nutrient cycling, and carbon sequestration, as well as serving a range of recreational, aesthetic and cultural values. These areas, however, provide little in the way of economic input to the forest industries, as the biomass of merchantable timber on these lands is low (Nova Scotia Department of Natural Resources, 2008b).

9.6.2 Threats and Impacts

Forest harvesting and associated road-building, ATV use and coastal development, all pose threats to the ecological integrity of these ecosystems as they can cause soil compaction, erosion and forest and habitat fragmentation (Canadian Parks and Wilderness Society-NS *et al.*, 2008). It is becoming progressively harder to find large tracts of coastal land that are still in their mature forested state. As a result, taxa that are dependent on contiguous forest cover for their core habitat are impacted.

Barrens, by their very nature, are created and maintained by disturbance, most notably fire. Although this natural disturbance regime has been stifled in recent years by fire suppression, such action seems to have had little effect in the short term. The threats to coastal barrens are predominantly due to human interference in the form of recreational and industrial usage. The main effects are reflected in a decrease in biodiversity, particularly in those areas which are most heavily impacted.

9.6.3 Protection Status

Formal legislation protects some significant areas of coastal forest and barrens in the province. Conservation easements on private land, organized by the Nova Scotia Nature Trust, also serve to protect some of these habitats (Nova Scotia Nature Trust, 2008). Exact figures on the extent of these ecosystems on private land are unavailable.

Several areas, many of which protect significant areas of coastal forest and coastal barrens, have been protected under the *Wilderness Areas Protection Act* or the *Provincial Parks Act* (Tables 9.7 and 9.8). The protection of these areas serves to mitigate some of the human impacts to these ecosystems elsewhere in the province.

Table 9-7: Areas of protected coastal barrens

<i>Category</i>	<i>Coastal Protected Area</i>	<i>Size (ha)</i>
Provincial Wilderness Protected Areas	9 areas	6480.7 ha
National Parks and Adjuncts	Kejimkujik Seaside Adjunct	544.5
	Cape Breton Highlands National Park of Canada	300.9
	Total	845.4 ha
Provincial Parks	11 areas	594.5 ha
	All Protected Areas	7,920.6 ha

Table 9-8: Areas of protected coastal forest by forest cover type

	<i>Coastal Protected Area</i>	<i>Coniferous (ha)</i>	<i>Mixed (ha)</i>	<i>Deciduous (ha)</i>
Provincial Wilderness Protected Areas	10 areas	6828 ha	1615.8 ha	1272.8 ha
National Parks and Adjuncts	Kejimkujik Seaside Adjunct	601.8	136.2	59.9
	Cape Breton Highlands National Park of Canada	3,536.5	2,819.6	981
	Total	4138.3 ha	2955.8 ha	1040.9 ha
Provincial Parks	49 areas	4407.9 ha	2645.4 ha	937.5 ha
	All Protected Areas Total	15374.2 ha	7217 ha	3251.2 ha

Note: In this report, coastal forest is defined as forest which is located within 2 km of the coast.

9.7 Estuaries and Mud Flats

9.7.1 Current Status

There are over 205,488 ha of estuarine flats in the province (Figure 9.5) making them the most extensive type of coastal habitat (McCullough *et al.*, 2005). Estuaries are located at the mouths of rivers where seawater becomes diluted by fresh water draining from the land (see Figure 3.1, Section 3.1). Mud flats form from the deposition of mud and sandy mud in the sheltered tidal water in areas where there is a large sediment supply and are exposed between the extreme-high-tide and extreme low-tide marks (Davis and Browne, 1997). Mud flats and estuaries are often coincident, and are frequently associated with saltmarshes. Estuaries and mud flats are among the most productive ecosystems, comparable to rainforests and coral reefs, partly because they tend to be shallow, receive a continued supply of nutrients from the rivers and are mixed by the tidal movements of the sea. These trapped sediments and nutrients in turn support a rich assortment of terrestrial and aquatic species of plants, algae, birds, fish, invertebrates and micro-organisms, whether directly or indirectly.

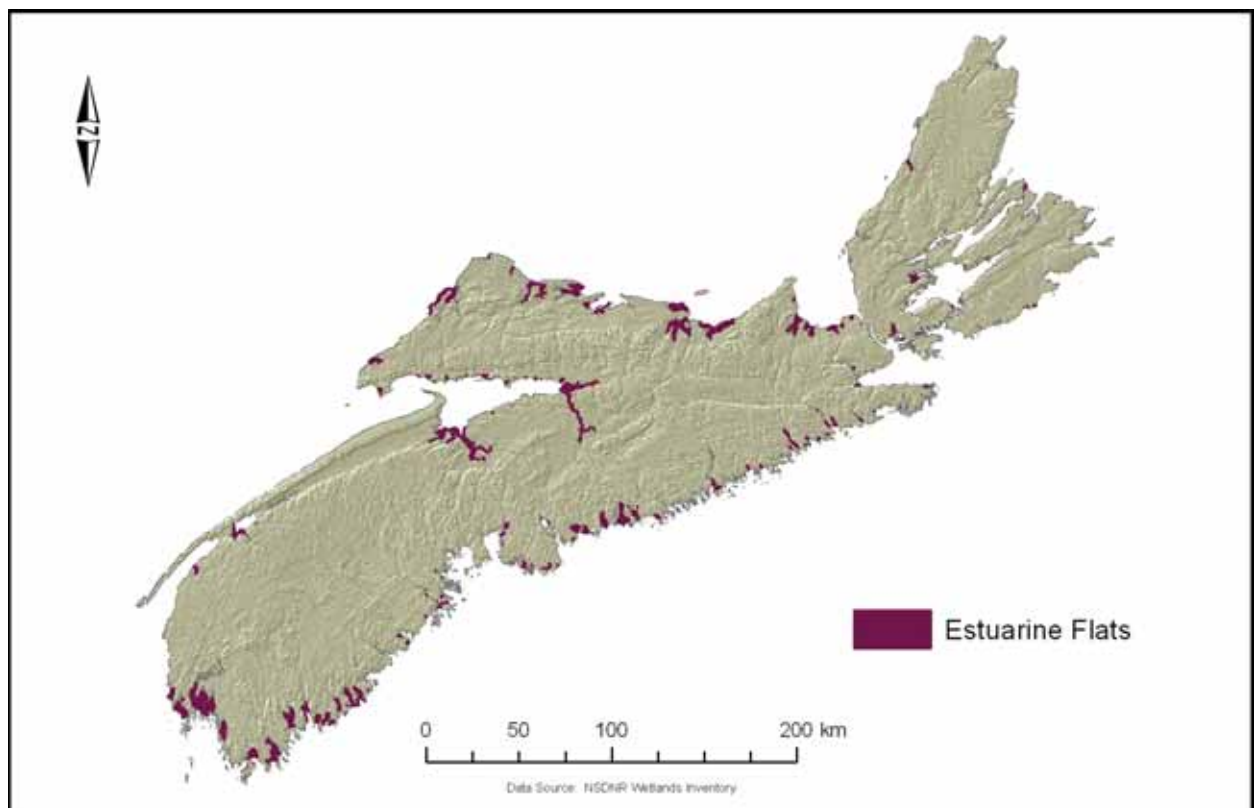


Figure 9.5: Distribution of estuarine flats

Note: Scale exaggerated in order for features to be visible



Zostera marina or eelgrass is one of 47 species of seagrasses found in nearshore coastal environments and estuaries (Phillips, 1984). Eelgrass meadows are ranked among the most productive of marine plant ecosystems (McRoy and McMillan, 1977). Like other seagrasses, eelgrass performs several functions in its environment. It provides food in two ways: direct grazing on the living plant, and utilization of detritus from decaying eelgrass material such as leaves (Zieman, 1982). The presence of eelgrass creates a diversity of habitats (Phillips, 1978). Eelgrass communities provide a nursery ground for food and protection for juveniles of various finfish and shellfish species (Zieman, 1982). Eelgrass also acts to stabilize sediments.

Various plants and animals are associated with eelgrass communities. A diverse range of epiphytic organisms, including bacteria, microalgae, macroalgae and fauna grow on the leaves of the plant (Harlin, 1980). Eelgrass beds are important nursery and feeding grounds for a wide variety of nektonic species, many of which are commercially or recreationally valuable, or important as food for other fish and birds. Eelgrass beds serve as important nursery habitat by providing protection from predators, substrate for attachment of sessile stages and an abundant food supply (Thayer *et al.*, 1979).

In Nova Scotia, eelgrass is commonly found in shallow inlets and embayments (Keddy and Patriquin, 1978) and often in areas near high-velocity channels (Smith *et al.*, 1976). It frequently occurs in the lower intertidal and subtidal zones adjacent to salt marshes (Patriquin, 1981). Along the east coast of Nova Scotia, an annual form of eelgrass inhabits intertidal and shallow subtidal mudflats. In many parts of Nova Scotia, eelgrass is also threatened, or already severely damaged, by high nutrient loadings and invasive species, e.g., green crabs and tunicates. Loss of these plants can de-stabilize mudflats and facilitate sediment transport and deposition that in turn can further damage adjacent eelgrass meadows and infill navigable channels.

9.7.2 Threats and Impacts

Industrial and commercial development, invasive species, as well as agricultural and forestry practices in watersheds, are among the principal threats to estuarine ecosystems. Many land use practices, including forestry, development and agriculture often cause excessive sedimentation and overfertilization, resulting in pollution and eutrophication of inland water bodies and watercourses. These waters in turn flow into the estuarine environments, where the problem is compounded (Swank *et al.*, 2001). The degradation of this ecosystem has adverse consequences for habitat both offshore and nearshore and for the riverine commercial and recreational fisheries.

9.7.3 Protection Status

There are approximately 28.1 ha of estuarine flats located within the boundaries of Kejimikujik Seaside Adjunct National Park. Other parks and wilderness area may harbour some amount of this habitat, but in most cases the boundaries of such areas extend only to the coastline, not beyond. Exact figures for the extent of estuarine and mudflat ecosystems are difficult to determine, and the area protected remains largely unquantified.

The Ramsar International Convention on Wetlands (1971) is an intergovernmental treaty dedicated to the conservation and wise use of rare or unique wetlands and the conservation of their biodiversity. To date the convention has designated 1,849 wetlands of international importance; three are located in Nova Scotia (see Table 9.9). The latter, located on the shores of the Minas Basin (Southern Bight – Minas Basin Ramsar Site), the Cumberland Basin (Chignecto Ramsar Site) and at Musquodoboit Harbour on the

eastern shore (Musquodoboit Harbour Outer Estuary), are the most notable estuarine environments protected in the province. Individually these systems have varying degrees of estuarine and mudflat habitat; mudflats are prominent at the Chignecto and Southern Bight-Minas Basin sites, but the extent of these ecosystems within the Ramsar boundaries is not well defined.

Table 9-9: Summary of Ramsar wetland sites, and contributing river systems with protected estuarine or mudflat habitats present

<i>Ramsar Wetland</i>	<i>Area (ha)</i>	<i>Contributing River Systems</i>
Chignecto	998.9	River Hebert, Sharps Creek, Maccan River and LaPlanche River
Southern Bight – Minas Basin	23,484.9	Cornwallis River, Habitant River, Canard River, Pereaux River, Avon River, Kennetcook River, St. Croix River, Cogmagun River and Cheverie Creek
Musquodoboit Harbour Outer Estuary	2,139.3	Musquodoboit River

Source: Nova Scotia Department of Natural Resources, 2008

9.8 Coastal Wetlands

9.8.1 Current Status

Wetlands are those lands where water saturation is the principal factor influencing the nature of soil development, the type of plant and animal communities living in the soil, on its surface or in the water, and various biological activities that occur there (Etherington, 1983; Mitsch and Gosselink, 1996; National Wetlands Working Group, 1988). For the purposes of this report, coastal wetlands include tidal (salt) marshes, coastal fresh water wetlands (defined as those located within 2 km of the coast) and coastal saline ponds. The location and abundance of these various wetlands is documented by NSDNR in the Wetlands Inventory program (Wildlife Division, Kentville, NS).

9.8.1.1 COASTAL FRESHWATER WETLANDS

NSDNR identifies nine freshwater wetland types. These are summarized in Table 9.10 both in terms of their provincial abundance and their abundance within the coastal zone. It is important to note that this inventory is based upon aerial photograph interpretation at a scale of 1:10,000. In terms of accuracy, the inventory is largely unverified by field surveys and tends to under-represent certain wetland classes that are difficult to delineate from aerial photography, most notably wooded swamps.

Table 9-10: Summary of wetland types: provincially and within coastal zone (after NSDNR, 1999)

<i>NSDNR Wetland Type</i>	<i>Total Area Province Wide</i>	<i>Total Area within 2 km of Coast</i>	<i>NSDNR Wetland Subtypes</i>
Bog	228,096 ha	37,392 ha	Open Bog, Shrub Bog and Treed Bog
Shrub Swamp	38,005 ha	5,991 ha	Tall Shrub Swamp, Compact Shrub Swamp, Deciduous Wooded Swamp and Evergreen Wooded Swamp

<i>NSDNR Wetland Type</i>	<i>Total Area Province Wide</i>	<i>Total Area within 2 km of Coast</i>	<i>NSDNR Wetland Subtypes</i>
Fen	60,696 ha	5,510 ha	Open Fen, Shrub Fen and Treed Fen
Deep Marsh	8,476 ha	2,764 ha	Dead Woody Deep Marsh, Compact Shrub Deep Marsh, Robust Emergents Deep Marsh, Emergents Deep Marsh, Floating-Leaved Deep Marsh and Nonvegetated Deep Marsh
Lakeshore Wetland	8,928 ha	1,061 ha	Dead Woody Lakeshore Wetland, Robust Lakeshore Wetland and Emergents Lakeshore Wetland
Seasonally Flooded Flats	7,357 ha	1,024 ha	Seasonally Flooded Emergent Flats, Seasonally Flooded Shrub Flats and Treed Seasonally Flooded Flats
Meadow	3,681 ha	950 ha	Ungrazed and Grazed Meadows
Shallow Marsh	855 ha	283 ha	Robust Emergents Shallow Marsh, Emergents Shallow Marsh and Floating-Leaved Shallow Marsh
Wooded Swamp	1,149 ha	105 ha	Deciduous Wooded and Evergreen Wooded swamps

NSDNR identifies 84,961 unique wetland areas in their provincial database of freshwater wetlands. Of these, 13,053 are located within 2 km of the coast. The distribution of these coastal freshwater wetlands is shown in Figure 9.6. The most common wetland types found near the coast are bogs, fens, shrub swamps and deep marshes (Hanson and Calkins, 1996; Nova Scotia Department of Natural Resources, 2002). Less common according to NSDNR's database are lakeshore wetlands, seasonally flooded flats, meadows, shallow marshes and wooded swamps (although the latter are arguably more abundant than what is presently documented). These nine wetland types are often composed of numerous subtypes, as shown in Table 9.10.

9.8.1.2 TIDAL (SALT) MARSHES

The salt marshes in Atlantic Canada are the northern extension of the vast salt marsh complex of the Gulf of Mexico and the east coast of the United States (Chapman, 1974; Reimold, 1977). Historically, there were more than 32,000 ha of salt marsh in Nova Scotia, but 65% of this has been dyked for agricultural use (80% along the Fundy coast) (Hilchey, 1981); see Section 9.9.1.

NSDNR identifies 3,840 unique salt marsh areas in their database, totaling 17,100 ha. The majority are located along the Minas Basin, the southwestern mainland and along the Northumberland Strait. With the exception of those in the vicinity of Lawrencetown, Halifax County, salt marshes are relatively under-represented along the Eastern Shore, and their distribution is sporadic through most areas of Cape Breton (Figure 9.7). They are typically divided into a high marsh and a low marsh, each with a distinct plant community (Figure 9.8). Salt marshes along the Atlantic coast of Nova Scotia are limited in lateral extent and are largely characterized by low marsh vegetation (Hatcher and Patriquin, 1981).

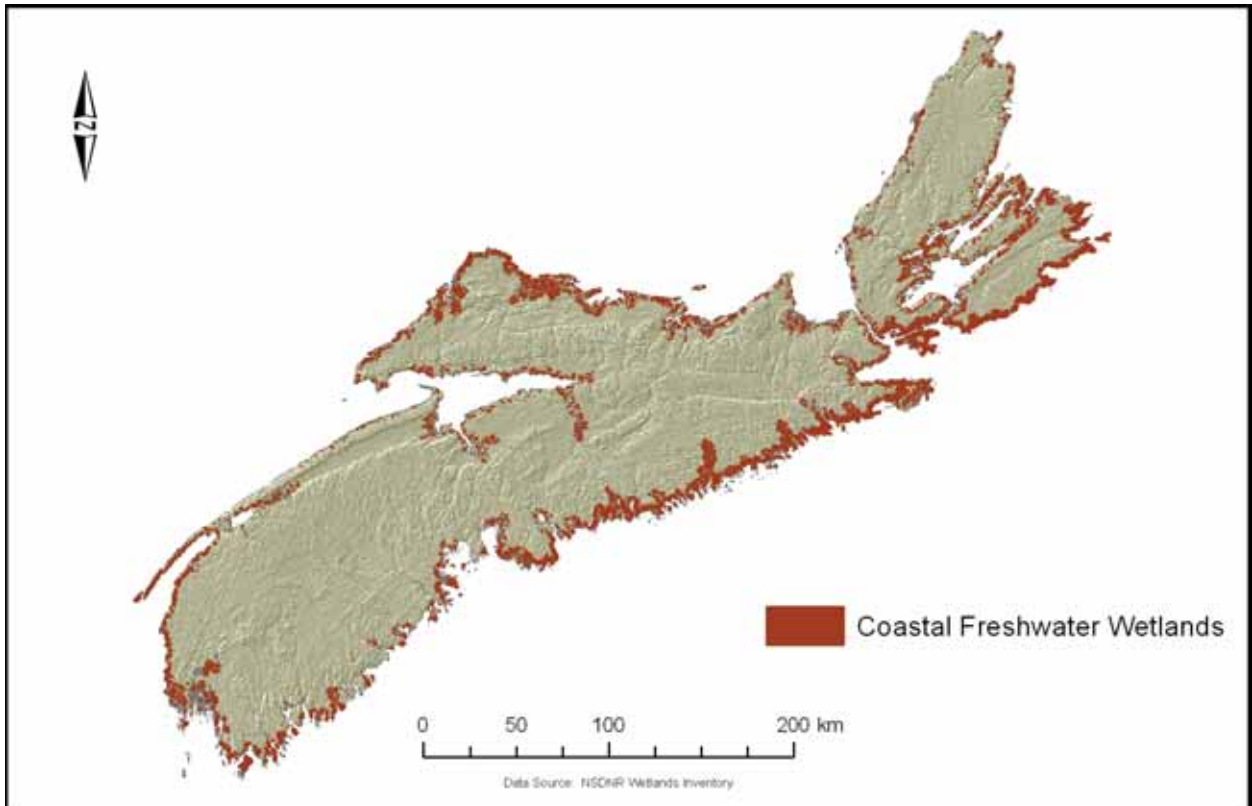


Figure 9.6: Distribution of coastal freshwater wetlands

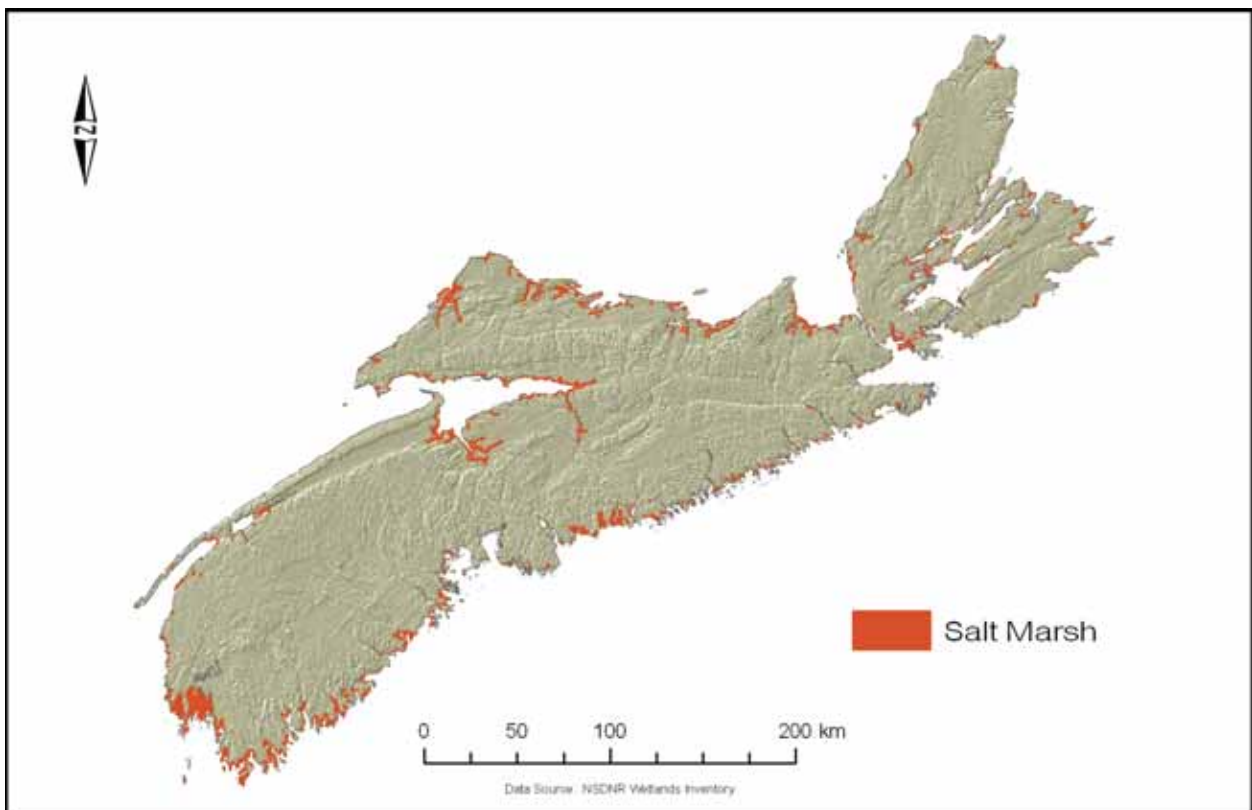


Figure 9.7: Distribution of salt marshes

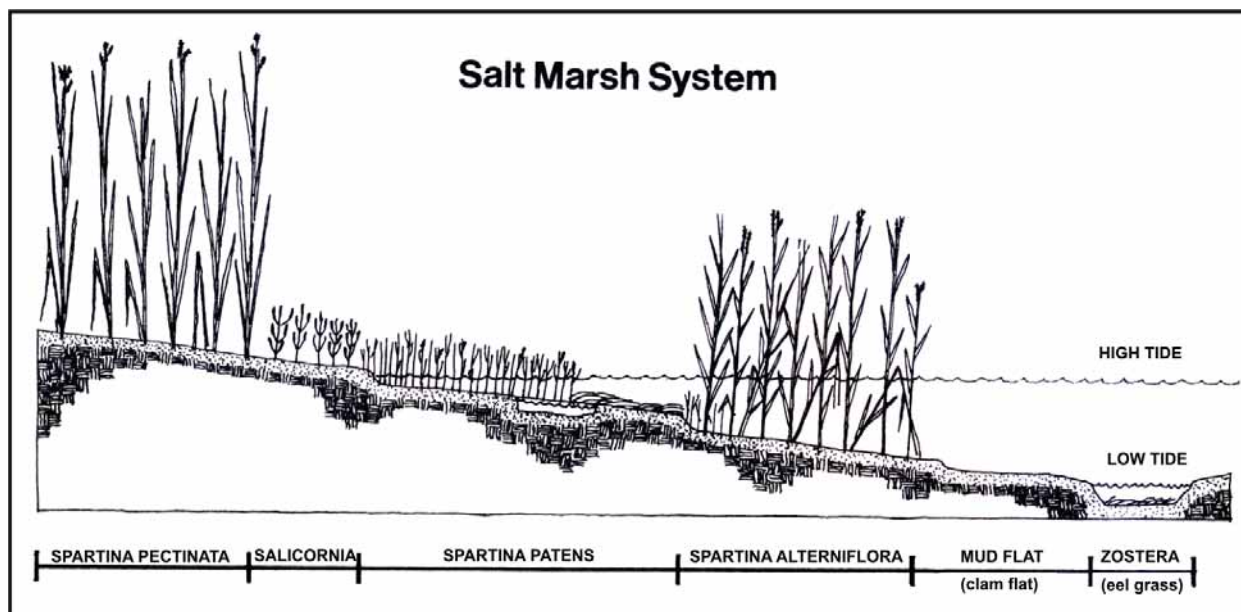


Figure 9.8: Typical salt marsh system (Source: Davis and Browne, 1997)

Salt marshes are highly productive systems year round (Teal and Teal, 1969) and are a major factor in the food chain of estuaries (Patriquin, 1981). The year round photosynthetic activity in a marsh maintains the productivity above that of the adjacent land area (Teal and Teal, 1969). Salt marshes also perform other critical functions related to their high productivity. These include: the provision of habitat for various invertebrates, fish, birds and mammals; performing waste treatment, and buffering against storm and flood events (McCullough *et al.*, 2005)

9.8.1.3 COASTAL SALINE PONDS

Using NSDNR's (2001) wetland inventory terminology, coastal saline ponds (more commonly known as lagoons or barachois) are classified as saltwater wetlands, but can also be considered part of the open water ecosystem. There are 4,476.5 ha of coastal saline ponds along the coast of Nova Scotia (Nova Scotia Department of Natural Resources, 2001), often associated with barrier beaches.

9.8.2 Threats and Impacts

Salt marshes are identified as one of the most highly productive ecosystems in Nova Scotia and, indeed, worldwide, but they are vulnerable to human pressure. The alteration and disruption of salt marsh functions and processes, for example, is one of the consequences of intensifying and changing patterns of coastal development. Only 20-35% of pre-settlement salt marshes remain. Infilling and development have reduced habitat and habitat quality, which in turn affects some salt marsh specialist species. Salt marshes were originally dyked by the Acadians in the 1600s to drain marshlands for agricultural use. Through the late 19th and early 20th Centuries, the dyked salt marshes remained profitable for hay crops. Although these historical dykes remain intact, there has been little additional dyking, due to advances in agriculture that allow greater usage of upland areas.

There is considerable current interest in capturing the inherent power associated with the Bay of Fundy. This is not only technically challenging, but whatever approach is adopted, the physical works may cause ecological consequences. The construction of dams, for example, may threaten the existence of salt marshes (MacKinnon and Scott, 1984). Any such construction across the mouth of a bay increases the

average water level, thereby reducing the upper limit of the tidal range and isolating the marsh area from tidal activity. The tidal dam at Annapolis, for example, converted salt marshes into pastureland and freshwater marshes.

Although salt marshes can act as buffers against pollution, including oil spills (Patriquin, 1981), they are also threatened by oil spillage. Whereas pulse oil pollution causes little long-term damage to perennial salt marsh grasses, annual species may be severely affected. Large long-term oil spills, on the other hand, can destroy both salt marshes and their inhabitants. Infilling for coastal development, i.e., infrastructure, such as road, as well as buildings, and for general "mosquito control" and dryland expansion (often for aesthetic reasons) also threaten salt marsh communities in various ways (MacKinnon and Scott, 1984). Dredging, for example, leads to increased turbidity, sediment build-up, reduced oxygen, disruption and removal of organisms, creation of stagnant deepwater areas and the disruption of circulation (McHugh, 1976), all of which effect nutrient production and distribution and disrupt the habitats of various organisms (MacKinnon and Scott, 1984). The biodiversity of bird species is also reduced through fragmentation and destruction of salt marsh habitats (Hanson, 2004).

9.8.3 Protection Status

While the Kejimikujik Seaside Adjunct includes a significant area of coastal bog, saline ponds and salt marsh, the Cape Breton Highlands National Park contains relatively little coastal wetland habitat of any type. Within the coastal wilderness protected areas of the eastern mainland and Cape Breton, a large number of bogs, fens and coastal saline ponds are protected in-perpetuity. Scatarie Island, for example, with a total land area of approximately 1,500 ha, contains 529 ha, or 35% of the total land area, of protected coastal wetlands, mostly bogs. Table 9.11 summarizes the areas of protected wetland in the province. Tables A3.4, A3.5 and A3.6 in Appendix 3 provide additional detail.

Table 9-11: Areas of Protected Freshwater Wetlands

<i>Area</i>	<i>Category Protected</i>	<i>Size (Ha)</i>
National Parks and Adjuncts	Freshwater wetlands	388.1
	Saltmarsh	67.1
	Saline ponds	5.4
	<i>Total</i>	<i>460.6</i>
Provincial Wilderness Protection Areas	Freshwater wetlands	2,272.9
	Saltmarsh	10.5
	Saline ponds	16.6
	<i>Total</i>	<i>2,300.0</i>
Provincial Parks	Freshwater wetlands	309.9
	Saltmarsh	106.7
	Saline ponds	13.4
	<i>Total</i>	<i>430.0</i>

In addition to federal and provincial protection, other conservation agreements exist. The Nova Scotia Transportation and Infrastructure Renewal, in collaboration with DFO, NSDNR, Ducks Unlimited Canada and private land owners, have established a program to rehabilitate and protect coastal wetlands. This is to compensate for wetland habitat that is impacted by road construction. As depicted in Table

9.12, six wetlands (81.8 ha in area) have been restored and are being monitored (Nova Scotia Transportation and Infrastructure Renewal, 2009).

Table 9-12: Salt Marsh Restoration Sites Developed by NSTIR and Protected by Various Partners

<i>Proponent</i>	<i>Salt Marsh Restoration Projects</i>	<i>Size (ha)</i>
NSTIR, other provincial departments, Ducks Unlimited Canada and private landowners	Cheverie Creek, Hants County	43
	Walton River, Hants County	10
	Smith Gut, Pictou County	1.5
	Lawrencetown, Halifax County	2.3
	St. Croix, Hants County	20
	Cogmagun, Hants County	5
	TOTAL	81.8

(Source: Nova Scotia Transportation and Infrastructure Renewal, 2009)

Environmental NGOs have also take initiatives to protect coastal and interior lands from development. The Nova Scotia Nature Trust, the Canadian Conservancy and Ducks Unlimited Canada have all either purchased or entered into agreements with landowners to provide protective covenants on privately held land (Table 9.13).

Table 9-13: Areas Protected by Non Governmental Organizations

<i>Organization</i>	<i>Hectares Protected</i>	<i>Coastal Land Protected (ha)</i>
Nova Scotia Nature Trust	>1,600	494 (between 25 km and 28 km of coastline)
Nature Conservancy of Canada	7,159	343
Ducks Unlimited Canada (Eastern Habitat Joint Venture (EHJV))	32,842	5,169

(Nova Scotia Nature Trust, 2008; Ducks Unlimited Canada, 2009; Nature Conservancy of Canada, 2009; C. Smith, Nova Scotia Nature Trust, pers. comm., 2009)

9.9 Dykelands

9.9.1 Current Status

Dykelands are agricultural lands historically developed from salt marshes, artificially drained via ditches and aboiteaux (gates allowing one-way flow of water) and protected from the marine environment by earthen dykes. These are located throughout Nova Scotia (see Table 9.14), but are found mainly along the Bay of Fundy (Stewart *et al.*, 2003). Originally constructed by Acadian settlers in the 1600s, they provided a valuable source of arable land. In an age predating mechanized agriculture, dyking proved a viable alternative to clearing less fertile upland sites. To this day, the dykes remain in place, maintained and protected through a variety of mechanisms. There are an estimated 17,519 hectares of land, as well as associated infrastructure such as roads, railways and utilities that are protected by dykes (Nova Scotia Department of Agriculture and Marketing, 1987).

Table 9-14: Summary of Acadian Dykelands and Marsh Bodies

County	Length of dykes	Protected marsh area*	Agriculture		Protected infrastructure (1995 statistics)						
			Land available	Actively used	Roads	Rail-roads	Utility lines	Sewage Plants	Buildings		
									Residential	Commercial	Institutional
km	ha	%	%	km	km	km	Ha	each	each	each	
<i>Below causeways</i>											
Annapolis	10	459	91	61	1	0	1	0	0	3	0
Cumberland	75	5,999	89	72	24	7	51	13	114	55	8
Colchester	67	2,778	87	76	22	4	36	2	95	161	5
Digby	4	304	47	36	3	0	0	0	0	0	0
Hants	36	1,106	92	93	17	6	11	5	30	44	4
Kings	49	3,590	89	86	21	11	15	38	34	29	3
Yarmouth	0	291	90	52	2	0	2	0	1	0	0
Total below causeways	241	14,527	585	476	90	28	116	58	274	292	20
<i>Above causeways</i>											
Annapolis Causeway (maintained by Nova Scotia Power)	1	1,621	89	72	3	0	6	11	10	0	0
Avon River Causeway	1	1,371	94	78	8	1	8	0	29	2	0
Total below causeways	2	2992	183	150	11	1	14	11	39	2	0
Totals	243	17,519	768	626	101	29	130	69	313	294	20

Source: Nova Scotia Transportation and Infrastructure Renewal, 2009

* Area is also a measure of lost salt marsh, estuaries and mud flat habitat from dyking.

The importance of dykelands to agriculture is due to the deep, rich soils that are contained within the dyke. These soils are typically silty and are moderately to well-drained.

Though the majority of dykelands are maintained primarily for agricultural purposes, they do provide habitat for a large number of grassland and marshland mammals, birds, fish and insects. Dykelands are typically found at the interface of several diverse habitats including the estuarine and marine environment, salt marshes, tidal flats and uplands. The habitat complexity surrounding dykelands translates to an increased biodiversity, with many species from each of these habitats frequenting the dykelands (Stewart *et al.*, 2003). In many regards, there exists today a balance of land use and habitat on dykelands, which has existed for three centuries or more (Nova Scotia Department of Natural Resources, 1998).

9.9.2 Threats and Impacts

Dykelands face threats similar to other coastal areas as a result of climate change and sea level rise. These lands used to be salt marshes and the lands are still below sea level. Dewatering and compaction of the soils (former aquatic and marine sediments) has further depressed the local elevations, making them susceptible to flooding.

9.9.3 Protection Status

All dykelands in Nova Scotia are protected by the *Agricultural Marshland Conservation Act* and are managed cooperatively by the Nova Scotia Department of Agriculture and various private landowners via marsh bodies in Yarmouth, Digby, Annapolis, Kings, Hants, Colchester and Cumberland Counties. Given the variety of protected resources and the accumulated wealth that thousands of Nova Scotians invested in the dykelands, they are considered to be critical infrastructure.

9.10 Bras d'Or Lakes

9.10.1 Current Status

Although not the only open water system in the province, one of the most unique and ecologically important such systems is the Bras d'Or Lakes, a large body of brackish water dominating the centre of Cape Breton Island. As depicted on Figure 9.10, the Bras d'Or Lakes is a series of estuarine bodies linked together in a manner that forms a unique coastal ecosystem. The watershed has an area of 3,565 km², of which 2,479 km² (70%) is terrestrial and freshwater and 1,086 km² (30%) is marine (Parker *et al.*, 2007). The lakes are considered unique because of their brackish waters and “protected inland” nature. They provide a varied seascape of bays and peninsulas, narrow passages, and many coves, inlets, and islands. The main connection to the sea, the narrow Great Bras d'Or Channel, attenuates the tides and limits water exchange with the Atlantic Ocean. The lakes also connect to the sea via the Little Bras d'Or at the upper end of St. Andrews Channel and via the St. Peter's Canal at the extreme southern end of the main lake.

The waters of the Bras d'Or Lakes are a mixture of Atlantic seawater, local freshwater run-off and a small amount of fresh groundwater. With an average salt content of 22 parts per thousand, compared to a salt content of 35 parts per thousand in the ocean, the waters of the Bras d'Or Lakes are more typical of mixed-water estuaries (Great Canadian Lakes, 2008). Much of the Bras d'Or Lakes can be characterized as a two layer aquatic system, where warmer less saline water, which flows towards the ocean, lies on top of a cooler more saline layer, which brings marine waters into the lakes (Parker *et al.*, 2007).

The Lakes range in depth from 16 m in the Great Bras d'Or Channel to 280 m in the St. Andrews Channel. The western part of the Lakes is generally shallow, with the “main lake” reaching a maximum depth of 157 m. Because the marine openings are constricted, the Lakes have an extremely low

The Bras d'Or Collaborative Environmental Planning Initiative (CEPI) has been established as an integrated management initiative for the Lakes. It includes participation from a cross-section of government departments (First Nation, federal, provincial and municipal), as well as representatives from local industry, academia, NGOs and community members with a role or interest in the environmental management of the Bras d'Or (see <http://www.brasdorcepi.ca>). The intent of the CEPI is to develop an overall management plan for the Bras d'Or lakes and associated watershed lands and to facilitate the plan's implementation by government departments and other relevant interests.

rate of water circulation. It can take up to two years for water to be flushed into the sea, and in some inner bays and coves, far from the marine interface, the flushing rate falls to 40 years (Great Canadian Lakes, 2008).

Ecologically the lakes are rich in flora and fauna (Parker *et al.*, 2007), and the brackish waters support a predominantly estuarine fauna and flora; those that can survive conditions of low to moderate salinity do best (Great Canadian Lakes, 2008). Recent trawling surveys show that Winter Flounder and Cod are the most common finfish species (Great Canadian Lakes, 2008); Black-Spotted Stickleback are also numerous, and recent scientific research suggests that a genetically distinct, spring-spawning population of Blueback Herring (Gaspereau) may remain in the inland waters throughout the year (Great Canadian Lakes, 2008). Recent studies have shown a marked decline in the number of Herring larvae in the Lakes and a reduced number of Herring spawning beds; this led to the closure of the Herring fishery in 1999.

Commercial trawling for Winter Flounder was banned in 1992 (Great Canadian Lakes, 2008).

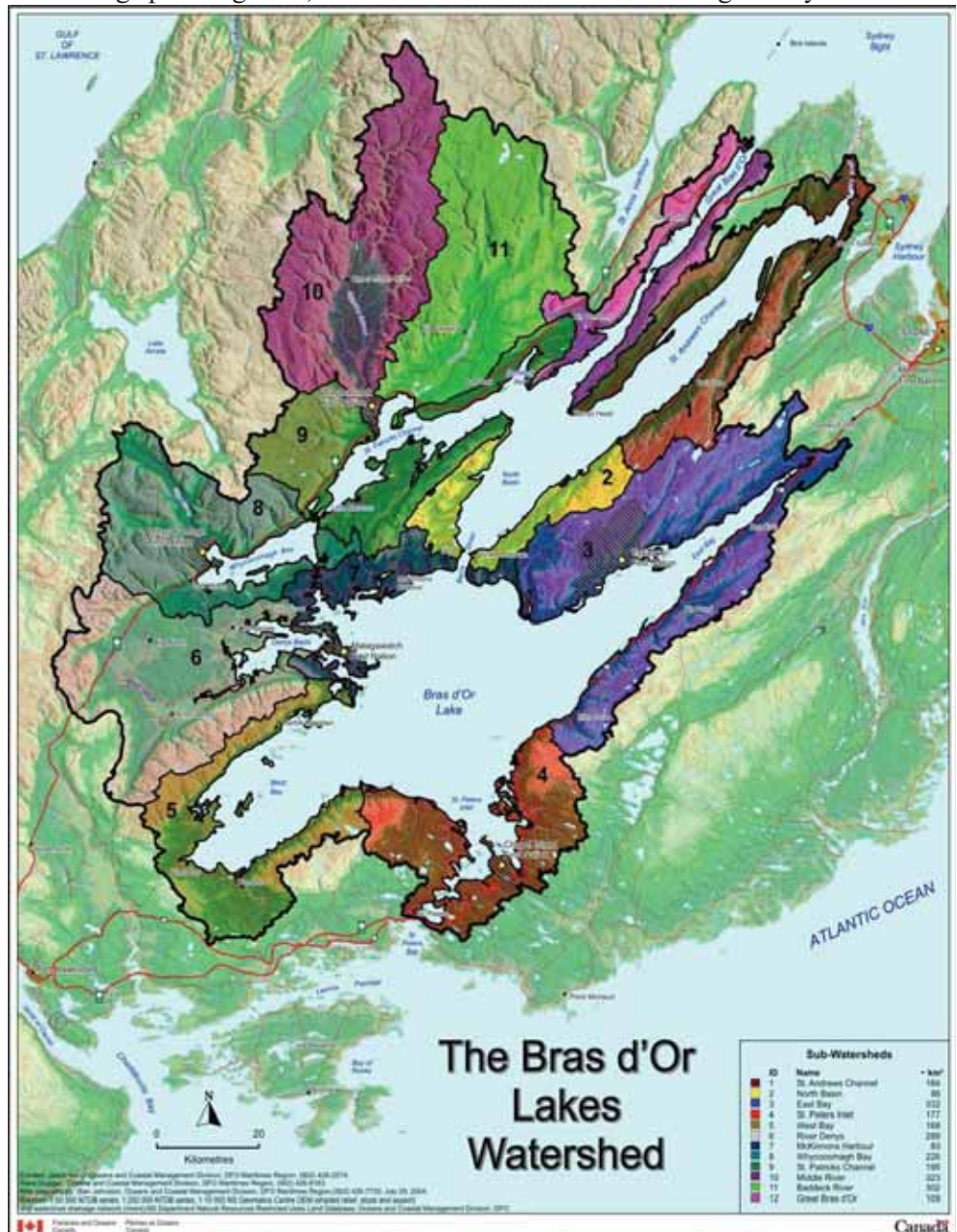


Figure 9.9: The Bras d'Or Lakes watershed (Source: Parker *et al.*, 2007)

While lobsters thrive in some areas of the Bras d'Or, supporting an ongoing food fishery, the salinity level of the lakes is generally too low to support their larval development. The waters are far more suitable for the growth and cultivation of American oysters, a hardy species that can thrive in a wide range of temperatures and varying levels of salinity (Great Canadian Lakes, 2008).

A number of terrestrial habitats support both marine and terrestrial fauna because of their proximity to the Bras d'Or Lakes. Some of these habitats are sensitive, and some are simply limited in area. They all add to the diversity of habitat found around the Bras d'Or Lakes, thereby supporting the diversity of flora and fauna of the ecosystem. The primary associated habitats include dunes, cliff habitats, island habitats and freshwater wetlands. Both the cliff habitats and dune habitats are limited in extent. The island habitats are often sought by colonial nesting birds because of the lack of predators and the associated shoals that provide feeding areas.

Freshwater wetland and saltmarsh are ecologically important as they typically support more diverse biota, may support some of the species at risk within the Bras d'Or Lakes, and serve as a filter mechanism for runoff entering the Bras d'Or system (Parker *et al.*, 2007).

9.10.2 Threats and Impacts

The large open bodies of water in the Bras d'Or Lakes remain relatively unimpacted, while the land base and nearshore areas are influenced by the pressures associated with resource use (such as mining and forestry) and shoreline development (Parker *et al.*, 2007). The most impacted areas of the lakes appear to be the nearshore fringe where science has documented conditions of coliform pollution, sedimentation, metal contamination, isolated areas of anoxia and hypoxia and other stressors such as road

development, shoreline development and various resource uses and extraction activities. Negative trends in the biodiversity of the lakes have been noted in recent years, including the decrease in Herring and American Plaice stocks, and the increase in invasive species such as the green crab and the Malpeque and MSX oyster diseases (Parker *et al.*, 2007).

Both moose and the non-native white tail deer have been successfully reintroduced to the Bras d'Or ecosystem; both now flourish. Humans have facilitated other large mammals, such as the coyote and bobcat, entering the Bras d'Or watershed from the mainland over the Canso causeway (Parker *et al.*, 2007).

Bras d'Or Lake First Nations Perspective

From the Traditional Ecological Knowledge (TEK) Workshop Proceedings

"Identifying specific significant areas for plant and animals and for cultural, recreational and social activities is a challenge for many Elders. Every species has a spirit or qualities that are important. Similarly, every brook or stream has its own significance. The watersheds of three main rivers (Baddeck, Skye and Middle River) were identified as significant, primarily because they are Salmon habitat. The entire watershed of the Bras d'Or lakes is significant as eagle habitat. Edges of streams and marshes throughout the watershed are important areas because they have many significant plants used for medicines. Other important areas for plants include Malagawatch (sweetgrass), little Narrows (sweetgrass), Whycocomagah (sweet flag medicinal plant) and Irish Cove (native orchids). Significant areas for Herring, Gaspereau, Smelts, Salmon and black ash were also identified" (Doherty and Naug, 2006).

9.11 Sensitivity of Ecosystems

Sensitivity in the present sense may be defined as any given ecosystem's vulnerability to, and ability to rebound from, human disturbance. While sensitivity is complex and difficult to assess in measurable units, a number of proxies may be used to assess this value.

The government, NGOs and the public place high conservation values on those ecosystems and natural areas which are perceived to be most sensitive. Advances in mapping and the proliferation of databases have allowed for a reasonable assessment of the extent and distribution of the various ecosystems discussed. In the broadest and most practical sense, one way of prioritizing management and protection of the identified ecosystems is by examining their rarity as an ecosystem, coupled with their protection status.

Table 9.15 presents a summary of the data that facilitated an interpretation of the sensitivity of the ecosystems. For each of the identified ecosystems, there are unique issues in terms of biodiversity and micro-habitats for specific species that may be impacted by future disturbance, both natural and anthropogenic. The dynamic nature of the various ecosystems discussed, whether in terms spatial and temporal distribution, abundance, or ecological integrity, is acknowledged. It is beyond the scope of this report to generate modelling to forecast any future ecological change, but this type of research is critical to our understanding of future changes in coastal processes in light of natural and human pressures.

Table 9-15: Summary of Quantities and Protection Areas for Identified Ecosystems

<i>Ecosystem</i>	<i>Provincial Statistics</i>		<i>2 km Coastal Zone Statistics</i>			<i>Protection</i>		
	<i>Ecosystem Area (ha)</i>	<i>% of NS Landmass</i>	<i>Ecosystem Area (ha)</i>	<i>% of Provincial Ecosystem</i>	<i>% of Coastal Zone</i>	<i>Known area of protected land in 2km coastal zone (ha)</i>	<i>% Protected of Ecosystem (Provincial)</i>	<i>% Protected of Ecosystem (Coastal)</i>
Coastal Islands	49300	0.9%	49300	100%	4.7%	1620	3.29%	3.3%
Rocky, Boulder & Cobble Shore	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Sandy Shores & Sand Dunes	6,480	0.1%	6480	100%	0.6%	2,500	38.6%	38.6%
Forest	4,272,800	77.5%	602,800	14.1%	57%	17,800	0.4%	2.9%
Barrens	120,200	2.2%	46,900	39 %	4.4%	7320	6.1%	15.6%
Estuaries & Mud Flats	205,500	N/A	205,500	100%	N/A	28 ¹	0.01%	0.01%
Freshwater Wetlands	359,700	6.5%	55,200	15.4%	5.2%	2,660	0.7%	4.8%
Coastal Saline Ponds	4,480	0.08%	4,480	100%	0.4%	22	0.5%	0.5%
Salt Marsh	17,100	0.3%	17,100	100%	1.6%	78 ²	0.5%	0.5%
Dykelands	17,519	0.3%	17,519	100%	1.6%	17,519	100%	100%
Bras d'Or Lakes	26,000	N/A	26,000	100%	N/A	N/A	N/A	N/A

1 Plus an unknown amount of estuaries and mudflats within Ramsar wetland sites

2 Plus an unknown amount of salt marsh within Ramsar sites

9.11.1 Coastal Islands

Sensitivity: Moderate

The coastal islands may be considered as microcosms containing a variety of terrestrial habitats representative of like habitats elsewhere in Nova Scotia. While these may not be unique in themselves, the physical isolation that islands provide is a factor that sets them apart from similar habitats on the mainland. Increased access to the islands could potentially impact the biodiversity, but their remoteness and ruggedness may offset serious adverse impact. The islands are seen as unique, but not necessarily sensitive ecosystems.

9.11.2 Rocky, Boulder & Cobble Shores

Sensitivity: Low

Although little is known as to the true extent of this ecosystem, it is considered ubiquitous throughout the province; to that extent that it may be considered stable into the foreseeable future.

9.11.3 Sandy Shores & Sand Dunes

Sensitivity: High

The easily transportable nature of the substrate in this ecosystem implies a high level of sensitivity, especially in light of forecasted sea level rise and intensified storm events resulting from climate change. The efforts being taken to protect these ecosystems reflects their value ecologically, recreationally and culturally. This ecosystem is rare within the province (0.1% of Nova Scotia and 0.6% of the coastal zone), but a relatively high proportion (38.6%) of these areas is protected through legislative mechanisms.

9.11.4 Coastal Forest & Barrens

Sensitivity: Low

Although, these ecosystems are considered relatively secure in provincial terms, they may include critical habitats that are sensitive to specific types of disturbance. While 15.6% of coastal barrens in the province are subject to some level of protection, coastal forests are less well represented, i.e., approximately 3%; coastal forests are not considered particularly sensitive, due to their resilient nature.

9.11.5 Estuaries and Mudflats

Sensitivity: High

These highly productive areas, as well as the rivers and streams that flow into them, are often found in close proximity to human development. These ecosystems are considered sensitive due to the compounded impact of such development with activities in the watersheds that cause non-point source percolation into the estuaries. Although significant (yet unquantified) areas of this ecosystem are captured within designations such as the Ramsar wetlands, only 0.01% are protected by federal or provincial legislation.

9.11.6 Coastal Wetlands

Sensitivity: High

Of the various coastal wetlands identified, salt marshes and coastal saline ponds may be the most sensitive in terms of both rarity and current level of protection. Both of these ecosystem types are potentially very productive in terms of biodiversity and are valuable habitat for a variety of species. Both are also potentially subject to deterioration as a result of coastal erosion, pollution, sea level rise, storm damage and human development.

Coastal freshwater wetlands are those at the highest risk of being encroached upon by development. While this is curbed to a modest degree by parks and protected areas, a more significant route is through adherence to the goal of “no net-loss of wetlands” to be implemented by Nova Scotia Environment.

9.11.7 Dykelands

Sensitivity: Low

Given proper management of dyke infrastructure and the effective stewardship of the lands they contain, dykelands are considered robust and not overly sensitive to change (Stewart *et al.*, 2003). The will to preserve centuries of investment in these rich agricultural lands is quite high. Therefore, short of any stochastic events that may occur, adaptive management and the implement of the legislation ensures that the dykelands remain viable as both wildlife habitat and agricultural productive lands.

9.11.8 Bras d'Or Lakes

Sensitivity: High

The classic example of an open water ecosystem, the Bras d'Or Lakes, is subject to various ecological, recreational, industrial and cultural uses. Presently, the lakes are not formally protected, and constitute a unique ecosystem that is not represented anywhere else within the province. As such, the sensitivity of this ecosystem is considered high, bearing in mind the significant catchment area and the land use activities therein, that feeds into the lakes.

9.12 Sustainability Issues Key Points

- Nova Scotia is endowed with a unique biodiverse coast, with 13 distinct ecosystems;
- Although the ecosystems and habitats of Nova Scotia are in relatively good condition, there is a need to remain vigilant in their management, monitoring and protection given their values and the articulated conviction by all levels of government to preserve this state for future generations;
- Nova Scotia's coastal ecosystems have been altered by, and will continue to be altered by, both natural and human driven processes. Through research, monitoring, modeling, management and planning Nova Scotians can respond to negate, or minimize, negative impacts emanating from these activities;
- Various government departments create and implement policies and programs towards the goal of effectively providing stewardship over our coasts; the limited capacity of these departments to undertake adequate monitoring and enforcement and to restore degraded habitat, however, affects their long-term sustainability;
- Monitoring of Nova Scotia's coastal ecosystems is paramount to understanding the dynamic changes that are occurring and how human development and activities are influencing them; it is important that the Province and municipalities respond to these changes and implement corrective action in a timely fashion, i.e., adaptive management.

Data Gaps

- Mapping and Spatial modeling needed at provincial level for
 - Ecosystem change over time
 - Degree of human impact on ecosystems
- Area measurements needed for
 - Mud flats and estuaries
 - Area of mudflats vs. area of estuaries
 - Length of tidally influenced portions of rivers
 - Rock, cobble and boulder shores
 - Length and/or area of this type of shoreline
- General status data for ecosystems at a provincial level are not available.

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The Interlocking Crises

“Until recently, the planet was a large world in which human activities and their effects were neatly compartmentalized within nations, within sectors (energy, agriculture, trade), and within broad areas of concern (environment, economics, social). These compartments have begun to dissolve. This applies in particular to the various global ‘crises’ that have seized public concern, particularly over the past decade. These are not separate crises: an environmental crisis, a development crisis, an energy crisis. They are all one.”
World Commission on Environment and Development (1987)

10.1 Introduction

In their seminal book entitled, *Our Common Future*, the World Commission on Environment and Development described sustainable development as “*a process of change in which the exploitation of natural resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations*” (World Commission on Environment and Development, 1987). They stressed that the concept would require enormous changes in human behaviour at all levels of society, i.e., individuals, families, communities, institutions, and countries. They further advocated that behavioural changes should be devoted to achieving the key objectives of:

- reviving growth;
- changing the quality of growth;
- meeting essential needs for jobs, food, energy, water, and sanitation;
- ensuring a sustainable level of population;
- conserving and enhancing the resource base;
- reorienting technology and managing risk; and
- merging environment and economics in decision making.

The vision for Nova Scotia, as outlined in the policy document *Opportunities for Prosperity* (Nova Scotia Economic Development, 2006), is consistent with the achievement of these objectives. There are many perspectives that will need to be considered in pursuing these, including the need to consider the attributes and needs of the provincial coast. This chapter highlights some of the main observations and findings from the preceding focus chapters (chapters 4 to 9). Because the intention of this report is to promote discussion on how to achieve an effective approach to integrated coastal zone management in Nova Scotia, it also presents key issues that might be important for consideration in the development of an appropriate strategy.

10.2 Main Conclusions from the Focused Overviews

This section provides a short summary of some of the main observations and findings from each of the focus chapters (chapters 4 to 9).

10.2.1 Coastal Development

Although Nova Scotia cannot be considered to have a highly developed coastline, there is a wide continuum of development intensity along its coast from land with little or no development (80% of the 2 km-wide coastal land strip) through to intensely developed urban and industrial areas (11%).

Development is generally of a nodal nature with a higher intensity of civic addresses located on the coast than inland. The most densely developed coastal areas are associated with ports and harbours, which include service centers such as Halifax, New Glasgow, Antigonish, Yarmouth and the Sydney area.

Interior concentrations of development are found along the commuter corridors between Halifax and Truro, and through the agricultural Annapolis-Cornwallis Valley (dykelands). Coastal development is sparse on the north-western and south-eastern sides of Cape Breton, in Guysborough County, along the Chignecto Bay in Cumberland County and along the South Shore (Queen's County). The pattern of provincial development has been the result of many physical and socio-economic factors including:

- the quality of ports and harbours in relation to marine-based economic activities;
- access to land-based and marine natural resources;
- climate, topography and soil conditions;
- transportation corridors;
- fluctuations and variations in real estate prices;
- availability of minerals;
- scenic settings for primary and vacation homes; and
- recreation and tourism.

Available information indicates that, where development has taken place, the predominant type of development is residential (76%), followed by industrial (8.7%), protected areas (6.2%) and commercial (5.7%). Between 1950 and 2000 there was an exponential growth in annual residential subdivision and registration of dwellings, but this now appears to have peaked primarily because most of the choice land has already been subdivided. Within high density urban areas there has been considerable strip-like development, which extends along the coast, including embayments, rivers and estuaries. This type of development pattern has a high potential to impact the coastal environment. The issue of competing interests, particularly in, and adjacent to, the more developed areas of the Nova Scotian coast is one that requires attention. For example, there is evidence of residential development occurring on land previously used for agriculture, thereby reducing the potential of the province to produce food.

The province has delegated zoning powers to the municipalities through the *Municipal Government Act*, which allows municipalities to develop strategies and zoning by-laws that regulate land use. At present only 45% of the provincial land area has municipal planning strategies and/or land use by-laws in place; this means that there is minimal control over development across the greater part of the province. As approximately 86% of the coastline, including the islands and shores of the Bras d'Or Lakes, is held privately, significant portions of the coast are also subject to minimal development controls. There is a need to improve information, planning and policies concerning development in these areas, i.e., the coastal lands, as they represent the parts of the province where future development pressures will most likely occur.

10.2.2 Working Waterfronts

Working water fronts include those sites and facilities that provide physical access to the sea for ocean-dependent uses and businesses. Three broad types of working waterfronts are found in Nova Scotia. These are: Canada Port Authority Ports (only one in Nova Scotia - Halifax); local and regional ports (25 in Nova Scotia, e.g., Sydney Marine Terminal and the Port Hawksbury Government Wharf) and small craft harbours, of which there are 247.

Over the last 15 years, there has been a trend towards the divestiture of ownership of many of the harbour and port facilities from government to the private sector. This trend has had enormous social and economic implications for the communities that are associated with these working waterfronts. Over the recent past, for example, there has been concern expressed on how many of them are operated, particularly the smaller ones. Evidence presented in Chapter 5 shows that there have been measurable statistical changes in the characteristics of some of the smaller rural waterfronts over the period from 1991 to 2006. On the basis of a classification system using simple social-economic indicators, i.e., income per household, housing repair, labour force participation and population change, it was possible to identify four types of working waterfront community:

- i) Healthy communities – well off and demographically robust;
- ii) Transitional – moderately well off, but showing significant population decline;
- iii) Declining communities – less well off and showing significant population decline; and
- iv) Outliers.

An examination of 93 coastal communities indicated that between 1991 and 2006 the number of communities in the “healthy” community type remained almost the same, i.e., approximately 30% of the total. By contrast, over the same period, the number of “transitional” communities declined from 29% to almost zero with a major shift towards the “declining type”, which by 2006 included approximately 65% of the communities. These results indicate a general decline in the wellbeing of the communities associated with small, rural working waterfronts. There are also indications that the healthier working waterfronts are increasingly associated with the larger more developed urban centres. It was possible to identify the individual communities that fit into each of these categories, the working waterfronts with which they are associated, and their relative change in socio-economic status between 1991 and 2006. More detailed case studies for Musquodoboit Harbour, LaHave, and Weymouth are presented to support some of the findings.

10.2.3 Public Coastal Access

Public coastal access is about people’s ability to view, reach and move along the shoreline of the mainland and islands of Nova Scotia. Maintaining coastal access supports local economic development and provides valued recreational space for residents and visitors. Factors that prevent public access include legislation, physical access (accessible/ inaccessible due to weather, terrain or physical structures) and economics (cost).

Access to the coast in Nova Scotia has changed considerably over time, primarily because of changing land-use patterns, road development and the ownership of shoreline property. The main tools to facilitate public access to the coast include legislation, which accommodates both property rights and public access,

and the outright public acquisition of property to ensure public access. There is currently no federal or provincial legislation that ensures universal access to the coast. Pertinent legislation is primarily aimed at the prevention of trespass, regulation of various economic activities, restriction on the use of vehicles and the construction of infrastructure such as wharves and ramps. All of these, however, cumulatively restrict public access to the coast. By contrast, there are mechanisms that promote access, including the development of wilderness trails, proclaimed parks, protected areas, tourist sites, and the proclamation and availability of Crown land, which is considered a public asset. Such mechanisms do not necessarily guarantee free public access at all times, as all have some form of associated restriction.

Although it has not been possible to provide any definitive estimates of the area or length of the coast that is inaccessible to the public, ownership of coastal land provides some indication of accessibility. Approximately 13.4% of coastal frontage is owned by federal, provincial or municipal governments. Of the 11,114 km of the coast, there are 1,491 km of publically-owned land and 99 km of protected land. The balance is privately owned and is legally inaccessible to the public. The purchase of land by government and non-government institutions appears to be a favoured mechanism by which public access to the coast is facilitated. For example, in the past five years the provincial trail network has grown by approximately 1,500 km with 400 to 500 km of trail being added to the network each year. Although much of this network is not directly located on the coast, there are portions that do have strong links, e.g., ocean scenery and vistas.

The public's perception of the issue of public access to the coast is extremely varied: it extends from being happy with the current status of access to total disagreement. Concern appears to centre primarily on ownership of coastal frontage, lack of appropriate planning and the need to ensure that a reasonable amount of coastal frontage is designated and maintained for public use. There is also an apparent need to provide the public with better information on those areas of the coast that are accessible and non-accessible, as well as providing the requisite opportunities for the public to identify those areas and resources to which they would like to have access.

10.2.4 Sea-Level Rise and Storm Events

A long-term rise in sea level is taking place in Atlantic Canada due to a combination of processes including: long-term mean sea level rise since the last ice age; regional land subsidence; and global warming and associated climate change.

The present rates of sea level rise are not uniform over the length of the Nova Scotian coast due to differences in the rates of land subsidence. Measured mean annual water level readings taken at Halifax since 1920 indicate a rate of 32 cm per century, a rate that is expected to continue into the future. Projections on sea level rise for other parts of Nova Scotia suggest that the value could be between 70 cm and 140 cm over the next century. Rises in sea level can be expected to have many biophysical and socio-economic impacts. Assessment of the biophysical sensitivity of the Nova Scotian coastline indicates that the Atlantic-facing shoreline is the most sensitive.

Nova Scotia is subjected to a wide range of storms, including extra-tropical and tropical cyclones. Such storms can cause enormous social and economic damage in terms of their ability to damage infrastructure, cause loss of property, life and financial loss. The phenomenon of storm surge is particularly important

as it cause waves to pile water onshore, thereby creating a higher potential for damage. The highest storm surges tend to occur along the North Shore, in western Cape Breton and at the head of the Bay of Fundy. It is projected that climate change will increase the frequency and intensity of storms in the North Atlantic and, in combination with sea level rise, will exacerbate impacts along the Nova Scotian coast. There are many potential biophysical and socio-economic impacts that can be identified, but there is insufficient information to provide specific quantitative assessments for all of these. It has, however, been estimated that Hurricane Juan, one of the most recent major storm events, caused a total of \$130 million in loss to Nova Scotia.

The greatest risks to the Nova Scotian coast may accrue to the following:

- Low-lying areas, e.g., salt marshes, floodplains and Acadian dykelands;
- areas with frequent storm conditions and high storm surge potential;
- areas of coastal infrastructure and property;
- areas of sensitive ecology;
- areas of rapid coastal erosion; and
- Perigean spring high water, i.e., the time of the largest monthly tide.

10.2.5 Coastal Water Quality

Water quality refers to the physical, chemical and biological characteristics of water that influences its ability to support designated uses. Coastal water quality is influenced by natural geological and oceanographic processes, as well as pressures from marine and land-based anthropogenic activities. The threats to coastal water quality come from land-based sources, both point and non-point sources, and shoreline and marine activities. The following are among the many threats to the quality of Nova Scotia's coastal waters:

- municipal effluents from 126 registered wastewater treatment plants;
- industrial effluents;
- petroleum refining wastes;
- food processing wastes (there are about 285 fish processing plants);
- thermal generating wastes;
- mining wastes;
- dredging and ocean dumping;
- aquaculture sites, of which there are 319 in Nova Scotia;
- shipyard activities (316 wharves); and
- offshore oil and gas activities

There is no single source of data that provides an overall picture of the condition of the province's coastal water quality. It is possible to identify areas where there are known levels of contamination, and these are usually located close to areas of urban development. High levels of contaminants (organic and heavy metals), for example, have been detected in waters, sediments and biological material in several of the province's harbours and estuaries, particularly the South Arm of Sydney Harbour, the Strait of Canso, Clam Harbour and Halifax Harbour.

Poor water quality, related mainly to bacteriological content, has resulted in beach closures, especially after rain events when increased storm water flow from land empties high organic loads into coastal waters. This results in elevated levels of bacteria which pose a health risk to the public. Such closures are of particular concern in the more highly developed areas, such as the HRM, where beaches are popular for recreational usage.

Closure of shellfish harvesting areas is another manifestation of poor coastal water quality. Between 1985 and 2000 there has been doubling of the number of shellfish closures. In 2000 there were 278 shellfish closures representing 939 km² and 3,314 km of the coastline. This trend appears to have continued.

Land-based sources of nutrients, which can stimulate unwanted, excessive growths of algal blooms in coastal waters, is also considered to be an important water quality problem. Monitoring indicates that coastal waters off parts of Cumberland, Pictou, Antigonish, Inverness, Colchester, Kings, Annapolis and Digby Counties have increased risk of contamination with nitrogen, a key eutrophication nutrient.

A lack of detailed information on water quality and its associated impacts in estuaries, salt marshes, the intertidal area, as well as the inshore marine waters, is of concern. There are numerous parameters that provide an indication of poor water quality, but it has not been possible to quantify these in a holistic sense due to the absence of any provincial-wide monitoring and summative reporting of the condition of the waters off the Nova Scotian coast. There are several water quality monitoring initiatives being undertaken around the province, but there is a need for these initiatives to become more robust and integrated in terms of their coverage and reporting.

10.2.6 Coastal Ecosystems and Habitats

There are 13 ecosystems associated with the Nova Scotian coast. These are: rocky shore; boulder/cobble shore; sandy shore; dune system; coastal forest; coastal barrens; estuaries; mud flats; coastal fresh water wetlands; tidal marsh; dykelands; coastal islands; and open water. These systems occur discontinuously along the length of the coast. Some of them are found adjacent to one another reflecting the geology, coastal dynamics and mesoclimate of Nova Scotia's ecoregions. Numerous habitats for fauna and flora occupy these ecosystems, providing Nova Scotia's shores a biologically rich asset. Unfortunately, there is little summative quantitative information on these coastal ecosystems and their associated habitats and most information presented in this report is qualitative in nature. There has been no consolidated evaluation of these ecosystem types by which their relative degree of sensitivity can be assessed or agreed on. Their relative significance to the Nova Scotian coastal zone is indicated by estimates of the land area that they cover in the 2 km strip along the coast line (Table 10.1). In the absence of any published assessment of their relative sensitivity in the Nova Scotian coastal context, it is not possible to provide any comparative quantitative ranking.

Table 10-1: Estimated area of coastal ecosystems in Nova Scotia

<i>Ecosystem</i>	<i>Estimated Area in ha within 2 km of the Coast</i>
Coastal Islands	49,291
Rocky, boulder and cobble shores	Unable to be estimated
Sandy shore and sandy dunes	6,481
Forest	602,750
Barrens	46,917
Estuaries and mudflats	205,488
Freshwater wetlands (includes nine categories of wetland)	55,248
Coastal saline ponds	4,476
Salt marsh	17,400
Open water (Bras d'Or Lakes)	26,000

Currently the main conservation mechanism to protect sensitive ecosystems and habitats is the designation of federal and provincial protected areas and parks. The current area of land protected in Nova Scotia is 452,581 ha or 8.72% of the land area. Few of the designated protected areas are situated on the coast, or positioned so as to provide specific protection for the Nova Scotian coastal ecosystem types. There are, however, protected areas that do provide varying levels of protection for some of the cited ecosystem types.

Some of the key threats to each of the ecosystem types are identified as follows:

- Coastal islands - Sea level rise, shoreline development;
- Rocky, boulder and cobble shores - Human disturbance by tourists, residential and industrial development;
- Sandy shores and sand dunes - Sand and gravel extraction, recreational ATV usage, roads, construction of buildings and coastal structures;
- Coastal forest and coastal barrens - forest harvesting, road building, ATV usage, construction of buildings and coastal structures;
- Estuaries and mudflats - industrial and commercial development, invasive species, agriculture and forestry practices;
- Coastal wetlands - infilling and development, construction of dams, changes to natural tidal influences; and
- Dykelands - climate change and sea level rise.

One of the most unique and ecologically important open water systems in Nova Scotia is the Bras d'Or Lakes area which represents a large body of water dominating the centre of Cape Breton Island. The lakes form a series of linked estuarine water bodies that are considered unique because of their brackish waters and protected inland nature.

Although the ecosystems and habitats of Nova Scotia are in relatively good condition, there is a need, given their values, to remain vigilant in their management, monitoring and protection. The development

of an appropriate monitoring and evaluation system for Nova Scotia's coastal ecosystems is paramount to understanding the dynamic changes that are occurring and how human development and activities are influencing them.

10.3 Some Strategic Perspectives

On the basis of the information that has been presented in this report, there are several key strategic perspectives as outlined below that a Nova Scotian coastal strategy will have to take into account.

10.3.1 The Complexity of the Nova Scotian Coast and its Natural Environment

Although relatively small by comparison to the rest of Canada and the North American continent, Nova Scotia has an extremely complex natural environment, which demonstrates:

- A unique geological structure that has been shaped by historical and glaciation processes to give a land form that poses special challenges for development and land management;
- A coast of 8,000 km that becomes more than 13,300 km when embayments, estuaries, coastal rivers and coastal islands are considered;
- Nine distinct ecozones with 25 ecodistricts, each of which have differing characteristics in terms of their resources and usage potential;
- A climate with high temporal and spatial variability, as evidenced by the nine distinct climatic areas identified;
- 46 primary watersheds all of which discharge into the marine environment; and
- A landscape made up of a network of terrestrial and aquatic corridors of varying size, dominated by forestry and wetland vegetation with associated fauna.

All anthropogenic development creates footprints of impact beyond their immediate physical areas. The whole of Nova Scotia fits into the concept of a coastal zone, and there are numerous physical zones of both influence and impact, the size and dimensions of which depend on the issue under discussion (see Section 10.3.3). Addressing any issue requires that its physical zone of influence and zone of impact are both well-defined and understood. It is also important to understand and assess the complexity and pervasive influence of the natural environment on all social and economic activities. From a human perspective, considerable adaptation is required, not only for basic life style, but also for the establishment and operation of all infrastructure, businesses and economic activities that are influenced by the natural environment, e.g., municipal infrastructure, utilities, tourism, recreation, transport, fishery, agriculture, forestry, etc.

There will be a great challenge in integrating coastal management into the provincial sustainable development program. Over the past 20 years there have been many examples throughout the world of countries that have not initiated, have abandoned or failed to implement integrated coastal management programs because they appeared, or became, too complicated (Nova Scotia Land Use Committee, 1994; Sorensen, 1997; Intergovernmental Oceanographic Commission, 2005). It will be important develop a simple workable coastal management program that is appropriate for Nova Scotia.

10.3.2 *Balancing a Service-Based Economy with the Natural Resources Economy*

The current economy of Nova Scotia is largely service-based; 76% of its 2007 GDP arose from the service sector industries and only 8% from natural resource-based industries. The trend is one where the GDP contribution from natural resource-based industries is continuing to decrease, whilst that of goods-producing and service industries is increasing. If this trend is to continue, there will be a challenge to ensure that natural resources do not become a neglected part of the Nova Scotian economy. This is particularly important because there are several sectors or industries that rely on the natural environment to sustain them, e.g., agriculture, forestry, fisheries and aquaculture; mining and oil and gas extraction. In addition, these industries need to be supported by infrastructure, including utilities (electrical power, natural gas, water, sewage, etc.) and transportation networks.

10.3.3 *Zones of Influence and Zones of Impact*

The definition of the coastal zone is best done through consideration of the zones of influence and impact that relate to specific issues (Fanning, 2008). The development of any strategy for a particular management issue must take into account the relative physical dimensions of these two zones and how they interrelate. A conceptual ballpark physical description of the zones of influence and impact for each of the six focus issues addressed in this report is given in Table 10.2. There will, no doubt, be considerable debate and disagreement on the exact physical dimensions of these zones, and the values given are indicative only to demonstrate the concept and the complexity in defining the two zones. In principle, these indicate that the physical dimensions of these zones differ depending on the issue, with more variation occurring for the zone of influence, which is generally larger than the zone of impact, bearing in mind an assumption that the ocean area part is limited to the nearshore zone. Effective sustainable development of the coastal zone will require strategies that include consideration of the physical dimensions of these zones and integration of the associated political, social, economic and ecological factors that are at play.

Table 10-2: Indicative Physical Dimensions of Zones of Influence and Impact for the Six Focus Issues of This Report

<i>Issue</i>	<i>Comments/Notes</i>	
	<i>Zone of Influence</i>	<i>Zone of Impact</i>
Coastal Development	<p>This might be best represented by a strip of sea and land running parallel to the coastline of some 30 to 40 km in width (30 km of land and 10 km of sea). This strip covers the area in which most of developments take place or can be seen. In this report, use of data for the 2 km strip to describe characteristics of the zone is arbitrary, but possibly represents the most concentrated part within the zone of influence.</p> <p>Possible physical dimensions: 30 to 40 km wide strip of land and sea.</p>	<p>This could be considered to be almost the same as the zone of influence, although certain impacts will be far wider.</p> <p>Possible physical dimensions: 30-40 km wide strip of land and sea</p>

<i>Issue</i>	<i>Comments/Notes</i>	
	<i>Zone of Influence</i>	<i>Zone of Impact</i>
Working Waterfronts	<p>This is the physical working waterfront area where economic activities take place. Depending on the size of the working waterfront, this could extend from a radius of 200 m to about 2 km.</p> <p>Possible physical dimensions: Radius of between 200 m to 2 km around the centre of the waterfront.</p>	<p>This is where the working waterfront links up with communities and associated infrastructure. It could extend from within the physical waterfront itself to considerable distances where communities and infrastructure occur. The impacts are more related to social and economic factors than ecological ones.</p> <p>Possible physical dimensions: Radius of up to 30 km inland from the physical waterfront.</p>
Coastal Public Access	<p>This could be represented by the properties contiguous to the coastline.</p> <p>Possible physical dimensions: Strip of land running inland of the coastline that can vary between 50 m and possibly up to 30 km dependent on ownership.</p>	<p>This could be represented by the area where the public seeks, or gets, access to the coastline, including the viewshed.</p> <p>Possible physical dimensions: Strip of land where people can get physical or “viewshed access” that can vary between 50 m and up to 10 km inland of the coastline.</p>
Sea-Level Rise and Storm Surge Events	<p>Factors affecting sea-level rise and storm surge events are of global, continental and oceanic dimensions as they are dependent on geological and climate related phenomena.</p> <p>Possible physical dimensions: 0-10,000 km from the coastline.</p>	<p>The impacts of sea-level rise and storm events are most felt in the immediate vicinity of the coastline and estuaries of tidal rivers. This will depend entirely on topography, elevation and the resources and structures within any affected areas.</p> <p>Possible physical dimensions: Strip of land and sea running parallel to the coastline, in the order of 500 m wide. This would be greater in the tidal rivers of the Bay of Fundy.</p>
Coastal Water Quality	<p>The sources of water pollution are multiple and can include both land and sea-based sources.</p> <p>Possible physical dimensions: This</p>	<p>Impacts of pollution are mainly felt in coastal wetlands, embayments, estuaries and the inshore area. This can be complicated by the influence of ocean currents which transport</p>

<i>Issue</i>	<i>Comments/Notes</i>	
	<i>Zone of Influence</i>	<i>Zone of Impact</i>
	includes the watershed on the landward side, plus an area of the marine environment where activities impact water quality. In Nova Scotia this extends up to 60 km inland and possibly the nearshore marine area (2 km).	pollutants. Possible physical dimensions: Inland from the low water mark where salt marshes, salt-flats and dykes occur (5 km), to the 12 nautical mile Territorial Sea. This could be extended into the offshore zone due to coastal marine currents.
Coastal ecosystems and habitats	Coastal ecosystems and habitats can be influenced by a wide variety of factors. From an anthropogenic perspective this can be by direct or indirect contact. Possible physical dimensions: The whole of inland Nova Scotia (60 km inland) and parts of the marine environment where economic activities overlap areas of the ecosystems and habitats (nearshore zone – 2 km).	Zone of impact is the actual area occupied by the ecosystems and habitats. Possible physical dimensions: Inland from the sea water level where salt marshes, salt-flats and dykes occur (5 km) into the marine nearshore zone (2 km). This could be extended into the offshore zone due to the influence of coastal marine currents.

10.3.4 Demographic Trends

The total population in Nova Scotia has remained static over the last 10 years, but there has been migration towards HRM. According to the 2006 Census, over 40% of the province's population now lives within HRM. Counties that have experienced population growth include HRM (8.7 %), Hants County (4.3%), Colchester County (1.5 %) and Kings County (1.4 %). Other counties in the province have decreased in population, e.g., 1 % for Lunenburg County to as high as 17 % for Guysborough County. Another demographic shift is that of an ageing population, in which the largest number of people are now found in the 40 to 60 years old age group. About 15% of Nova Scotians are older than 65, and the population of seniors is expected to increase by 70 % within the next 20 years. This pattern is a good indicator of a gradual decline in the prosperity of provincial residents who are more dependent on the natural resource economy, as opposed to the service-based economy. These trends, should they continue, or accelerate, have self-evident implications that are not in harmony with Nova Scotia's vision for prosperity.

10.3.5 The Importance of Heritage and Cultural Resources

Modern Nova Scotia is a mix of cultures with the current diversity of origin consisting of aboriginal First Nations, British, French (Acadian and other), German, other European nationalities and African. Each of these cultures has its own special history in terms of colonization and development. There are many coastal resources, areas of interest and sites which hold special importance to these cultural groups, as they articulate their heritage in Nova Scotia. One of the challenges for sustainable development is to ensure that these interests are understood and that conservation of cultural heritage resources is a component of comprehensive coastal management.

10.3.6 Multiple and Conflicting Jurisdictions

This report has indicated that there are at least 45 pieces of international, federal, provincial and municipal legislation that influence how provincial coastal resources are managed. Whilst legislation and associated mandates are vital to good governance, they can also be one of the biggest stumbling blocks to achieving sustainable development and implementing integrated coastal management.

10.3.7 Appropriate Land Unit Planning and Management

History presents evidence that Nova Scotia was colonized from Europe for political objectives and that the initial emphasis was on a military and physical presence in the “New World”. Thereafter, as more became known of the province’s natural resources, the development pattern changed to incorporate the value of the ocean and lands that could easily be dyked for intensive agricultural use. The subsequent development of Nova Scotia’s towns and associated communications infrastructure has been largely based on sites that were originally established along the coastline. This has largely followed an “add on” approach to what has already been there, without actually achieving the best sustainable arrangement for the area’s resources. In some cases, historical infrastructure and planning approaches has impeded the attainment of sustainable development. The practice of promoting linear development of strips of land adjacent to the shoreline, for example, is a practice which requires reconsideration as it is a development pattern that can be associated with many potential negative impacts.

Planning, usage and management of the landscape are conventionally undertaken based on the application of land units that are associated with specific interests, e.g., community, sectoral, political, resource, technical, etc. Such approaches, unfortunately, do little to promote the concept of integrated management and can be confusing or, at worst, conflicting. Sustainable development and integrated coastal management require that the use of land units reflect the issues that need to be dealt with, as well as the concept of areas of influence and areas of impact. The use of the watershed concept, which attempts to incorporate both a physical and an operational zone of influence, is a good example of an appropriate land use unit for implementing coastal management in Nova Scotia.

10.3.8 Knowledge Management

Sound and wise management decisions are best made when the responsible parties are knowledgeable and well-informed about the issues at stake. This report has highlighted the complexities of the Nova Scotian social, economic and natural environment within a coastal context. It has also indicated that there are many unknowns and areas where there is inadequate information available for decision-makers. Much of the current knowledge, opinion and decision-making are based on anecdotal information. The whole question of knowledge management is one which must be incorporated into the development, planning, implementation and evaluation of any future coastal zone programs. Knowledge management includes activities such as: research; education; inventory and stocktaking; databases – primary and metadatabases; guidelines and standards (accepted values); monitoring; processing of information (communication and reporting); and evaluation.

10.3.9 Integrated Coastal Zone Governance and the Measurement and Evaluation of Progress and Performance

Integrated coastal zone management is an extremely complicated and involved process that requires that the input from and participation of stakeholders from numerous government, non-government, industrial,

community and academic organizations. Most intended coastal management programs have been challenged to obtain the necessary cooperation and synergy (Intergovernmental Oceanographic Commission, 2005). One of the main factors preventing the successful development and implementation of integrated coastal management has been the absence of appropriate governance systems to facilitate accountability and the monitoring of progress and performance (Sorensen, 1997; Walmsley, 2006). Integrated management programs cannot proceed effectively without having the following in place:

- the identification of agreed societal outcomes;
- the definition of workable and feasible objectives;
- the identification of responsibilities and accountability;
- appropriate resource allocation; and
- mechanisms to measure and evaluate progress and performance.

10.4 References

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Appendix 1

Contacts

Table includes people who were contacted by the drafters of the report for information

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Wyatt White	Office of Aboriginal Affairs

Appendix 2

Indicators

List of Indicators that have been used in the chapters of this report (see Chapter 2 for explanation)

Section of Report	Indicators Used
Chapter 3:	
3.1 Natural Environment	Basic geographical statistics
	Areas of open freshwater in Nova Scotia
	Primary Watersheds
	Geological map of Nova Scotia
	Distribution of bedrock types in Nova Scotia
	Positioning of ocean currents that influence Nova Scotian climate
	Distribution of ecoregions in Nova Scotia
	Percentage of forestry area in Nova Scotia
	Percentage of area devoted to agriculture
	Wetland conversion statistics
	Nova Scotia energy demand and supply
	Siting of protected areas in Nova Scotia
	Legally protected area in Nova Scotia
3.2 Socio-economic environment	Canadian real gross domestic product by province and territory
	Nova Scotia GDP by industry type
	Number of farms in Nova Scotia (1871 – 2006)
	Commercial fishery landings in Nova Scotia (1987-2007)
	Value of Nova Scotian commercial fish landings by type (2002-2007)
	Production and value of Nova Scotia's aquaculture industry (1994-2007)
	Value of mining primary production (1987-2007)
	Number of vessels and tonnage for Nova Scotian ports in 2004
	Tourism revenues by region (2004-2007)
	Population of Nova Scotia by county (1996-2006)
	Population Pyramids for Nova Scotia (2006)
	Educational attainment for people 20 years and older in Nova Scotia
	Community health survey 2007
	Labour participation rate and unemployment in Nova Scotia by county for 2006
	Individual and household incomes for Nova Scotia (2001)
	Population of Nova Scotia by ethnic origin

Section of Report	Indicators Used
	Immigration statistics for Nova Scotia (1996-2006)
	Distribution of archaeological sites in Nova Scotia
	Fossil sites in Nova Scotia
	Nova Scotia's lighthouses
	Shipwrecks off Nova Scotia's coast
3.3 Built Environment	Transport routes in the early 18 th century
	The 1947 plan for Halifax
	The grid pattern established by the British in Lunenburg
	The 10 largest communities in Nova Scotia (2008)
	Distribution of private dwellings by housing type in Nova Scotia (2006)
	Primary areas in Nova Scotia with significant industrial development
3.4 Regulatory Environment	List of relevant legislation
Chapter 4: Coastal Development	% Coverage of different development types within 2 km of coastline
	Location of different development types within 2km of coastline
	% Land use immediately adjacent to Nova Scotia's coast
	Density of civic address points in Nova Scotia
	% change in occupied dwellings in regional and rural census areas
	Distribution of rural coastal population
	Rate of lot registration within 2km of coastline per decade (1899-2008)
	Year of registration of properties within 2km of coast in Pubnico Harbour area (1970-2008)
	Availability of municipal planning strategies for counties in Nova Scotia
	Federal and provincial designated lands in Nova Scotia
Chapter 5: Working Waterfronts	Number of port facilities transferred to private industry
	Location of small waterfronts in Nova Scotia
	Classification and numbers of 93 working waterfront communities in 2006
	Income of working 93 waterfront community groups in 1996; and 2001
	Housing requirements of 93 working water waterfront community groups in 1991; and 2006
	Participation rate of 93 working water waterfront community groups in 1991; and 2006

Section of Report	Indicators Used
	Population change of 93 working water waterfront community groups between 1991 and 1996; and 2001 and 2006
	Location of working waterfront communities in Nova Scotia
	Wharves and harbours in Musquodoboit harbour
	Socio-economic changes in Musquodoboit harbour
	Wharves and harbours in LaHave, Lunenburg County
	Socio-economic changes in La Have, Lunenburg County
	Wharves and harbours in Digby Neck, Digby County
	Socio-economic changes in Digby Neck, Digby County
	Working waterfronts that improved their conditions from 1991 – 2006
	Working waterfronts that deteriorated their conditions from 1991 – 2006
Chapter 6: Public Coastal Access	Designated protected beaches
	Public land ownership with coastal frontage in Nova Scotia
	Comparison of crown land versus coastal frontage in Cape Breton
	Potential wilderness areas in Nova Scotia
	Viewplanes from the Halifax Citadel
	Examples of residential strip development on the coast between Halifax and Lunenburg
Chapter 7: Sea-level Rise and Storm Events	Mean annual water levels at 6 harbours in Atlantic Canada (1920-2009)
	Regional rates of relative sea level rise in Atlantic Canada
	Sea level rise at Fortress Louisbourg
	Return period of extreme sea levels into the next century at Halifax
	40-year return level of extreme storm surges
	Regional physical sensitivity of coastline in Atlantic Canada
	Flooding scenarios for downtown Halifax
	Flood risk assessment of Annapolis Royal
Chapter 8: Coastal Water Quality	Number of point sources of coastal water contamination in Nova Scotia
	Areas where there is known coastal water contamination
	Contaminant concentrations from surface sediments in coastal HRM
	Distribution of PAH in top layer sediments of Sydney Harbour
	Distribution of PCBs in sediment of Sydney Harbour
	Distribution of seabed macro-invertebrate communities in Sydney Harbour
	Concentrations of contaminants in mussels at select locations
	Number of shellfish closures in Nova Scotia (1940-2000)
	Commercial landings of shellfish in Nova Scotia
	Aquaculture monitoring locations

Section of Report	Indicators Used
	Coastal areas at risk of nitrogen contamination
	Sites of environmental water quality monitoring programs
Chapter 9: Sensitive Coastal Ecosystems and Habitats	Number and area of Protected Areas
	Number and area of coastal islands
	Number and area of protected islands
	Area of protected rocky, boulder and cobbled shores
	Distribution of sandy shores and dunes
	Distribution of protected beaches
	Area of protected sandy shores and dunes
	Coastal zone forest cover within 2km of coast
	Distribution of coastal barrens
	Area of coastal barrens and rock barrens within 2km of coast
	Area of protected coastal forest and coastal barrens
	Area of estuarine mudflat
	Distribution of estuarine flats
	Distribution of coastal freshwater wetlands
	Area of wetland types within 2km of coast
	Area of man-made dykes
	Area of salt marsh
	Distribution of salt marsh
	Loss of natural salt marsh
	Area of protected freshwater wetland
	Area of protected salt marsh
	Area of coastal saline ponds
	Details of Acadian dykelands and marsh bodies
	Characteristics of the Bras d'Or Lakes Watersheds
	Provincially protected areas as related to identified ecosystem types

Appendix 3

Legislation, Policies and Designations with Relevance to the Nova Scotia Coast

Table A3.1: Legislation, Policies and Designations

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
INTERNATIONAL		
United Nations Convention on the Law of the Sea, 1982	States implement the legal regime set out in the UN Convention. Disputes are negotiated between states. Failing successful negotiation, there are several options for binding third-party settlement.	The United Nations Convention on the Law of the Sea lays down a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources. It enshrines the notion that all problems of ocean space are closely interrelated and need to be addressed as a whole. Two agreements regarding fish stocks and seabed mining have been made to address issues that arose from the implementation of the convention.
Available online: http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm		
FEDERAL		
Canada's Oceans Strategy, 2002	Department of Fisheries and Oceans (DFO)	Canada's Oceans Strategy is the Government of Canada's policy statement for the management of estuarine coastal and marine ecosystems. The Oceans Strategy emphasizes integrated management planning as a means to manage ocean resources.
Available online: http://www.dfo-mpo.gc.ca/oceans-habitat/oceans/ri-rs/cos-soc/page02_e.asp		
<i>Oceans Act</i> , 1996	Department of Fisheries and Oceans (DFO)	The <i>Oceans Act</i> lays out a legal framework for the management of Canada's oceans (Arctic, Pacific and the Atlantic) The <i>Act</i> highlights the principles of sustainable development, integrated management, and precautionary approach. The <i>Act</i> contains laws related to oceans, ocean processes, marine resources and marine ecosystems.
<i>Oceans Act</i> (1996, c.31) Available online: http://laws.justice.gc.ca/en/ShowFullDoc/cs/O-2.4//en		
Regulations Made under the <i>Oceans Act</i> , 1996 relevant to the Nova Scotia coastal area		<ul style="list-style-type: none"> • Fishing Zones of Canada (Zones 1, 2 and 3) Order • Fishing Zones of Canada (Zones 4 and 5) Order • Gully Marine Protected Area Regulations See: http://www.mar.dfo-mpo.gc.ca/oceans/e/essim/gully/essim-gully-e.html • Territorial Sea Geographical Coordinates Order
<i>Fisheries Act</i> , 1985	Department of	The <i>Fisheries Act</i> lays out a legal framework for the

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
	Fisheries and Oceans (DFO)	management of fisheries and protection of marine and freshwater fish habitat.
<i>Fisheries Act</i> (R.S., 1985, c.F-14) Available online: http://laws.justice.gc.ca/en/F-14/		
Regulations Made under the <i>Fisheries Act</i> , 1985 relevant to the Nova Scotia coastal area		<ul style="list-style-type: none"> • Aboriginal Communal Fishing Licences Regulations • Atlantic Fishery Regulations, 1985 • Chlor-Alkali Mercury Liquid Effluent Regulations • Fish Health Protection Regulations • Fish Toxicant Regulations • Fishery (General) Regulations • Foreign Vessel Fishing Regulations • Management of Contaminated Fisheries Regulations • Marine Mammal Regulations • Maritime Provinces Fishery Regulations • Meat and Poultry Products Plant Liquid Effluent Regulations • Metal Mining Effluent Regulations • Petroleum Refinery Liquid Effluent Regulations • Potato Processing Plant Liquid Effluent Regulations • Pulp and Paper Effluent Regulations
<i>Coastal Fisheries Protection Act</i> , 1985	Department of Fisheries and Oceans (DFO)	The <i>Coastal Fisheries Protection Act</i> prohibits foreign fishing vessels from entering Canadian fisheries waters, or fishing, unloading, discharging crew members in Canada or Canadian fisheries waters unless authorized by this Act or the regulations, any other law of Canada or a treaty. The <i>Act</i> also gives the Governor in Council authority to make regulations regarding foreign fishing vessels, permits and license for those vessels, and other regulations regarding foreign fishing vessels.
<i>Coastal Fisheries Protection Act</i> (R.S., 1985, c. C-33) Available online: http://laws.justice.gc.ca/en/C-33/index.html		
Regulations Made under the <i>Coastal Fisheries Protection Act</i> , 1985 relevant to the Nova Scotia coastal area		<ul style="list-style-type: none"> • Coastal Fisheries Protection Regulations <ul style="list-style-type: none"> ○ Includes regulations respecting foreign fishing vessels
<i>Fisheries Development Act</i> , 1985	Department of Fisheries and Oceans (DFO)	The <i>Fisheries Development Act</i> establishes a legal basis for the more efficient exploitation of fishery resources and for the exploration for and development of new fishery resources and new fisheries; the introduction and demonstration to fishermen of new types of fishing vessels and fishing equipment and of new fishing techniques; and for the development of new fishery products and for the

Legislation, Agreements & Policies	Responsible Department	Objectives
		improvement of the handling, processing and distribution of fishery products.
<i>Fisheries Development Act (R.S., 1985, c. F-21)</i> Available online: http://laws.justice.gc.ca/en/F-21/index.html		
<i>Fishing and Recreational Harbours Act, 1985</i>	Department of Fisheries and Oceans (DFO)	The <i>Fishing and Recreational Harbours Act</i> provides a legal basis for the administration and development of certain fishing and recreational harbours in Canada (The <i>Act</i> applies to any port, as defined in section 5 of the Canada Marine Act, or any harbour, works or property under the jurisdiction of a harbour commission established under an Act of Parliament; or any harbour, wharf, pier or breakwater under the control and management of any member of the Queen’s Privy Council for Canada other than the Minister.)
<i>Fishing and Recreational Harbours Act (R.S., 1985, c. F-24)</i> Available online: http://laws.justice.gc.ca/en/F-24/index.html		
Regulations Made under the <i>Fishing and Recreational Harbours Act, 1985</i> relevant to the Nova Scotia coastal area		Fishing and Recreational Harbours Regulations. Includes regulations regarding leases and licences, mooring vessels, berthage, wharfage and other charges, ticket offences, and fines.
<i>Canada Shipping Act, 2001</i>	Transport Canada except Part 8 (Pollution Prevention and Response), which is Department of Fisheries and Oceans (DFO) and Transport Canada	<p>The objectives of the <i>Canada Shipping Act</i> are to:</p> <ul style="list-style-type: none"> • protect the health and well-being of individuals, including the crews of vessels, who participate in marine transportation and commerce; • promote safety in marine transportation and recreational boating; • protect the marine environment from damage due to navigation and shipping activities; • develop a regulatory scheme that encourages viable, effective and economical marine transportation and commerce; • promote an efficient marine transportation system; • develop a regulatory scheme that encourages the viable, effective and economical use of Canadian waters by recreational boaters; • ensure that Canada can meet its international obligations under bilateral and multilateral agreements with respect to navigation and shipping; • encourage the harmonization of marine practices; and • establish an effective inspection and enforcement program. <p>The <i>Act</i> covers registration, listing, recording of vessels, personnel, safety, navigation services, incidents, accidents and casualties, wreck, pollution prevention and response, and</p>

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		other relevant legal matters regarding shipping.
<i>Canada Shipping Act, 2001 (2001, c.26)</i> Available online: http://laws.justice.gc.ca/en/C-10.15/index.html		
Regulations Made under the <i>Canada Shipping Act</i> relevant to the Nova Scotia coastal area		<ul style="list-style-type: none"> • Administrative Monetary Penalties Regulations • Anchorage Regulations • Ballast Water Control and Management Regulations • Board of Steamship Inspection Scale of Fees • Boat and Fire Drill and Means of Exit Regulations • Boating Restriction Regulations [Repealed] • Cargo, Fumigation and Tackle Regulations • Certain Areas Covered With Water Proclaimed Public Harbours Effective January 1, 1980 • Charts and Nautical Publications Regulations, 1995 • Classed Ships Inspection Regulations, 1988 • Collision Regulations • Competency of Operators of Pleasure Craft Regulations • Crew Accommodation Regulations • Eastern Canada Vessel Traffic Services Zone Regulations • Environmental Response Arrangements Regulations • Fire Detection and Extinguishing Equipment Regulations • Home-Trade, Inland and Minor Waters Voyages Regulations • Large Fishing Vessel Inspection Regulations • Life Saving Equipment Regulations • Load Line Regulations • Marine Machinery Regulations • Marine Personnel Regulations • Minor Waters Order • Navigation Safety Regulations • Pollutant Discharge Reporting Regulations, 1995 • Port Wardens Tariff • Private Buoy Regulations • Regulations Excluding Certain Government Ships from the Application of the Canada Shipping Act • Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals • Response Organizations and Oil Handling Facilities Regulations • Sable Island Regulations • Safe Working Practices Regulations • Safety Management Regulations • Ship Radio Inspection Fees Regulations

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		<ul style="list-style-type: none"> • Ship Station (Radio) Regulations, 1999 • Ship Station (Radio) Technical Regulations, 1999 • Shipping Casualties Reporting Regulations • Ships' Elevator Regulations • Small Fishing Vessel Inspection Regulations • Small Vessel Regulations • Special-purpose Vessels Regulations • St. Clair and Detroit River Navigation Safety Regulations • Tackle Regulations • Tariff of Fees of Shipping Masters • Towboat Crew Accommodation Regulations • Vessel Certificates Regulations • Vessel Clearance Regulations • Vessel Detention Orders Review Regulations • Vessel Operation Restriction Regulations • Vessel Registration and Tonnage Regulations • Vessel Traffic Services Zones Regulations • Vessels Registry Fees Tariff • VHF Radiotelephone Practices and Procedures Regulations
<i>Navigable Waters Protection Act, 1985</i>	Transport Canada	The <i>Navigable Waters Protection Act</i> prohibits the construction of works in navigable waters unless the work is approved by the Minister of Transport.
<p><i>Navigable Waters Protection Act</i> (R.S., 1985, c. N-22) Available online: http://laws.justice.gc.ca/en/ShowFullDoc/cs/N-22///en</p>		
Regulations Made under the <i>Species at Risk Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Ferry Cable Regulations • Navigable Waters Bridges Regulations • Navigable Waters Works Regulations
<i>International Boundary Waters Treaty Act, 1985</i>	Department of Foreign Affairs and International Trade	The <i>International Boundary Waters Treaty Act</i> implements the treaty relating to the boundary waters and to questions arising along the boundary between Canada and the United States made between His Majesty, King Edward VII, and the United States, 1909.
<p><i>International Boundary Waters Treaty Act</i> (R.S., 1985, c. I-17) Available online: http://laws.justice.gc.ca/en/I-17/index.html</p>		
Regulations Made under the <i>International Boundary Waters Treaty Act, 1985</i> with potential relevance for the Nova Scotia coastal area		International Boundary Waters Regulations
<i>Canadian Environmental</i>	Environment Canada in cooperation with other	The <i>Canadian Environmental Protection Act, 1999</i> gives the Minister of Environment the authority to issue non-regulatory

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
<i>Protection Act, 1999</i>	departments	objectives, guidelines and codes of practice to prevent and reduce marine pollution from land-based sources following consultation with other affected Ministers. The <i>Act</i> also prohibits the disposal of wastes and other matter at sea within Canadian jurisdiction and by Canadian ships in international waters and waters under foreign jurisdiction, unless the disposal is done under a permit issued by the Minister.
<p><i>Canadian Environmental Protection Act, 1999</i> (1999, c. 33) Available online: http://laws.justice.gc.ca/en/C-15.31/text.html</p>		
Regulations Made under the <i>Canadian Environmental Protection Act, 1999</i> with potential relevance for the Nova Scotia coastal area	<ul style="list-style-type: none"> • 2-Butoxyethanol Regulations • Asbestos Mines and Mills Release Regulations • Benzene in Gasoline Regulations • Chlor-Alkali Mercury Release Regulations • Chlorobiphenyls Regulations [Repealed] • Contaminated Fuel Regulations • Disposal at Sea Regulations • Environmental Emergency Regulations • Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations • Export Control List Notification Regulations • Export of Substances Under the Rotterdam Convention Regulations • Federal Halocarbon Regulations, 2003 • Federal Mobile PCB Treatment and Destruction Regulations • Federal Registration of Storage Tank Systems for Petroleum Products and Allied Petroleum Products on Federal Lands or Aboriginal Lands Regulations [Repealed] • Fuels Information Regulations, No. 1 • Gasoline and Gasoline Blend Dispensing Flow Rate Regulations • Gasoline Regulations • Interprovincial Movement of Hazardous Waste Regulations • List of Hazardous Waste Authorities • Masked Name Regulations • New Substances Fees Regulations • New Substances Notification Regulations (Chemicals and Polymers) • New Substances Notification Regulations (Organisms) 	

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		<ul style="list-style-type: none"> • Off-Road Compression-Ignition Engine Emission Regulations • Off-Road Small Spark-Ignition Engine Emission Regulations • On-Road Vehicle and Engine Emission Regulations • Ozone-Depleting Substances Regulations, 1998 • PCB Regulations • PCB Waste Export Regulations, 1996 • Perfluorooctane Sulfonate and its Salts and Certain Other Compounds Regulations • Persistence and Bioaccumulation Regulations • Phosphorus Concentration Regulations • Polybrominated Diphenyl Ethers Regulations • Prohibition of Certain Toxic Substances Regulations, 2003 • Prohibition of Certain Toxic Substances Regulations, 2005 • Pulp and Paper Mill Defoamer and Wood Chip Regulation • Pulp and Paper Mill Effluent Chlorinated Dioxins and Furans Regulations • Regulations Respecting Applications for Permits for Disposal at Sea • Rules of Procedure for Boards of Review • Secondary Lead Smelter Release Regulations • Solvent Degreasing Regulations • Storage of PCB Material Regulations [Repealed] • Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations • Sulphur in Diesel Fuel Regulations • Sulphur in Gasoline Regulations • Tetrachloroethylene (Use in Dry Cleaning and Reporting Requirements) Regulations • Tributyltetradecylphosphonium Chloride Regulations • Vinyl Chloride Release Regulations, 1992 • Virtual Elimination List
<i>Canadian Environmental Assessment Act, 1992</i>	Environment Canada	The <i>Canadian Environmental Assessment Act</i> ensures that the environmental effects of projects are carefully reviewed before federal authorities take action in connection with them so that projects do not cause significant adverse environmental effects. The <i>Act</i> promotes cooperation and coordinated action between federal and provincial governments and between federal and Aboriginal peoples on environmental assessments. The <i>Act</i> also ensures that

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		development in Canada or on federal lands does not cause significant adverse environmental effects in areas surrounding the project. Furthermore, the <i>Act</i> ensures that there is an opportunity for public participation in the environmental assessment process.
<p><i>Canadian Environmental Assessment Act</i> (1992, c. 37) Available online: http://laws.justice.gc.ca/en/ShowFullDoc/cs/C-15.2///en</p>		
Regulations Made under the <i>Canadian Environmental Assessment Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Canada Port Authority Environmental Assessment Regulations • Comprehensive Study List Regulations • Crown Corporations Involved in the Provision of Commercial Loans Environmental Assessment Regulations • Exclusion List Regulations [Repealed] • Exclusion List Regulations, 2007 • Federal Authorities Regulations • Inclusion List Regulations • Law List Regulations • Projects Outside Canada Environmental Assessment Regulations • Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements
<i>Migratory Birds Convention Act, 1994</i>	Environment Canada	The <i>Migratory Birds Convention Act, 1994</i> protects and conserves migratory birds, as populations and individual birds, and their nests. The <i>Act</i> implements the 1916 convention for the protection of migratory birds in Canada and the United States (full title: Convention Between the United States and Great Britain (for Canada) for the Protection of Migratory Birds; 39 Stat. 1702; TS 628). This <i>Act</i> coastal habitat used by migrating birds.
<p><i>Migratory Birds Convention Act, 1994</i> (1994, c. 22) Available online: http://laws.justice.gc.ca/en/ShowFullDoc/cs/M-7.01///en</p>		
Regulations Made under the <i>Migratory Birds Convention Act, 1994</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Migratory Bird Sanctuary Regulations • Migratory Birds Regulations
<i>Species at Risk Act, 2002</i>	Environment Canada in cooperation with other departments	The <i>Species at Risk Act</i> protects wildlife species from becoming extinct by providing for the recovery of species at risk due to human activity; and by ensuring through sound management that species of special concern do not become endangered or threatened. The <i>Act</i> includes prohibitions

Legislation, Agreements & Policies	Responsible Department	Objectives
		against killing, harming, harassing, capturing or taking species at risk, and against destroying their critical habitats., including marine and coastal areas.
<p><i>Species at Risk Act</i> (2002, c. 29) Available online: http://laws.justice.gc.ca/en/s-15.3/text.html</p>		
Regulations Made under the <i>Species at Risk Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Order Acknowledging Receipt of the Assessment Done Pursuant to Subsection 23(1) of the Act • Order Extending the Time for the Assessment of the Status of Wildlife Species • Order Giving Notice of Decisions not to add Certain Species to the List of Endangered Species
<i>Canada Water Act</i> , 1985	Environment Canada	The <i>Canada Water Act</i> contains provisions for formal consultation and agreements with the provinces for the protection of water through comprehensive water resources management programs.
<p><i>Canada Water Act</i> (R.S., 1985, c. C-11) Available online: http://laws.justice.gc.ca/en/ShowFullDoc/cs/C-11//en</p>		
<i>Canada Wildlife Act</i> , 1985	Environment Canada	The <i>Canada Wildlife Act</i> , gives the Minister of the Environment authority to promote and recommend conservation, initiate and undertake research, coordinate and implement wildlife policies and programs in cooperation with provincial governments. It also outlines provisions for the Minister of the Environment's authority over wildlife research, conservation and interpretation on public lands. The <i>Act</i> gives the Governor in Council authority to establish protected marine areas in any area of the sea that forms part of the internal waters of Canada, the territorial sea of Canada or the exclusive economic zone of Canada. The <i>Act</i> also gives the Minister of the Environment authority to provide advice relating to any wildlife research, conservation and interpretation carried out in protected marine areas and may carry out measures for the conservation of wildlife in those areas.
<p><i>Canada Wildlife Act</i> (R.S., 1985, c. W-9) Available online: http://laws.justice.gc.ca/en/ShowFullDoc/cs/W-9//en</p>		
Regulations Made under <i>Canada Wildlife Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Assigning the Administration, Management and Control of Certain Lands from the Minister of Indian Affairs and Northern Development to the Minister of the Environment (SI/86-150) • Assigning to the Minister of the Environment the Administration, Management and Control of Certain

Legislation, Agreements & Policies	Responsible Department	Objectives
		Public Lands <ul style="list-style-type: none"> • Order Assigning to the Minister of the Environment the Administration of Certain Public Lands • Order Authorizing the Minister of the Environment to Exercise, with the Concurrence of the Minister of National Defence, the Administration of Certain Public Lands • Wildlife Area Regulations
<i>Canada National Parks Act, 2000</i>	Canadian Heritage	The <i>Canada National Parks Act</i> gives the Governor in Council authority to make regulations regarding the operation and maintenance of National Parks. Of particular importance to marine environments are regulations regarding the protection of fauna, the taking of specimens of fauna for scientific or propagation purposes, and the destruction or removal of dangerous or superabundant fauna; the establishment, maintenance, administration of trails and wharves
<i>Canada National Parks Act (2000, c. 32)</i> Available online: http://laws.justice.gc.ca/en/N-14.01/index.html		
Regulations Made under the <i>Canada National Parks Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • National Historic Parks General Regulations • National Historic Parks Wildlife and Domestic Animals Regulations • National Historic Sites of Canada Order • National Parks General Regulations • National Parks of Canada Businesses Regulations • National Parks of Canada Cottages Regulations • National Parks of Canada Fishing Regulations • National Parks of Canada Water and Sewer Regulations • National Parks Town, Visitor Centre and Resort Subdivision Designation Regulations • National Parks Wilderness Area Declaration Regulations • National Parks Wildlife Regulations
<i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act, 1988</i>	Natural Resources Canada	The <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act</i> implements an Agreement between the Government of Nova Scotia and the Government of Canada on Offshore Petroleum Resource Management and Revenue. (See Provincial equivalent the <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act</i>). The joint operation of the federal and provincial <i>Acts</i> legally establishes the Canada-Nova Scotia Offshore Petroleum Board, which is responsible for the regulation of petroleum activities in the Nova Scotia Offshore Area. The

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		Board regulates the health and safety for offshore workers, protection of the environment, management and conservation of petroleum resources, employment and industrial benefits, issuance of offshore licences, resource evaluation, data management and distribution.
<p><i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act</i> (1988, c. 28) Available online: http://laws.justice.gc.ca/en/C-7.8/index.html</p>		
<p>Regulations Made under the <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act</i> with potential relevance for the Nova Scotia coastal area</p>	<ul style="list-style-type: none"> • Regulations made under made under the <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act</i> include: <ul style="list-style-type: none"> ○ Canada-Nova Scotia Oil and Gas Spills and Debris Liability Regulations (SOR/95-123) ○ Nova Scotia Offshore Area Petroleum Diving Regulations (SOR/95-189) ○ Nova Scotia Offshore Area Petroleum Geophysical Operations Regulations (SOR/95-144) ○ Nova Scotia Offshore Area Petroleum Production and Conservation Regulations (SOR/95-190) ○ Nova Scotia Offshore Certificate of Fitness Regulations (SOR/95-187) ○ Nova Scotia Offshore Petroleum Drilling Regulations (SOR/92-676) ○ Nova Scotia Offshore Petroleum Installations Regulations (SOR/95-191) ○ Nova Scotia Offshore Revenue Account Regulations (SOR/93-441) ○ Nova Scotia Offshore Revenue Fiscal Equalization Offset Payments Regulations (SOR/96-249) ○ Nova Scotia Resources (Ventures) Limited Drilling Assistance Regulations (SOR/94-168) ○ Nova Scotia Share of Offshore Revenue Interim Period Payment Regulations (SOR/84/848) ○ Nova Scotia Share of Offshore Sales Tax Payments Regulations (SOR/85-912) ○ Offshore Area Exclusion Order (SOR/84-592) ○ Guidelines Respecting Physical Environmental Programs During Petroleum Drilling and Production Activities on Frontier Lands (April 1994) ○ Notice of Revised Offshore Waste Treatment Guidelines (21 August 2002) <p>See: http://www.neb.gc.ca/clf-</p>	

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		nsi/rpblctn/ctsndrgltn/rgltnsdgdlnsprsntttthrc/cndnvsctffshrp trlm/cndnvsctffshrp trlm-eng.html
Federal Policy on Wetland Conservation, 1991	Multiple departments and levels of government working in cooperation to meet the goals outlined in the policy. The policy was published in 1991 by Environment Canada.	The objective of the Federal Government with respect to wetland conservation is to <i>promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions, now and in the future</i> . The Policy establishes that the federal government with work with the provinces, territories, and the general Canadian public to achieve the following goals: <ul style="list-style-type: none"> · maintenance of the functions and values derived from wetlands throughout Canada · no net loss of wetland functions on all federal lands and waters · enhancement and rehabilitation of wetlands in areas where the continuing loss or degradation of wetlands or their functions have reached critical levels · recognition of wetland functions in resource planning, management and economic decision-making with regard to all federal programs, policies and activities · securing wetlands of significance to Canadians · recognition of sound, sustainable management practices in sectors such as forestry and agriculture that make a positive contribution to wetland conservation while also achieving wise use of wetland resources · utilization of wetlands in a manner that enhances prospects for their sustained and productive use by future generations
Federal Policy on Wetland Conservation Available online: http://dsp-psd.communication.gc.ca/Collection/CW66-116-1991E.pdf		
Provincial		
<i>Beaches Act</i> , 1989	Natural Resources	The <i>Beaches Act</i> provides for the protection of beaches and associated dune systems as significant and sensitive environmental and recreational resources. The <i>Act</i> also provides for the regulation and enforcement of the full range of land-use activities on beaches, including aggregate removal, so as to leave them unimpaired for the benefit and enjoyment of future generations. The <i>Act</i> also controls recreational and other uses of beaches that may cause undesirable impacts on beach and associated dune systems. There is no specific mention in the <i>Act</i> about development or construction that may impact beaches or dunes.
<i>Beaches Act</i> . R.S., c. 32, s. 1.		

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
Available online: http://www.gov.ns.ca/legislature/legc/Statutes/beaches.htm		
Regulations Made under the <i>Beaches Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Beaches Regulations, made under Section 13 of the <i>Beaches Act</i> includes regulations respecting: <ul style="list-style-type: none"> ○ Administration (appointment of a beach attendant); ○ Management of lands adjacent to a beach; Removal of beach aggregate; ○ Development of a beach (No person shall develop a beach without the prior written authorization and approval of the Minister); ○ Restricted Activities (wilfully removing, defacing, damaging or destroying natural objects, signs, rocks, etc, selling things, altering, destroying or damaging a watercourse, leaving a fire unattended); ○ Domestic Animals; ○ Vehicles (none permitted on beach) ○ Vessels (no more than 5m/hr within 200 ft of an occupied beach) ○ Production of permit ○ Signs/notices ○ Penalty ○ Repeal of old regulations and effective date of new regulations. <p>See: http://www.gov.ns.ca/JUST/REGULATIONS/regs/beachreg.htm</p> <ul style="list-style-type: none"> • There are 92 Beach Designations in Nova Scotia, listed following this table.
<i>Beaches and Foreshores Act, 1989</i>	Natural Resources	The <i>Beaches and Foreshores Act</i> outlines provisions and restrictions for the granting or lease of any ungranted flat, beach or foreshore upon the Nova Scotia Coast.
<i>Beaches and Foreshores Act</i> . R.S., c. 33, s. 1.		
Available online: http://www.gov.ns.ca/legislature/legc/statutes/beachesf.htm		
<i>Fisheries and Coastal Resources Act, 1996</i>	Fisheries and Aquaculture	The purpose of the <i>Fisheries and Coastal Resources Act</i> is to encourage, promote and implement programs that will sustain and improve the fishery, including aquaculture. The purpose of the <i>Act</i> is also to service, develop and optimize the harvesting and processing segments of the fishing and aquaculture industries for the betterment of coastal communities and the Province as a whole; assist the aquaculture industry to increase production; expand recreational and sport-fishing opportunities and ecotourism;

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		foster community involvement in the management of coastal resources; provide training to enhance the skills and knowledge of participants in the fishery, including aquaculture; increase the productivity and competitiveness of the processing sector by encouraging value-added processing and diversification.
<p><i>Fisheries and Coastal Resources Act</i>. 1996, c. 25, s. 1. Available online: http://www.gov.ns.ca/legislature/legc/statutes/fishand.htm</p>		
Regulations Made under the <i>Fisheries and Coastal Resources Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Regulations made under made under the <i>Fisheries and Coastal Resources Act</i> include: <ul style="list-style-type: none"> ○ Aquaculture Licence and Lease Regulations ○ Fish Buyers' Licensing and Enforcement Regulations ○ Fish Inspection Regulations ○ Fisheries and Aquaculture Loan Regulations ○ Nova Scotia Fisheries and Aquaculture Loan Board Fees Regulations ○ Recreational Fishing Regulations ○ Rock Weed Harvesting Regulations <p>See: http://www.gov.ns.ca/JUST/REGULATIONS/rxaa-1.htm</p>
<i>Environmental Goals and Sustainable Prosperity Act</i> , 2007	Several departments responsible for various pieces of the legislation and it is a government-wide commitment.	<p>The <i>Environmental Goals and Sustainable Prosperity Act</i> promotes environmentally sustainable economic development that recognizes the economic value of the Province's environmental assets is essential to the long-term prosperity of the Province. Of particular relevance for the coast are several environmental and economic goals:</p> <ul style="list-style-type: none"> • 12 per cent of the total land mass of the Province will be legally protected by the year 2015; • a policy of preventing net loss of wetlands will be established by the year 2009 • a comprehensive water-resource management strategy will be developed by the year 2010; and • wastewater treatment facility discharges will be provided at least primary treatment by the year 2017. <p>The Act also gives the Governor in Council authority to establish or participate in programs including those related to adaptation to the effects of climate change.</p>
<p><i>Environmental Goals and Sustainable Prosperity Act</i>. BILL NO. 146 (as passed, with amendments)Royal Assent: April 13, 2007 Available online: http://www.gov.ns.ca/legislature/legc/bills/60th_1st/3rd_read/b146.htm</p>		
<i>Environment Act</i> ,	Environment	The <i>Environment Act</i> encourages and promotes the

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
1994-95		<p>protection, enhancement and prudent use of the environment, including water resource management. Water resources in the <i>Act</i> include all fresh and marine waters comprising all surface water, groundwater and coastal water. The <i>Act</i> gives the Minister of the Environment authority to classify water resources according to their sensitivity or uses, develop sensitivity indices for the Province, adopt water quality guidelines, and indicators. The Minister also has the authority to establish or adopt goals for effluent reduction and establish total allowable waste-loads for water bodies. The Governor in Council is given authority in the <i>Act</i> to make regulations including those regarding the infilling or alteration of wetlands, swamps, marshes, ravines or gulches. Under the <i>Environment Act</i>, no wetland, including salt marches, can be altered without approval from Nova Scotia Environment.</p>
<p><i>Environment Act</i>. 1994-95, c. 1, s. 1. Available online: http://www.gov.ns.ca/legislature/legc/statutes/envromnt.htm</p>		
<p>Regulations Made under the <i>Environment Act</i> with potential relevance for the Nova Scotia coastal area</p>		<ul style="list-style-type: none"> • Regulations made under made under the <i>Environment Act</i> include: <ul style="list-style-type: none"> ○ Activities Designation Regulations ○ Air Quality Regulations ○ Approvals Procedure Regulations ○ Asbestos Waste Management Regulations ○ Dangerous Goods Management Regulations ○ Emergency Spill Regulations ○ Environmental Assessment Regulations ○ Environment Act and Regulations Fees Regulations ○ Motive Fuel and Fuel Oil Approval Regulations ○ Nova Scotia Environmental Assessment Board Regulations ○ Nova Scotia Environmental Trust Regulations ○ On-site Services Advisory Board Regulations ○ On-site Sewage Disposal Systems Regulations ○ Ozone Layer Protection Regulations ○ PCB Management Regulations ○ Pesticide Regulations ○ Petroleum Management Regulations ○ Protected Water Areas ○ Solid Waste-Resource Management Regulations ○ Sulphide Bearing Material Disposal Regulations ○ Used Oil Regulations

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		<ul style="list-style-type: none"> ○ Water and Wastewater Facilities and Public Drinking Water Supplies Regulations ○ Well Construction Regulations <p>See: http://www.gov.ns.ca/just/regulations/rxaa-1.htm#env</p> <ul style="list-style-type: none"> ● There are 25 Protected Water Area Designations in Nova Scotia, listed following this table.
<i>Provincial Parks Act, 1989</i>	Natural Resources	The Provincial Parks Act allows for the preservation of significant historic or natural environment resources and recreational opportunities.
<p><i>Provincial Parks Act, R.S., c. 367, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/provpark.htm</p>		
Regulations Made under the <i>Provincial Parks Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> ● Provincial Parks Regulations, made under made under Section 37 of the <i>Provincial Parks Act</i> includes regulations respecting: <ul style="list-style-type: none"> ○ Administration (appointment of chief caretaker, or park attendant) ○ Park Classifications (ie. wildland park, or wayside park) ○ Zoning with a park: environmental protection zone, resource conservation zone, or recreation development zone. ○ Management of lands adjacent to a park ○ Occupation of land in park ○ Designated Areas (ie. campground or day use park) ○ Closing time in a day use park ○ Regulations regarding campsite permits and fees ○ Agricultural lease/permit ○ Aggregate removal & mining ○ Removal of timber ○ Conduct of persons in a park ○ Clean condition ○ Domestic animals ○ Fires, ○ Sports, other activities, hunting and trapping, fishing ○ Vehicles and off-highway vehicles and traffic ○ Vessels ○ Signs and notices ○ Damage, theft and removal of property ○ Repeal of old regulations and effective date of new regulations. <p>See: http://www.gov.ns.ca/just/regulations/regs/ppregs.htm</p>

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		<ul style="list-style-type: none"> • There are 96 Provincial Parks Designations in Nova Scotia, listed following this table.
<p><i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act. 1987</i></p>	<p>Energy</p>	<p>The <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act</i> implements an Agreement between the Government of Nova Scotia and the Government of Canada on Offshore Petroleum Resource Management and Revenue. The <i>Act</i> prevails over any other provincial legislation. (See federal equivalent the <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act</i> (1988, c. 28). The joint operation of the federal and provincial <i>Acts</i> legally establishes the Canada-Nova Scotia Offshore Petroleum Board, which is responsible for the regulation of petroleum activities in the Nova Scotia Offshore Area. The Board regulates the health and safety for offshore workers, protection of the environment, management and conservation of petroleum resources, employment and industrial benefits, issuance of offshore licences, resource evaluation, data management and distribution.</p>
<p><i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act. 1987, c. 3, s. 1</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/can-nso1.htm</p>		
<p>Regulations Made under the <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act</i> with potential relevance for the Nova Scotia coastal area</p>		<ul style="list-style-type: none"> • Regulations made under made under <i>Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation (Nova Scotia) Act</i> include: <ul style="list-style-type: none"> ○ Nova Scotia Offshore Area Certificate of Fitness Regulations (as amended to N.S. Reg. 112/2003) ○ Nova Scotia Offshore Area Oil and Gas Spills and Debris Liability Regulations (N.S. Reg. 3/96) ○ Nova Scotia Offshore Area Petroleum Diving Regulations (N.S. Reg. 6/96) ○ Nova Scotia Offshore Area Petroleum Drilling Regulations (amended to N.S. Reg. 165/2006) ○ Nova Scotia Offshore Area Petroleum Geophysical Operations Regulations (N.S. Reg. 191/95) ○ Nova Scotia Offshore Area Petroleum Installations Regulations (N.S. Reg. 166/97) ○ Nova Scotia Offshore Petroleum Production and Conservation Regulations (N.S. Reg. 144/96) ○ Schedule I (Offshore Area Limits) Amending Regulations (N.S. Reg. 11/2004)

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		See: http://www.gov.ns.ca/just/regulations/rxaa-1.htm#offshoreprlm/cndnvsctffshrprlm-eng.html
<i>Mineral Resources Act, 1990</i>	Natural Resources	<p>The <i>Mineral Resources Act</i> intends to support and promote responsible mineral resource management consistent with sustainable development while recognizing the following goals:</p> <ul style="list-style-type: none"> (a) providing a framework for efficient and effective mineral rights administration; (b) encouraging, promoting and facilitating mineral exploration, development and production; (c) providing a fair royalty regime; and (d) improving the knowledge of mineral resources in the Province
<p><i>Mineral Resources Act, 1990, c. 18, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/mineralr.htm</p>		
Regulations Made under the <i>Mineral Resources Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Regulations made under made under the <i>Mineral Resources Act</i> include: <ul style="list-style-type: none"> ○ Declaration of Limestone Deposits as a Mineral in the Marble Mtn. Area ○ Mineral Resources Regulations ○ Pictou County Geothermal Resource Area Designation ○ Springhill Geothermal Resource Area Designation <p>See: http://www.gov.ns.ca/just/regulations/rxam-z.htm#minres</p>
<i>Conservation Easements Act, 2001</i>	Natural Resources	<p>The <i>Conservation Easements Act</i> provides for conservation easements, which are agreements entered into between an owner and an eligible body that</p> <ul style="list-style-type: none"> (a) grants rights and privileges to the easement holder over the owner's land that relate to the purposes for which the conservation easement is granted; (b) may impose obligations, either positive or negative, on the owner or the easement holder, or both, respecting the owner's land that relate to the purposes for which the conservation easement is granted; and (c) is made for the purpose of protecting, restoring or enhancing land that <ul style="list-style-type: none"> (i) contains natural ecosystems or constitutes the habitat of rare, threatened or endangered plant or animal species, (ii) contains outstanding botanical, zoological, geological, morphological or palaeontological [palaeontological] features, (iii) exhibits exceptional and diversified scenery,

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		<p>(iv) provides a haven for concentrations of birds and animals, (v) provides opportunities for scientific or educational programs in aspects of the natural environment, (vi) is representative of the ecosystems, landforms or landscapes of the Province, or (vii) meets any other purpose prescribed by the regulations. The easements run with the land and exist for a stated period of time or continue in perpetuity. Municipalities are eligible to hold conservation easements (See discussion in Municipal section of this table).</p>
<p><i>Conservation Easements Act, 2001, c. 28, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/consease.htm</p>		
<p>Regulations Made under the <i>Conservation Easements Act</i> with potential relevance for the Nova Scotia coastal area</p>	<ul style="list-style-type: none"> • Regulations made under made under the <i>Conservation Easements Act</i> include: <ul style="list-style-type: none"> ○ Archaeological Sites Regulations ○ Designation of Eligible Bodies Regulations Allows Organizations to be designated as eligible holders of conservation easements. Schedule A of these Regulations lists designated organizations: <ul style="list-style-type: none"> – Archaeological Land Trust of Nova Scotia Society – Ecology Action Centre – Nova Scotia Nature Trust (originally designated by Order in Council 95-160) – Nature Conservancy of Canada (originally designated by Order in Council 95-91) – Bras d'Or Preservation Foundation (originally designated by Order in Council 93-944) – Ducks Unlimited Canada (originally designated by Order in Council 94-998) – Federation of Nova Scotia Naturalists (originally designated by Order in Council 95-451) – Kingsburg Coastal Conservancy Association (originally designated by Order in Council 97-235) – Blomidon Naturalists Society (originally designated by Order in Council 97-235) – Shubenacadie Canal Commission (originally designated by Order in Council 2000-146) – Schedule “A” amended: O.I.C. 2007-589, N.S. Reg. 435/2007. <p>See: http://www.gov.ns.ca/just/regulations/rxaa-</p>	

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
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<i>Off-highway Vehicles Act, 1989</i>	Natural Resources, and Transportation and Infrastructure Renewal	The Off-highway Vehicles Act regulates the operation of off-highway vehicles, include that no person can operate an off-highway vehicle on a beach as defined by the <i>Beaches Act</i> ; in a core habitat as defined by the <i>Endangered Species Act</i> ; in a provincial park or park reserve as defined by the <i>Provincial Parks Act</i> ; in a protected site or ecological site designated pursuant to the <i>Special Places Protection Act</i> , unless the vehicle operator is given a permit.
<i>Off-highway Vehicles Act</i> . R.S., c. 323, s. 1. Available online: http://www.gov.ns.ca/legislature/legc/statutes/offhighw.htm		
Regulations Made under the <i>Off-highway Vehicles Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Regulations made under made under the <i>Off-highway Vehicles Act</i> include: <ul style="list-style-type: none"> ○ Designation of Snow Vehicle Trails (Department of Natural Resources) ○ Off-highway Vehicles Designated Trails and Trail Permits Regulations (Department of Natural Resources) ○ Off-highway Vehicles General Regulations ○ Off-highway Vehicles Vulnerable Areas Licensing Regulations (Environment & Natural Resources) ○ (N.S. Reg. 47/2006) ○ Prohibition of Off-highway Vehicle Use in Pockwock Lake Watershed Protected Water Area (Environment) ○ (N.S. Reg. 275/2008) <p>See: http://www.gov.ns.ca/just/regulations/rxaa-1.htm#hlthprotect</p>
<i>Special Places Protection Act, 1989</i>	Tourism, Culture & Heritage <i>and</i> Nova Scotia Environment	The <i>Special Places Protection Act</i> , provides for the preservation, regulation and study of archaeological and historical remains and palaeontological and ecological sites. There are 5 designated sites, 3 of which are in coastal areas: Joggins Fossil Cliffs, Parrsboro Fossil Site, Port Morien Old French Coal Mine. Debert Palaeo-Indian Site, Fletcher Lock, Shubenacadie Canal are also protected, but not coastal.
<i>Special Places Protection Act</i> . R.S., c. 438, s. 1. 1989 Available online: http://www.gov.ns.ca/legislature/legc/statutes/specplac.htm		
<i>Wilderness Areas Protection Act, 1998</i>	Environment	Wilderness Areas Protection Act provide for the establishment, management, protection and use of wilderness areas, in perpetuity, for present and future generations, in order to achieve the following primary objectives:

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		(a) maintain and restore the integrity of natural processes and biodiversity; (b) protect representative examples of natural landscapes and ecosystems; (c) protect outstanding, unique, rare and vulnerable natural features and phenomena, and the following secondary objectives: (d) provide reference points for determining the effects of human activity on the natural environment; (e) protect and provide opportunities for scientific research, environmental education and wilderness recreation; and (f) promote public consultation and community stewardship in the establishment and management of wilderness areas, while providing opportunities for public access for sport fishing and traditional patterns of hunting and trapping
<p><i>Wilderness Areas Protection Act, 1998</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/wildarea.htm Summary: http://www.gov.ns.ca/nse/protectedareas/docs/Wilderness_Act_Sum.pdf</p>		
Regulations Made under the <i>Wilderness Areas Protection Act, 1998</i> with potential relevance for the Nova Scotia coastal area		Regulations made under made under the <i>Wilderness Areas Protection Act</i> include: <ul style="list-style-type: none"> ○ Designation of Chignecto Isthmus Wilderness Area (N.S. Reg. 438/2008) ○ Designation of Additional Lands to Wilderness Areas in Act (consolidated to N.S. Reg. 15/2006) ○ Eigg Mountain-James River Wilderness Area Designation (amended to N.S. Reg. 224/2005) ○ Gully Lake Wilderness Area Designation (N.S. Reg. 91/2005)
<i>Agricultural Marshland Conservation Act, 2000</i>	Agriculture	The <i>Agricultural Marshland Conservation Act</i> gives the Minister of Agriculture authority to develop marshland, defined as land that is subject to periodic flooding and designated by the Minister as marshland, for agricultural purposes. The <i>Act</i> also gives the Minister authority to reconstruct and repair any dykes or other works, including breakwaters, canals, and ditches, for the maintenance of agricultural land that would otherwise be marshland.
<p><i>Agricultural Marshland Conservation Act, 2000, c. 22, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/agricmar.htm</p>		
<i>Treasure Trove Act, 1989</i>	Natural Resources	The <i>Treasure Trove Act</i> outlines gives authority to the Minister of Natural Resources to give license to any person to search in any part of the Province specified in the licence for

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		<p>precious stones or metals in a state other than their natural state and to recover and retain the same upon the payment to the Minister of a royalty thereon at such rate as the Governor in Council may prescribe.</p> <p>Licence holders may search on Crown Land, as per the terms laid out in the licence, or on private land upon agreement with the land owner. However, even with a Treasure Trove Licence, a person is bound by the legal requirements of the Special Places Protection Act.</p>
<p><i>Treasure Trove Act. R.S., c. 477, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/treasure.htm</p>		
<i>Trails Act, 1989</i>	Natural Resources	<p>The <i>Trails Act</i> provides for trails over land and water in Nova Scotia. The <i>Act</i> provides for the establishment and operation of trails on Crown lands and over watercourses for recreational use and enjoyment; establishment of trails on privately owned lands, with the prior consent of the owners or occupiers; reduction of the liability of the owner or the occupier of privately owned lands where consent is given to designate a trail; establishment and operation of trails, either by the Department or through agreement with persons, including municipalities, clubs, organizations and other such bodies; and provision for effective management of trails and the regulation of trail user activities to ensure quality user experiences.</p>
<p><i>Trails Act. R.S., c. 476, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/trails.htm</p>		
<i>Angling Act, 1989</i>	Natural Resources	<p>The <i>Angling Act</i> gives any resident of the Province the right to go on foot along the banks of any river, stream or lake, upon and across any uncultivated lands and Crown lands for the purpose of lawfully fishing with rod and line in such rivers, streams or lakes. It also gives any resident of the Province the right to go on, upon or across any river, stream or lake in boat or canoe or otherwise, for the purpose of lawfully fishing with rod and line in such rivers, streams or lakes. The Act does not in any way limit or restrict the right of any owner or occupant to compensation for actual damages caused by any person going upon or across such lands for the purpose aforesaid, and shall not be construed to give the right to build any fires upon such lands.</p>
<p><i>Angling Act. 1989. R.S., c. 14, s. 1</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/angling.htm</p>		

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
<i>Private Ways Act, 1989</i>	Natural Resources	<p>The <i>Private Ways Act</i> enables every owner or occupier of any mine, mill, quarry, farm or factory who is desirous of transporting the produce of such mine, mill, quarry, farm or factory to a railway or public way, or to tidal or other waters or elsewhere, and every owner or occupier of any timber lands who desires to enter upon such lands and cut the timber or wood thereon and remove the same to a mill, railway or public way, or tidal or other waters or elsewhere, and who is unable to agree for a right of way with the owner or owners of any lands which it is necessary to cross in order to effect such entry or transportation, to petition the Governor in Council. The Governor in Council, if satisfied that the right of way sought to be obtained is actually necessary for the purposes for which it is sought and that it is otherwise just and reasonable that the same should be obtained, shall thereupon by order in council declare that the petitioner is entitled to acquire under this Part a right of way over the lands mentioned in the petition or a part thereof.</p>
<p><i>Private Ways Act, 1989, R.S., c. 358, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/privways.htm</p>		
<i>Public Highways Act,</i>	Transportation and Infrastructure Renewal	<p>The <i>Public Highways Act</i> provides for the construction, supervision, management and control of highways. Goals are to prevent accidents, maintain road [& public] safety, steward public transportation corridors and assets, and protect the adjacent and down-gradient lands and receiving waters.</p> <p>Key components of significance for coastal management include:</p> <ul style="list-style-type: none"> Purchase or otherwise acquire [coastal] properties for roads, bridges and other structures. Implement coastal habitat restoration and compensation projects to meet requirements of federal and provincial permits and authorizations (e.g., wetlands, fish habitat, and habitat for at-risk species). Control drainage in the highway right-of-way ROW (road and ditches) to down-gradient lands and receiving waters Manage the ROW via routine maintenance and prohibitions on the construction of fences and railings and planting trees and hedges, and the deposition of waste materials and deleterious substances (e.g., sewage and silt). Approvals for construction of buildings and other structures within 100 m of the highway centerline Approvals for the break-up of soil of the ROW, e.g., creation

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		of driveways and access roads, to limit erosion and sedimentation of the ROW, down-gradient lands and receiving waters. Approvals for advertising signage within 1,000 m of the centre-line to prevent accidents, maintain safety and protect scenic views.
<i>Public Highways Act</i> R.S., c. 371, s. 1 Available online: http://www.gov.ns.ca/legislature/legc/statutes/pubhighw.htm		
<i>Wildlife Act</i>	Department of Natural Resources	The <i>Wildlife Act (An Act to Provide for the Protection, Management and Conservation of Wildlife and Wildlife Habitats)</i> is aimed at conservation of wildlife species and their habitat. The Act regulates coastal wildlife resource use in the form of angling, hunting and trapping.
<i>Wildlife Act</i> . R.S., c. 504, s. 2. Available online: http://www.gov.ns.ca/legislature/legc/statutes/wildlife.htm		
<i>Endangered Species Act</i>	Department of Natural Resources	The <i>Endangered Species Act</i> provides for the protection, designation, recovery and conservation of species at risk in the Province, including those found in coastal habitats.
<i>Endangered Species Act</i> Available online: http://www.gov.ns.ca/legislature/legc/bills/57th_1st/3rd_read/b065.htm		
<i>Crown Lands Act</i>	Department of Natural Resources	The <i>Crown Lands Act</i> provides for the effective administration and management of all Crown lands with particular regard to forestry management practices, leasing and licensing, and the integration of wildlife and recreation considerations in forestry activities on Crown lands.
<i>Crown Lands Act</i> . R.S., c. 114, s. 1. Available online: http://www.gov.ns.ca/legislature/legc/statutes/crownlan.htm		
<i>Health Protection Act, 2004</i>	Fisheries and Aquaculture OR Health	The <i>Health Protection Act</i> , ensures health and safety and mitigation of potential health hazards. The Governor in Council may make regulations regarding health and safety, including the authority to establish standards and requirements regarding the health or safety of persons in, on or about recreational waters.
<i>Health Protection Act</i> . 2004, c. 4, s. 1. Available online: http://www.gov.ns.ca/legislature/legc/statutes/healthpr.htm		
Regulations Made under the <i>Health Protection Act</i> with potential relevance for the Nova Scotia coastal area		<ul style="list-style-type: none"> • Regulations made under made under the <i>Health Protection Act</i> with potential relevance to the coastal area include: <ul style="list-style-type: none"> ○ Food Safety Regulations (Agriculture) ○ Health Hazards Regulations ○ Industrial and Construction Camps Regulations See: http://www.gov.ns.ca/just/regulations/rxaa-

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
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Municipal Related		
<p><i>Municipal Government Act, 1998</i></p>	<p><i>Provincial Department: Service Nova Scotia and Municipal Relations</i></p>	<p>The <i>Municipal Government Act</i> gives authority to Municipal councils over governance within the jurisdiction given to them, including land use planning. The <i>Act</i> outlines five statements of provincial interests, which direct and guide all provincial and municipal land use decisions regarding drinking water, flood risk areas, agricultural land, infrastructure, and housing. It is a potential policy gap that there is no statement of provincial interest regarding coastal areas.</p> <p>Municipal Planning Strategies and Land Use By-laws can include policies regarding development in coastal areas. Although the <i>Act</i> is not explicit about how to control land use in coastal areas, if interpreted broadly, it leaves room for municipalities to control development and land use in coastal areas through land acquisition, easements, restrictions, comprehensive development districts, land use zoning and requirements for location, landscaping, infilling of land, etc (See sections below).</p> <p><i>Municipal Government Act</i> Section 218, Acquisition of Land for Development & Imposition of easements or other restrictions 218 (1) A municipality may (a) acquire and assemble land for the purpose of carrying out a development consistent with the municipal planning strategy, whether the development is to be undertaken by the municipality or not; or (b) by agreement with the owners of the land, acquire the right to impose easements or other development restrictions on the lands as if it had acquired the title. (2) The municipality may subdivide, rearrange and deal with lands described in clause (1)(a) as if it were a private owner and may sell the lands subject to any building restrictions or easements that the council requires to ensure the development is consistent with the municipal planning strategy. 1998, c. 18, s. 218.</p> <p>Section 220, Content of Land Use By-law (5) Where a municipal planning strategy so provides, a land-</p>

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		<p>use by-law may</p> <p>(d) in connection with a development, regulate or require the planting or retention of, trees and vegetation for the purposes of landscaping, buffering, sedimentation or erosion control;</p> <p>(j) set out conditions, including performance standards, to be met by a development before a development permit may be issued”</p> <p>(o) regulate or prohibit development within a specified distance of a watercourse or a municipal water-supply wellhead</p> <p>(p) prohibit development on land that (i) is subject to flooding or subsidence (ii) has steep slopes (iii) is low-lying, marshy, or unstable (iv) is otherwise hazardous for development because of its soil conditions, geological conditions, undermining or topography (iv) is located in an areas where development is prohibited by a statement of provincial interest or by an enactment of the province</p> <p>Section 222 - Future Public Use</p> <p>(1) a council may zone privately owned land for future public use other than transportation reserves if the by-law provides for an alternative zone on the land, consistent with the MPS</p> <p>(2) where privately owned land is zoned for future public use the municipality shall within one year of the effective date of the zoning, acquire the land or the alternative zone comes into effect.</p> <p>Section 226 - Comprehensive development districts</p> <p>226 (1) A council may regulate the development of a district by development agreement by establishing a comprehensive development district where the municipal planning strategy identifies</p> <p>(a) the classes of uses permitted in a district;</p> <p>(b) developments or uses in a district, if any, that are permitted without a development agreement;</p> <p>(c) the area or areas where a district may be established; and</p> <p>(d) the matters that council shall consider prior to the approval of a development agreement for the development of a district.</p> <p>(2) When a municipal planning strategy provides for a comprehensive development district, the land-use by-law</p>

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
		shall include a comprehensive development district zone. (3) No development may occur in a comprehensive development district unless it is consistent with the development agreement or it is a development permitted without a development agreement. 1998, c. 18, s. 226.
<p><i>Municipal Government Act. 1998, c. 18, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/muncpgov.htm</p>		
<p><i>Halifax Regional Municipality Charter, 2008</i></p>	<p><i>Provincial Department:</i> Service Nova Scotia and Municipal Relations</p>	<p>The <i>Halifax Regional Municipality Charter</i> recognizes Halifax Regional Municipality as having particular importance regarding the economic well-being of Nova Scotians and as a regional business centre. The <i>Charter</i> (a) gives broad authority to HRM Council, including broad authority to pass by-laws, and respect its right to govern the Municipality in whatever ways the Council considers appropriate within the jurisdiction given to it; (b) enhances the ability of the Council to respond to present and future issues in the Municipality; and (c) recognizes that the functions of the Municipality are to (i) provide good government, (ii) provide services, facilities and other things that, in the opinion of the Council, are necessary or desirable for all or part of the Municipality, and (iii) develop and maintain safe and viable communities. Coastal development in the Halifax Regional Municipality must conform to the provisions in the <i>Charter</i>.</p>
<p><i>Halifax Regional Municipality Charter, 2008</i> Available online: http://www.gov.ns.ca/legislature/legc/bills/60th_2nd/1st_read/b179.htm</p>		
<p><i>Peggy's Cove Commission Act, 1989</i></p>	<p><i>Provincial Department:</i> Service Nova Scotia and Municipal Relations</p>	<p>The <i>Peggy's Cove Commission Act</i> designates Peggy's Cove, in the Halifax Regional Municipality as the Peggy's Cove Preservation Area. The purpose of the Commission enabled by this <i>Act</i> is to preserve the unique scenic beauty, character and atmosphere of the Area for the enjoyment of both residents and visitors. The commission can make bylaws regarding development and land use.</p>
<p><i>Peggy's Cove Commission Act. R.S., c. 339, s. 1.</i> Available online: http://www.gov.ns.ca/legislature/legc/statutes/peggycom.htm</p>		
<p><i>Wharves and Public Landings Act, 1989</i></p>	<p><i>Provincial Department:</i> Service Nova Scotia and Municipal Relations</p>	<p>The Wharves and Public Landings Act gives municipal councils control over all public wharves and landings within municipal boundaries.</p>
<p><i>Wharves and Public Landings Act. R.S., c. 503, s. 1.</i></p>		

<i>Legislation, Agreements & Policies</i>	<i>Responsible Department</i>	<i>Objectives</i>
Available online: http://www.gov.ns.ca/legislature/legc/statutes/wharves.htm		
Conservation Easements	Municipalities	Municipalities are eligible to hold conservation easements according to the <i>Conservation Easements Act, 2001</i> Section 8. This power could be used to place specific obligations on private land in order to protect and conserve sensitive coastal ecosystems. (See <i>Conservation Easements Act</i> in Provincial section of this table)
Climate Smart Climate Change: Developer's Risk Management Guide, 2007	Halifax Regional Municipality	<p>The Climate Smart guide represents a first step towards incorporating climate change into land use development practices in Halifax Regional Municipality. The guide is meant to assist developers and HRM staff in</p> <ul style="list-style-type: none"> ○ assessing the risk associated with climate change on a proposed development activity; ○ identifying the significance of the risks; and, ○ identifying appropriate adaptation (i.e., risk reduction) measures. <p>The guide is particularly applicable to:</p> <ul style="list-style-type: none"> ○ development in coastal and low-lying areas; ○ development at the urban forest fringe; ○ development with on-site services; and ○ rural development
Climate Smart Climate Change: Developer's Risk Management Guide Available online: http://www.ccap.org/docs/resources/394/DevelopersGuidetoRiskManagment.pdf		
Halifax Harbour Designation and Functional Plan	Halifax Regional Municipality	Halifax Regional Municipality is undertaking a Halifax Harbour planning process. As part of this process, the Regional Municipal Planning Strategy, 2006 establishes a Halifax Harbour Designation within which specific guidance for land use and investments will be made. The Regional Municipal Planning Strategy 2006 also recommends a Halifax Harbour Functional Plan, which will allow for further analysis and study of land use policies and regulations necessary to implement the goals for the harbour.
Regional Municipal Planning Strategy, 2006 Available online: http://www.halifax.ca/regionalplanning/documents/Regional_MPS.pdf		

**While the above table is comprehensive, it is not intended to be exhaustive*

Table A3.2: Designated Areas

a) Beaches Designations	
1. Auld's Cove Beach (N.S. Reg. 145/76)	47. Little Dyke Beach (N.S. Reg. 157/75)
2. Ballantyne Cove Beach (N.S. Reg. 159/75)	48. Livingston Cove Beach (N.S. Reg. 42/78)
3. Bartlett's Beach (N.S. Reg. 133/76)	49. Lower Cove Beach (N.S. Reg. 153/75)
4. Bayfield Beach (N.S. Reg. 138/76)	50. Lower Debert Beach (N.S. Reg. 156/75)
5. Beach Meadows Beach (N.S. Reg. 1/85)	51. Lower East Chezzetcook Beach (N.S. Reg. 155/76)
6. Beatty Marsh Beach (N.S. Reg. 17/77)	52. Lower Half Island Cove Beach (N.S. Reg. 159/79)
7. Big Pond Beach (Amended to N.S. Reg. 50/81)	53. Lower L'Ardoise Beach (N.S. Reg. 58/81)
8. Black Point Beach (N.S. Reg. 133/81)	54. Mahoney's Beach (N.S. Reg. 132/76)
9. Bramber Beach (N.S. Reg. 25/86)	55. Main-a-Dieu Beach (N.S. Reg. 152/75)
10. Bridgeport Basin Beach (N.S. Reg. 145/78)	56. Majors Point Beach (N.S. Reg. 66/77)
11. Cape Jack Beach (N.S. Reg. 139/76)	57. Malcolm Cove Beach (N.S. Reg. 157/81)
12. Carters Beach (N.S. Reg. 88/84)	58. Malignant Cove Beach (N.S. Reg. 140/76)
13. Catalone Gut Beach (N.S. Reg. 144/78)	59. Margaree Harbour Beach (amended to N.S. Reg. 25/81)
14. Chance Harbour Beach (N.S. Reg. 168/86)	60. MacCormacks Beach (amended by N.S. Reg. 211/2005)
15. Cherry Hill Beach (N.S. Reg. 36/94)	61. Meisners Beach (N.S. Reg. 201/79)
16. Cheverie Beach (N.S. Reg. 21/77)	62. Merigomish Beach (N.S. Reg. 136/76)
17. Christies Beach (N.S. Reg. 67/77)	63. Middle Harbour Beach (N.S. Reg. 254/92)
18. Church Point Beach (N.S. Reg. 95/82)	64. Myettes Beach (amended to N.S. Reg. 247/92)
19. Colindale Beach (N.S. Reg. 151/76)	65. Noonan's Beach (N.S. Reg. 149/76)
20. Conrod's Beach and Lawrencetown Beach (N.S. Reg. 144/76)	66. North Bay Ingonish Beach (N.S. Reg. 143/76)
21. Cooks Cove Beach (N.S. Reg. 161/78)	67. North Harbour Beach (N.S. Reg. 256/92)
22. Crescent Beach (N.S. Reg. 135/76)	68. Partridge Island Beach (N.S. Reg. 16/77)
23. Dominion Beach (N.S. Reg. 134/76)	69. Point Michaud Beach (N.S. Reg. 148/76)
24. Dunn's and Monks Head Beach (N.S. Reg. 141/76)	70. Pomquet Beach (N.S. Reg. 142/76)
25. Fancy's Beach (N.S. Reg. 18/77)	71. Pondville Beach (N.S. Reg. 9/80)
26. Florence Beach (N.S. Reg. 146/76)	72. Port Greville Beach (N.S. Reg. 262/83)
27. Fox Island Main Beach (N.S. Reg. 131/76)	73. Port Hood Beach (N.S. Reg. 147/76)
28. Fox Point Beach (N.S. Reg. 83/79)	74. Port Hood Station Beach (N.S. Reg. 156/76)
29. Framboise Beach (N.S. Reg. 22/77)	75. Port Morien Beach (N.S. Reg. 164/85)
30. Gabarus Beach (N.S. Reg. 153/76)	76. Queensport Beach (N.S. Reg. 164/89)
31. Glace Bay Beach (N.S. Reg. 150/76)	77. Ragged Harbour Beach (N.S. Reg. 114/84)
32. Hadley Cove Beach (N.S. Reg. 110/79)	78. Ragged Head - Port Shoreham Beach (N.S. Reg. 109/79)
33. Half Island Cove Beach (N.S. Reg. 73/79)	79. Riverside Beach (N.S. Reg. 20/77)
34. Hampton Beach (N.S. Reg. 28/80)	80. Rocky Bay Beach (N.S. Reg. 29/77)
35. Harrington Beach (N.S. Reg. 178/78)	81. St. Catherines River Beach (N.S. Reg. 82/83)
36. Hawk Beach (N.S. Reg. 154/76)	82. Sand Beach (N.S. Reg. 152/76)
37. Hirtle's Beach (N.S. Reg. 155/75)	83. Sand Point Beach (N.S. Reg. 68/79)
38. Iona Beach (N.S. Reg. 10/90)	84. Sand River Beach (N.S. Reg. 27/80)
39. Israel's Cove Beach (N.S. Reg. 125/79)	85. Sandy Bay Beach (N.S. Reg. 284/84)
40. Inverness Beach (N.S. Reg. 112/93)	86. Schooner Pond Beach (N.S. Reg. 23/77)
41. Jersey Cove Beach (N.S. Reg. 100/93)	87. Scots Bay Beach (N.S. Reg. 137/76)
42. Johnstons Pond Beach (N.S. Reg. 85/98)	88. Shenacadie Beach (N.S. Reg. 160/78)
43. Kingsburg Beach (amended to N.S. Reg. 114/95)	89. South Harbour Beach (N.S. Reg. 257/92)
44. Larry's River Beach (N.S. Reg. 159/78)	90. Tor Bay Beach (N.S. Reg. 112/87)
45. Lily Pond Beach (N.S. Reg. 255/92)	91. West Apple River Beach (N.S. Reg. 64/79)
46. Linwood Beach (N.S. Reg. 154/75)	92. Westhaver Beach (N.S. Reg. 155/92)

(Source: <http://www.gov.ns.ca/JUST/REGULATIONS/rxaa-l.htm>)

b) Provincial Parks

Not all active Provincial Parks are legally designated under the *Provincial Parks Act*. The following list includes the 127 active Provincial Parks, 96 of which are designated and promoted for public use on the department's website; the latter are marked *.

1. Amherst Shore* (Northumberland Shore)	66. Martinique Beach* (Eastern Shore)
2. Annapolis Basin Look Off* (Fundy Shore & Annapolis Valley)	67. Mavillette Beach* (Yarmouth & Acadian Shores)
3. Anthony* (Fundy Shore & Annapolis Valley)	68. MacCormack Beach (Cape Breton)
4. Arisaig* (Northumberland Shore)	69. MacCormacks Beach (Halifax Metro)
5. Balmoral Mills (Northumberland Shore)	70. MacElmons Pond (Fundy Shore & Annapolis Valley)
6. Barachois* (Cape Breton)	71. McNabs and Lawlor Islands* (Halifax Metro)
7. Battery* (Cape Breton)	72. Melmerby Beach* (Northumberland Shore)
8. Bayfield Beach (Northumberland Shore)	73. Mira River* (Cape Breton)
9. Bayswater Beach* (South Shore)	74. Moose River* Gold Mines (Eastern Shore)
10. Beaver Mountain* (Northumberland Shore)	75. Musquodoboit Valley* (Eastern Shore)
11. Ben Eoin* (Cape Breton)	76. Newville Lake (Fundy Shore & Annapolis Valley)
12. Black Duck Cove (Eastern Shore)	77. Ninevah (South Shore)
13. Blomidon* (Fundy Shore & Annapolis Valley)	78. North River* (Cape Breton)
14. Boylston* (Eastern Shore)	79. Northport Beach* (Northumberland Shore)
15. Blue Sea Beach (Northumberland Shore)	80. Oakfield* (Halifax Metro)
16. Burnt Island (Cape Breton)	81. Petersfield* (Cape Breton)
17. Bush Island (South Shore)	82. Plaster* (Cape Breton)
18. Cabots Landing* (Cape Breton)	83. Point Michaud Beach (Cape Breton)
19. Caddell Rapids Look-off (Fundy Shore and Annapolis Valley)	84. Pomquet Beach (Northumberland Shore)
20. Camerons Brook* (South Shore)	85. Pondville Beach* (Cape Breton)
21. Cape Chignecto* (Fundy Shore & Annapolis Valley)	86. Port Hood Beach (Cape Breton)
22. Cape Smokey* (Cape Breton)	87. Port Maitland Beach* (Yarmouth & Acadian Shores)
23. Card Lake* (South Shore)	88. Port Shoreham Beach (Eastern Shore)
24. Caribou/Munroes Island* (Northumberland Shore)	89. Porters Lake* (Eastern Shore)
25. Central Grove* (Fundy Shore & Annapolis Valley)	90. Powells Point* (Northumberland Shore)
26. Clairmont* (Fundy Shore)	91. Provincial Wildlife Park (Fundy Shore & Annapolis Valley)
27. Clam Harbour Beach* (Eastern Shore)	92. Queensland Beach* (South Shore)
28. Cleveland Beach* (South Shore)	93. Rainbow Haven Beach (Eastern Shore)
29. Coldbrook* (Fundy Shore & Annapolis Valley)	94. Rissers Beach* (South Shore)
30. Cookville (South Shore)	95. Ross Ferry (Cape Breton)
31. Cottage Cove (Fundy Shore & Annapolis Valley)	96. Rushtons Beach* (Northumberland Shore)
32. Crystal Crescent Beach* (Halifax Metro)	97. Sable River* (South Shore)
33. Dalem Lake* (Cape Breton)	98. Salsman* (Eastern Shore)
34. Dollar Lake* (Eastern Shore)	99. Salt Springs* (Northumberland Shore)
35. Dominion Beach* (Cape Breton)	100. Sand Hills Beach* (South Shore)
36. Dundee (Cape Breton)	101. Savary* (Fundy Shore & Annapolis Valley)
37. East River* (South Shore)	102. Scots Bay (Fundy Shore & Annapolis Valley)
38. Elderbank (Eastern Shore)	103. Second Peninsula* (South Shore)
39. Ellenwood Lake* (Yarmouth & Acadian Shores)	104. Sherbrooke (Eastern Shore)
40. Falls Lake* (Fundy Shore & Annapolis Valley)	105. Shinimicas* (Northumberland Shore)
41. Fancy Lake* (South Shore)	106. Smileys* (Fundy Shore & Annapolis Valley)
42. Five Islands* (Fundy Shore & Annapolis Valley)	107. Smuggler's Cove* (Yarmouth & Acadian Shores)
43. Fox Harbour* (Northumberland Shore)	108. Southwest Margaree* (Cape Breton)
44. Glenwood* (Yarmouth & Acadian Shores)	109. Spry Bay (Eastern Shore)
45. Graves Island* (South Shore)	110. St Ann's* (Cape Breton)
46. Green Hill* (Northumberland Shore)	111. Summerville Beach* (South Shore)

47. Groves Point* (Cape Breton)	112. Tatamagouche* (Northumberland Shore)
48. Gulf Shore* (Northumberland Shore)	113. Taylor Head* (Eastern Shore)
49. Heather Beach* (Northumberland Shore)	114. Ten Mile Lake* (South Shore)
50. Hubbards (South Shore)	115. The Islands* (South Shore)
51. Irish Cove	116. Thomas Raddall* (South Shore)
52. Jerry Lawrence (Lewis Lake)	117. Tidnish Dock* (Northumberland Shore)
53. Lake George* (Fundy Shore & Annapolis Valley)	118. Tor Bay (Eastern Shore)
54. Lake Midway* (Fundy Shore & Annapolis Valley)	119. Trout Brook (Cape Breton)
55. Lake O'Law* (Cape Breton)	120. Uisage Ban Falls (Cape Breton)
56. Laurie* (Halifax Metro)	121. Valleyview* (Fundy Shore & Annapolis Valley)
57. Jerry Lawrence (Lewis Lake) (Halifax Metro)	122. Waterside* (Northumberland Shore)
58. Lawrencetown Beach* (Eastern Shore)	123. West Mabou Beach* (Cape Breton)
59. Lennox Passage* (Cape Breton)	124. Wentworth* (Fundy Shore & Annapolis Valley)
60. Lochiel Lake* (Eastern Shore)	125. Wildlife Park (Shubenacadie) (Fundy Shore & Annapolis Valley)
61. Londonderry (Fundy Shore & Annapolis Valley)	126. William de Garthe* (South Shore)
62. Long Point (Cape Breton)	127. Whycomomagh* (Cape Breton)
63. Lumsden Pond (Fundy Shore & Annapolis Valley)	
64. Mabou* (Cape Breton)	
65. Marie Joseph (Eastern Shore)	

(Source: http://www.novascotiaparks.ca/misc/parks_a-z.asp)

c) Protected Water Areas

There are 25 Protected Water Areas designated under the *Environment Act* to protect future water supplies in Nova Scotia. Designations and regulations for each Protected Water Area can be found at <http://www.gov.ns.ca/just/regulations/rxaa-1.thm#env>

1. Bennery Lake Watershed	13. McGee Lake Watershed
2. Dares Lake	14. Mill Cove Lake
3. Forbes Lake Watershed	15. Mill Lakes Watershed
4. French Mill Brook Watershed	16. North Tyndal
5. Hebb, Milipsigate and Minamkeak Lake Watershed	17. Oakland Lake Watershed
6. James River Watershed	18. Pockwock Lake Watershed
7. Cady Lake	19. Port Hawkesbury Watershed
8. Lake George Watershed	20. Pottle Lake
9. Lake Major Watershed	21. Sand Lake
10. Lily Lake	22. Shubenacadie Watershed Protected Water Area
11. Lunenburg Town Reservoir	23. Stewiacke
12. Margaretsville Watershed	24. Town Lake
	25. Walsh or Wilkins Lake

Table A3.3: Federally and Provincially Protected Areas within 2 km of the Coast

	<i>Coastal Protected Area</i>	<i>Size (ha)</i>
Provincial Wilderness Protected Areas	Bonnett Lake Barrens Wilderness Area	10,362
	Bowers Meadows Wilderness Area	4,120
	Canso Coastal Barrens Wilderness Area	8,016
	French River Wilderness Area	7,097
	Gabarus Wilderness Area	3,747
	North River Wilderness Area	3,988
	Polletts Cove-Aspy Fault Wilderness Area	27,235
	Scatarie Island Wilderness Area	1,497
	Tangier Grand Lake Wilderness Area	16,018
	Terence Bay Wilderness Area	4,341
National Parks and Adjuncts	Kejimikujik Seaside Adjunct National Park of Canada	2,001
	Cape Breton Highlands National Park of Canada	94,869
Provincial Parks	Amherst Shore Provincial Park	255
	Annapolis Basin Look Off Provincial Park	2
	Anthony Provincial Park	8
	Arisaig Provincial Park	28
	Barachois Provincial Park	118
	Battery Provincial Park	59
	Bayswater Beach Provincial Park	4
	Ben Eoin Provincial Park	90
	Blomidon Provincial Park	843
	Boylston Provincial Park	91
	Cabot's Landing Provincial Park	9
	Cape Chignecto Provincial Park	4225
	Cape Smokey Provincial Park	161
	Caribou-Munroes Island Provincial Park	134
	Central Grove Provincial Park	13
	Clam Harbour Provincial Park	183
	Cleveland Beach Provincial Park	4
	Cole Harbour-Lawrencetown Coastal Heritage Park	704
	Conrod Island Provincial Park	9
	Crystal Crescent Beach Provincial Park	497
	Dalem Lake Provincial Park	48
	Dominion Beach Provincial Park	28
	East River Provincial Park	1
	Five Islands Provincial Park	506
	Fox Harbour Provincial Park	29
	Glenwood Provincial Park	38
	Graves Island Provincial Park	50
	Groves Point Provincial Park	5

	<i>Coastal Protected Area</i>	<i>Size (ha)</i>
	Gulf Shore Provincial Park	10
	Heather Beach Provincial Park	6
	Lake Midway Provincial Park	2
	Lennox Passage Provincial Park	37
	Lewis Lake Provincial Park	135
	Long Lake Provincial Park	626
	Long Point Provincial Park	4
	Mabou Provincial Park	2
	Martinique Beach Provincial Park	43
	Mavilette Beach Provincial Park	42
	Melmerby Beach Provincial Park	113
	Northport Beach Provincial Park	11
	Petersfield Provincial Park	23
	Plaster Provincial Park	13
	Pondville Beach Provincial Park	3
	Port Maitland Beach Provincial Park	8
	Powell's Point Provincial Park	26
	Queensland Beach Provincial Park	1
	Risser's Beach Provincial Park	101
	Rushtons Beach Provincial Park	19
	Sable River Provincial Park	54
	Salsman Provincial Park	12
	Sand Hills Beach Provincial Park	97
	Savary Provincial Park	11
	Second Peninsula Provincial Park	19
	Shubenacadie Provincial Park	76
	Smiths Cove Look Off Provincial Park	0.4
	Smugglers Cove Provincial Park	7
	Smugglers Cove Provincial Park Reserve	0.5
	St. Anne's Provincial Park	4
	Summerville Beach Provincial Park	26
	Tatamagouche Provincial Park	6
	Taylor Head Provincial Park	802
	The Islands Provincial Park	103
	Thomas Raddall Provincial Park	609
	Tidnish Dock Provincial Park	10
	Upper Clements Provincial Park	17
	Waterside Beach Provincial Park	97
	West Mabou Beach Provincial Park	275
	Whycocomagh Provincial Park	192
	William de Garthe Provincial Park	0.1

	<i>Coastal Protected Area</i>	<i>Size (ha)</i>
Provincial Wildlife Management Areas	Abercrombie Wildlife Management Area	140
	Antigonish Wildlife Management Area	193
	Debert Wildlife Management Area	381
	Dewey Creek Wildlife Management Area	53
	Eastern Shore Islands Wildlife Management Area	12,527
	Maccan River Wildlife Management Area	76
	Minas Basin Wildlife Management Area	127
	Pearl Island Wildlife Management Area	318
	Scatarie Island Wildlife Management Area	6,770
Federal Wildlife Management Areas	Boot Island National Wildlife Area	107
	Chignecto-Amherst Point National Wildlife Area	410
	Chignecto-John Lusby Marsh National Wildlife Area	589
	Margaree Island National Wildlife Area	77
	Sand Pond National Wildlife Area	539
	Wallace Bay National Wildlife Area	675
Federal Migratory Bird Sanctuaries	Amherst Point Migratory Bird Sanctuary	427
	Big Glace Bay Lake Migratory Bird Sanctuary	392
	Haley Lake Migratory Bird Sanctuary	95
	Port Hebert Migratory Bird Sanctuary	338
	Port Joli Migratory Bird Sanctuary	344
	Sable Island Migratory Bird Sanctuary	3,102
	Sable River Migratory Bird Sanctuary	302
	Total Area	223,058 ha

Source: NSDNR RLUL Database

Table A3.4: Areas of Protected Freshwater Wetlands within 2 km of the Coast

	<i>Coastal Protected Area</i>	<i>Wetland Type</i>	<i>Size (ha)</i>
National Parks & Adjuncts	Cape Breton Highlands National Park	BG	66.4
		DM	1.4
		FE	11.6
		SF	6.3
		SS	6.2
	Kejimikujik Seaside Adjunct National Park	BG	296.2
	TOTAL		388.1 ha
Provincial Wilderness Protected Areas	Bonnett Lake Barrens Wilderness Area	BG	281.5
		FE	10.1
		SS	4.9
	Bowers Meadows Wilderness Area	BG	150.4
	Canso Coastal Barrens Wilderness Area	BG	315.9
		FE	11.8
		LW	4.9
	French River Wilderness Area	BG	7.3
		FE	4.5
	Gabarus Wilderness Area	BG	813.3
		FE	15.7
		SS	5.6
	Polletts Cove-Aspy Fault Wilderness Area	BG	33.8
		FE	3.9
		SS	7.5
	Scatarie Island Wilderness Area	BG	466.4
		FE	62.2
	Tangier Grand Lake Wilderness Area	BG	14
		FE	4.4
	Terence Bay Wilderness Area	BG	46.3
FE		8.5	
	TOTAL		2272.9 ha
Provincial Parks	Amherst Shore Provincial Park	BG	9.6
		DM	4.8
		SM	0.4
		SS	3.3
	Battery Provincial Park	BG	1.1
	Ben Eoin Provincial Park	BG	3.6
	Blomidon Provincial Park	BG	3.6
		SS	8.2
	Cabot's Landing Provincial Park	SS	4.9
	Cape Chignecto Provincial Park	BG	109.2
		ME	3.8
		SS	2.6
	Cape Smokey Provincial Park	BG	1.6
	Caribou-Munroes Island Provincial Park	SS	0.3
	Clam Harbour Provincial Park	BG	1.3
		DM	3.0
Cole Harbour-Lawrencetown Coastal Heritage Park	BG	7.0	
	FE	0.7	

	<i>Coastal Protected Area</i>	<i>Wetland Type</i>	<i>Size (ha)</i>
	Crystal Crescent Beach Provincial Park	BG	37.6
		FE	15.1
	Glenwood Provincial Park	BG	0.9
		FE	0.6
		LW	0.0
	Heather Beach Provincial Park	SS	2.2
	Long Lake Provincial Park	LW	3.8
	Melmerby Beach Provincial Park	BG	3.5
	Sable River Provincial Park	DM	0.4
	Savary Provincial Park	BG	2.0
		BG	0.0
		DM	2.7
	Shubenacadie Provincial Park	SS	13.8
		SM	0.4
		SM	0.4
	Tatamagouche Provincial Park	SM	0.4
	Taylor Head Provincial Park	BG	45.8
		FE	1.4
	Waterside Beach Provincial Park	BG	1.9
		SM	0.7
		SS	1.1
West Mabou Beach Provincial Park	BG	0.8	
	DM	5.4	
	SS	0.8	
		TOTAL	309.9 ha
		All Protected Areas TOTAL	2970.9 ha

BG=Bog, DM=Deep Marsh, FE=Fen, SF=Seasonally Flooded Flats, SS= Shrub Swamp, LW=Lakeshore Wetland
 (Source: NSDNR RLUL & Wetlands Inventory)

Table A3.5: Areas of Protected Saltmarsh within 2 km of the Coast

	<i>Coastal Protected Area</i>	<i>Size (ha)</i>
Provincial Wilderness Protected Areas	Canso Coastal Barrens Wilderness Area	0.6
	Gabarus Wilderness Area	0.6
	Scatarie Island Wilderness Area	7.4
	Terence Bay Wilderness Area	1.9
	TOTAL	10.5 ha
National Parks & Adjuncts	Cape Breton Highlands National Park	18.9
	Kejimikujik Seaside Adjunct National Park	48.2
	TOTAL	67.1 ha
Provincial Parks	Amherst Shore Provincial Park	4.0
	Cape Chignecto Provincial Park	3.3
	Caribou-Munroes Island Provincial Park	5.2
	Clam Harbour Provincial Park	3.1
	Cole Harbour-Lawrencetown Coastal Heritage Park	18.3
	Conrod Island Provincial Park	2.4
	Five Islands Provincial Park	0.0
	Gulf Shore Provincial Park	0.9
	Lennox Passage Provincial Park	0.4
	Martinique Beach Provincial Park	5.5
	Mavilette Beach Provincial Park	2.7
	Melmerby Beach Provincial Park	7.1
	Rushtons Beach Provincial Park	10.5
	Sand Hills Beach Provincial Park	23.5
	Summerville Beach Provincial Park	2.8
	Taylor Head Provincial Park	1.7
	The Islands Provincial Park	4.1
	Upper Clements Provincial Park	3.1
	Waterside Beach Provincial Park	2.6
	West Mabou Beach Provincial Park	5.5
	TOTAL	106.7 ha
	All Protected Areas TOTAL	184.3 ha

(Source: NSDNR RLUL & Wetlands Inventory)

Table A3.6: Areas of Protected Coastal Saline Ponds within 2 km of the Coast

	<i>Coastal Protected Area</i>	<i>Size (ha)</i>
Provincial Wilderness Protected Areas	Canso Coastal Barrens Wilderness Area	0.8
	Scatarie Island Wilderness Area	7.6
	Terence Bay Wilderness Area	8.2
	TOTAL	16.6 ha
National Parks & Adjuncts	Kejimikujik Seaside Adjunct National Park	5.4
	TOTAL	5.4 ha
Provincial Parks	Barachois Provincial Park	0.1
	Caribou-Munroes Island Provincial Park	0.0
	Cole Harbour-Lawrencetown Coastal Heritage Park	0.0
	Crystal Crescent Beach Provincial Park	0.4
	Fox Harbour Provincial Park	0.4
	Martinique Beach Provincial Park	0.0
	Melmerby Beach Provincial Park	4.1
	Powell's Point Provincial Park	0.7
	Summerville Beach Provincial Park	0.0
	Taylor Head Provincial Park	0.0
	Waterside Beach Provincial Park	7.7
	TOTAL	13.4 ha
	All Protected Areas TOTAL	35.4 ha

(Source: NSDNR RLUL & Wetlands Inventory)

Appendix 4

Data in Support of Coastal Development and Coastal Access Analysis

Appendix 4

a) Development Types

Description of Land Development Patterns based on DNR Forestry Database Info Files

Source: DNR Forestry Database Info Files. Retrieved on 10 February 2009 from www.gov.ns.ca/natr/forestry/GIS/data/forest.pdf

<i>Development Type Assigned by State of the NS Coast Study</i>	<i>DNR Code</i>	<i>DNR Description</i>
Forested		
Undeveloped - Forest	0	Natural stand - any forested stand which has not been silvicultured and does not qualify under clear cut, partial cut, bum, old field wind throw, alders, brush or dead categories. The stand must contain trees that are capable of reaching at least 3 in height at maturity.
Managed Stand	1	Treated - treatment not classified, not Christmas trees- an area where silviculture activity has been identified from photos, field data not yet available.
Undeveloped - Forest	2	Bum - any stand that has been completely destroyed by fire leaving less than 25% crown closure. In cases of partial bum the remaining live stand is to be categorized and not classed as bum.
Managed Stand	3	Christmas trees - any stand being used for Christmas tree cultivation.
Managed Stand	4	Sugar bush - any stand being used to produce maple sugar products. It may or may not have been silviculture treated.
Undeveloped - Forest	5	Old field - any field that has an indication of merchantable tree species growing in with less than 25% crown closure and less than 1.0 meters in height.
Undeveloped - Forest	6	Wind throw - any stand where trees have been pushed over to more than 45 degrees from the vertical by wind action.

<i>Development Type Assigned by State of the NS Coast Study</i>	<i>DNR Code</i>	<i>DNR Description</i>
Undeveloped - Forest	7	Dead - any stand that contains dead trees due to any cause which contains less than 25% crown closure of live residual material and which contains evidence of dead material either standing or laying on the ground with little or no evidence of regeneration.
Undeveloped - Forest	8	Dead - 1 - any stand that contains dead trees due to any cause which contains 26-50% crown closure of live residual material and which contains evidence of dead material either standing or laying on the ground with little or no evidence of regeneration.
Undeveloped - Forest	9	Dead - 2 - any stand that contains dead trees due to any cause and which contains 51-75% crown closure of live residual material and which contains evidence of dead material either standing or laying on the ground with little or no evidence of regeneration.
Undeveloped - Forest	10	Research stand - stands treated in some manner primarily to provide data on growth, etc. which contain sample plots for evaluation of response rather than intended as operational treatment.
Managed Stand	11	Seed orchard & seed production area - any stands designated by the Department as an area reserved for seed production.
Managed Stand	12	Treated stand - treatment classified-an area where silviculture activity has occurred and the actual treatment has been identified primarily by field data, not including plantations, harvests, Christmas trees or sugarbush.
Undeveloped - Forest	13	Dead - 3 - any stand that contains 26-50% of equivalent crown closure of dead material and which contains regeneration which will be categorized in stand classification section. Equivalent crown closure being an estimate of what the crown closure would be if the dead material was alive.
Undeveloped - Forest	14	Dead - 4 - any stand that contains 51-75% of equivalent crown closure of dead material and which contains regeneration which will be categorized in stand classification section. Equivalent crown closure being an estimate of what the crown closure would be if the dead material was alive.
Undeveloped - Forest	15	Dead - 5 - any stand that contains 75+% of equivalent crown closure of dead material and which contains regeneration which will be categorized in stand classification section. Equivalent crown closure being an estimate of what the crown closure would be if the dead material was alive. The live portion of the stand is to be classified as any forest stand as per the specifications.
Managed Stand	20	Plantation - a group of trees artificially established by direct seeding or setting out seedlings, transplants or cuttings.

<i>Development Type Assigned by State of the NS Coast Study</i>	<i>DNR Code</i>	<i>DNR Description</i>
Undeveloped - Forest	33	Brush - any area containing less than 25% merchantable tree cover and contains non-merchantable woody plants consisting of at least 25% cover. Replaces non-forested class, December, 1998
Undeveloped - Forest	38	Alders less than 75% cover - any forested area containing alders that compose less than 75% crown closure. Replaces non-forested class, December 1998
Undeveloped - Forest	39	Alders 75% or greater cover - any forested area containing alders that compose 75% or more crown closure. Replaces non-forested class, December 1998
Managed Stand	60	Clear cut - any stand that has been completely cut and any residuals make up less than 25% crown closure and with little or no indication of regeneration.
Managed Stand	61	Partial depletion verified - any stand that has been cut and residuals make up 25% or more of the crown closure on the site, identified by photo Interpreters or field data.- a temporary code given to a stand identified from satellite imagery as a partial cut. Further verification from photo interpretation or field data required for residuals.
Managed Stand	62	Partial depletion not verified
<i>Non-Forested</i>		
Undeveloped – Non-Forest	70	Wetlands general - any wet area, not identified as a lake, river or stream, excluding open and treed bogs, and beaver flowage. (In GIS wetland complexes may include open and treed bogs)
Undeveloped – Non-Forest	71	Beaver flowage - an area that is or has been occupied by beavers
Undeveloped – Non-Forest	72	Open bogs - any area consisting primarily of ericaceous plants, sphagnum or other mosses with less than 25% live tree cover and poorly drained wet all year. Indicator plants: Bog Rosemary, Leather Leaf, Labrador Tea, Cranberry and Lambkill. Ericaceous plants being plants in or related to the heather family (ericaceae). They are typically plants of acid soils, bogs and woodlands.
Undeveloped – Non-Forest	73	Treed bogs - any area consisting primarily of ericaceous plants, sphagnum or other mosses with stunted softwood or hardwood species 25% or more live tree cover.
Undeveloped – Non-Forest	74	Coastal habitat areas - any area that has been defined as a wetland that lies in the ocean
Undeveloped – Non-Forest	75	Lake wetland - any area that has been defined as a wetland that lies within freshwater (lake or river)

<i>Development Type Assigned by State of the NS Coast Study</i>	<i>DNR Code</i>	<i>DNR Description</i>
Undeveloped – Non-Forest	76	Cliffs, dunes, coastal rocks - that area of land between high tide mark and the forest or non forest stand which consists of cliffs (a high steep face of a rocky or soil mass), dunes (a ridge or hill created by wind blown sand), or coastal rock (a toque shaped or lobate area of bedrock, may or may not extend into the water).
Undeveloped – Non-Forest	77	Inland water - inland water bodies which may include takes, rivers, reservoirs, canals and ponds (ID value 9003)
Undeveloped – Non-Forest	78	Ocean (ID value of 9006)
Undeveloped – Forest	83	Brush - any area containing less than 25% merchantable tree cover and contains non-merchantable woody plants consisting of at least 25% cover. Being replaced with forested class, December, 1998
Undeveloped – Non-Forest	84	Rock barren - any area covered by at least 50% exposed rock outcrop and/or boulders with less than 25% live tree cover. Boulders being rock fragment over 60cm in diameter.
Undeveloped – Non-Forest	85	Barren - any area of less than 25% live tree cover containing "ericaceous" vegetation with less than 50% rock out crops and/or boulder cover and less than 50% other woody plant cover. Area dry and firm in summer. Indicator plants: Bearberry, Rhodora, Blueberry, Huckleberry and Lambkill.
Agriculture	86	Agriculture - any area in hay field, pasture, tilled crops, or orchards which contains no merchantable species.
Urban	87	Urban - any area used primarily as residential, industrial and related structures such as streets, sidewalks, parking lots, etc. Also include house lots in wooded areas outside of towns and villages which are not adjacent to agriculture land and those lots surrounded by forest. In cases of ribbon development along some roads, a strip may be delineated along the road and classed as urban. Obvious urban area within agriculture land will be delineated and coded accordingly. Categories that will be classified as urban are bunkers, golf courses, picnic parks, campgrounds, drive in theaters, auto salvage yards, power stations, water treatment areas, lagoons sewer/water, cemeteries, light houses, ball parks, etc.
Undeveloped - Forest	88	Alders less than 75% cover - any forested area containing alders that compose less than 75% crown closure. Dry land only. Being replaced with forested class, December, 1998
Undeveloped - Forest	89	Alders 75% or greater cover - any forested area containing alders that compose 75% or more crown closure. Dry land only. Being replaced with forested class, December, 1998

<i>Development Type Assigned by State of the NS Coast Study</i>	<i>DNR Code</i>	<i>DNR Description</i>
Agriculture	91	Blueberries - areas that appear to have been or are being used for blueberry production.
Infrastructure / Industrial Use	92	Miscellaneous - any area of non-forest not covered by any of the other non-forest categories, i.e. old mill site, rifle range, tower site ,observation site, lake shore bottom (where unable to give forest/non-forest code), quarry, mining activity, wharf, pier, causeway, dams, unidentified objects, airstrips, etc.
Infrastructure / Industrial Use	93	Sanitary land fill - areas used by municipalities for disposal of garbage by burying of the material.
Undeveloped – Non-Forest	94	Beach - that area of land between normal water line and the forest or non forest category (i.e. bog, etc.) . Area showing due to abnormally low water is not considered to be part of a beach.
Infrastructure / Industrial Use	95	Gravel pit - any area either active or non active used for the purpose of extracting gravel.
Infrastructure / Industrial Use	96	Pipeline corridor - A 25 meter buffer around a defined linear feature of a gas or oil pipeline route defining limited or restricted use lands.
Infrastructure / Industrial Use	97	Powerline corridor - Corridor of land with limited use due to powerlines, as defined from photography (ID value 9002)
Infrastructure / Industrial Use	98	Road corridor - Generated polygons of varying widths for paved roads, based on road classes. (ID value 9000)
Infrastructure / Industrial Use	99	Rail corridor - Generated 20 meter polygons around active and abandoned rail lines (ID values 9001 & 9005)

Appendix 4

b) Publicly Owned Land

Includes property owned by the Federal, Provincial and Municipal governments, which is located within a 2 km buffer zone along the Coast, including “k roads”.

List of Public Lands from the Nova Scotia Property Records Database

OWNER NAME	OWNER CODE
ROAD PARCEL OWNER UNDETERMINED	K
N S NATURAL RESOURCES	FD
N S UNGRANTED LANDS	FH
HER MAJESTY THE QUEEN (CANADA)	G
TOWN OF PICTOU	82
N S SUPPLY & SERVICES	50

PUBLIC WORKS AND GOVERNMENT SERVICES	
CANADA	GW
CAPE BRETON DEVELOPMENT CORP	GK
N S FARM LOAN BOARD	FM
INDIAN AND NORTHERN AFFAIRS CANADA	GI
HER MAJESTY THE QUEEN CANADA	G
HER MAJESTY THE QUEEN N S	F
MUNICIPALITY OF THE DISTRICT OF YARMOUTH	97
TRANSPORT CANADA	GT
HALIFAX REGIONAL MUNICIPALITY	99
MUNICIPALITY OF THE DISTRICT OF HANTS EAST	59
N S ENVIRONMENT	FB
MUNICIPALITY OF THE DISTRICT OF GUYSBOROUGH	30
TOWN OF PORT HAWKESBURY	65
TOWN OF LUNENBURG	77
FISHERIES & OCEANS CANADA	GF
N S TRANSPORTATION AND PUBLIC WORKS	FC
REGION OF QUEENS MUNICIPALITY	89
MUNICIPALITY OF THE COUNTY OF RICHMOND	66
TOWN OF LOCKEPORT	91
MUNICIPALITY OF THE COUNTY OF VICTORIA	67
MUNICIPALITY OF THE DISTRICT OF ARGYLE	95
TOWN OF YARMOUTH	98
FISHERIES AND OCEANS	GF
N S ECONOMIC DEVELOPMENT AND TOURISM	FA
TOWN OF MULGRAVE	31
NOVA SCOTIA NATURAL RESOURCES	FD
HER MAJESTY THE QUEEN NS	F
NATIONAL DEFENCE	GD
PUBLIC WORKS CANADA	GW
GOVERNMENT OF CANADA	G
N.S.SUPPLY AND SERVICES	F
N S TRANSPORTATION & COMMUNICATIONS	FC
FISHERIES & OCEANS	GF
MUNICIPALITY OF THE DISTRICT OF LUNENBURG	75
NOVA SCOTIA TRANSPORTATION & PUBLIC WORKS	FC
ROAD SEGMENT	
HER MAJESTY THE QUEEN	G
PUBLIC WORKS & GOVERNMENT SERVICES CANADA	GW
TOWN OF MAHONE BAY	78
TOWN OF DIGBY	24
MUNICIPALITY OF THE DISTRICT OF DIGBY	23
ENVIRONMENT CANADA	GE
N S JUSTICE	F
DEPT OF FINANCE	G
CDN DEPT OF INDIAN AFFAIRS	G
N S HOUSING AND MUNICIPAL AFFAIRS	FF
N S EDUCATION AND CULTURE	F
MUNICIPALITY OF THE DISTRICT OF SHELBURNE	92
HER MAJESTY THE QUEEN CAN	G
N S SOCIAL SERVICES	FK
MUNICIPALITY OF THE COUNTY OF COLCHESTER	43

CANADIAN DEPT OF FINANCE	G
MUNICIPALITY OF THE DISTRICT OF BARRINGTON	87
PARKS CANADA	GP
INDIAN & NORTHERN AFFAIRS	GI
TOWN OF PARRSBORO	50
MUNICIPALITY OF THE COUNTY OF GUYSBOROUGH	30
MUNICIPALITY OF THE COUNTY OF ANNAPOLIS	20
PROVINCE OF NOVA SCOTIA	F
MUNICIPALITY OF THE COUNTY OF INVERNESS	64
MUNICIPAL GRANTS DIVISION	G
COUNTY OF CUMBERLAND	47
NOVA SCOTIA FARM LOAN BOARD	FM
FEDERAL GOVERNMENT - GENERAL	G
MUNICIPALITY OF THE DISTRICT OF CHESTER	74
TOWN OF SHELBURNE	93
N S SYSCO	FS
MUNICIPALITY OF THE DISTRICT OF ST. MARY'S	32
MUNICIPALITY OF THE COUNTY OF KINGS	69
TOWN OF WOLFVILLE	72
CANADA MORTGAGE AND HOUSING CORPORATION	GM
MUNICIPALITY OF THE COUNTY OF ANTIGONISH	27
OWNER UNKNOWN	K
NOVA SCOTIA ENVIRONMENT & LABOUR	FB
HER MAJESTY THE QUEEN	F
OWNER UNKNOWN	P
HER MAJESTY THE QUEEN CAN	F
TOWN OF CANSO	29
COUNTY OF PICTOU	80
HIS MAJESTY THE KING	G
CITY OF HALIFAX	57
N S HOUSING DEVELOPMENT CORP	FG
TOWN OF CLARK'S HARBOUR	88
HER MAJESTY THE QUEEN N S	G
MUNICIPAL GRANTS DIVISION PUBLIC WORKS	
CANADA	G
OWNER UNDETERMINED	K
N S TRANSPORTATION & PUBLIC WORKS	FC
HER MAJESTY THE QUEEN NS	G

Appendix 5

Data in Support of Working Waterfronts Analysis

Appendix 5

a) Method Used to Identify Working Waterfront Community Groups

The CCN has defined 77 coastal community clusters (CCN 2008b). The Community Counts web portal (<http://www.gov.ns.ca/finance/communitycounts/>) provides spatial definitions of communities at a finer scale and provides consistent data reporting beginning in 1991 up to the 2006 Census. Of the 278 communities defined by Community Counts, about 149 border the ocean coast and the Bras d'Or Lakes shore. The communities described in this report include CCN's information on the location of wharves and the Community Counts spatial definition of communities.

Ninety-three communities defined by Community Counts that are home to wharves and harbour authorities. Table A5.1 provides a list of wharves and the counties and communities in which they are located.

Two-stage cluster analysis was used to reduce the data set was reduced by categorizing each working waterfront community by measures of well-being. The measures of well-being are derived from the work of Cooke, Beavon and McHardy (2004), and White and Maxim (2007). Census information for the following indicators was collected for the 93 communities that are home to 247 wharves/working waterfronts were categorized according to the following variables:

- the proportion of the population aged 20+ with less than a Grade 9 education, collected for 1991 and 2006 (a proxy for literacy levels),
 - 1991, 0.205 of the population aged 20+ has less than a Grade 9 education,
 - 2006, 0.146 of the population aged 20+ has less than a Grade 9 education;
- the labour force participation rate, collected for 1991 and 2006 (proportion of the population aged 15+ working for looking for work) (a proxy for economic and labour force vitality);
 - 1991, 0.575 of the population aged 15 years and older was active in the labour force,
 - 2006, 0.576 of the population aged 15 years and older was active in the labour force;
- the proportion of the population aged 15+ that was employed, collected for 1991 and 2006 (a proxy for economic well-being),
 - 0.484 of the population aged 15 years and older was employed,
 - 0.502 of the population aged 15 years and older was employed;
- the log of the median household income per household member, collected for 1996 and 2001 (1991 and 2006 data not available at the time of writing) (a proxy for material well-being) (The log is used to account for the declining marginal utility of income. The per household member measure is used to account for different household sizes between communities.),
 - 1996, the average income per member of a household stood at about \$12,234 (\$15,563, 2008\$),
 - 2001, the average income per member of a household stood at about \$14,090 (\$17,009, 2006\$);

- the proportion of dwellings in need of major repair, collected for 1991 and 2006 (a proxy for housing quality)
 - 1991, 0.135 of occupied dwellings required major repair,
 - 2006, 0.114 of occupied dwellings required major repair;
- the proportion of the population that has moved into or out of the community in the last five years, collected for 1986 -1991 and 2001 - 2006 (a proxy for mobility),
 - 1986 – 1991, 0.1153 of the population had moved between their home community and other points in Canada in the last five years,
 - 2001 - 2006, 0.0905 of the population had moved between their home community and other points in Canada in the last five years; and;
- population change, collected for 1991 – 96 and 2001 – 2006 (a proxy for demographic vitality)
 - 1991 - 1996, the average proportional change in population was negative 0.0167,
 - 2001 – 2006, the average proportional change in population was negative 0.0254.

Indicators describing the proportion of households that were low-income households were intended for inclusion in the list of measures of well-being but they were available only for 2006.

Due to statistical interdependences between several indicators, the independent variable set was reduced to:

- the labour force participation rate, collected for 1991 and 2006 (proportion of the population aged 15+ working for looking for work) (a proxy for economic and labour force vitality);
- the log of the median household income per household member, collected for 1996 and 2001 (a proxy for material well-being) (The log is used to account for the declining marginal utility of income. The per household member measure is used to account for different household sizes between communities.);
- the proportion of dwellings in need of major repair, collected for 1991 and 2006 (a proxy for housing quality); and
- population change, collected for 1991 – 96 and 2001 – 2006 (a proxy for demographic vitality).

Table A5.1-1: Wharves in Nova Scotia (by County, Community Counts Community Ownership Management) (2004)

County	CC Community*	Community**	Ownership	Management	Length (M)	Value (2004)
Annapolis	Granville Ferry	Parkers Cove	Small Craft Harbours	Bayshore Harbour Authority (Parker's Cove)	331	\$ 1,529,023
Antigonish	Mahoneys Beach	Ballantynes Cove	Small Craft Harbours	Harbour Authority of Ballantynes Cove	295	\$ 1,016,014
Antigonish	Malignant Cove	Cribbons Point	Small Craft Harbours	Harbour Authority of Cribbons Point	173	\$ 721,477
Antigonish	Malignant Cove	Livingstone Cove	Small Craft Harbours	Harbour Authority of Livingstones Cove	109	\$ 191,728
Antigonish	Malignant Cove	Arisaig	Small Craft Harbours	Harbour Authority of Arisaig	247	\$ 467,053
Annapolis	Margaretsville	Margaretsville	Non Profit Organization	Margaretsville Wharf Society	N/A	N/A
Annapolis	Port Lorne	Hampton	Small Craft Harbours	Harbour Authority of Hampton	229	\$ 1,613,956
Annapolis	Port Lorne	Port Lorne	Non Profit Organization	Port Lorne Preservation Society	N/A	N/A
Annapolis	Port Royal	Anderson Cove (Hillsburn)	Non Profit Organization	Anderson Cove Slipway Association	188	N/A
Annapolis	Port Royal	Battery Point (Victoria Beach)	Small Craft Harbours	Harbour Authority of Battery Point (Victoria Beach)	260	\$ 911,997
Annapolis	Port Royal	Delaps Cove	Small Craft Harbours	Harbour Authority of Delaps Cove	205	\$ 542,955
Antigonish	Tracadie	Aulds Cove	Small Craft Harbours	Harbour Authority of Aulds Cove	67	\$ 285,181
Antigonish	Tracadie	Barrios Beach (Tracadie)	Small Craft Harbours	Harbour Authority of Barrios Beach	62	\$ 330,135
Antigonish	Tracadie	Bayfield (Pomquet Point)	Small Craft Harbours	Harbour Authority of Bayfield	136	\$ 1,069,906
Antigonish	Tracadie	Havre Boucher	Small Craft Harbours	Harbour Authority of Havre Boucher	95	\$ 278,641
Cape Breton	Bouladerie Island	Point Aconi (McCreadyville)	Small Craft Harbours	Harbour Authority of Point Aconi	70	\$ 359,333
Cape Breton	Eskasoni IR 3	Crane Cove (Eskasoni)	Non Profit Organization	Eskasoni Fish and Wildlife Commission	N/A	N/A
Cape Breton	Florence	Alder Point	Small Craft Harbours	Harbour Authority of Alder Point	212	\$ 936,697
Cape Breton	Glace Bay	Glace Bay	Small Craft Harbours	Harbour Authority of Glace Bay	343	\$ 3,573,605
Cape Breton	Louisbourg	Louisbourg	Small Craft Harbours	Harbour Authority of Louisbourg	316	\$ 1,510,104
Cape Breton	Louisbourg	Main-A-Dieu	Small Craft Harbours	Harbour Authority of Main-a-Dieu	192	\$ 900,253
Cape Breton	Mira East	Mira River	Private	Equity 99 Limited	N/A	N/A
Cape Breton	Mira West	Gabanus	Non Profit Organization	Gabanus Harbour Association	46	\$ 262,704
Cape Breton	Mira West	Marion Bridge	Non Profit Organization	Mira Boat Club	N/A	N/A
Cape Breton	Mira West	Victoria Bridge	Non Profit Organization	Mira Boat Club	N/A	N/A
Cape Breton	New Waterford	Lingan	Non Profit Organization	Lingan Bay Fisherman's Association	N/A	\$ 36,348
Cape Breton	New Waterford	New Waterford	Small Craft Harbours	Harbour Authority of New Waterford	30	\$ 366,910
Cape Breton	North Sydney	North Sydney - Marina Brkwtr	Non Profit Organization	Northern Yacht Club	N/A	N/A
Cape Breton	North Sydney	North Sydney-Ballast Grounds	Small Craft Harbours	Harbour Authority of North Sydney Ballast Grounds	210	\$ 652,940
Cape Breton	Port Morien	Port Morien	Small Craft Harbours	Harbour Authority of Port Morien	314	\$ 3,044,415
Cape Breton	Port Morien	Three Stick Cove (False Bay)	Non Profit Organization	False Bay Fishermans Association	N/A	N/A
Cape Breton	Sydney Northwest	South Bar	Small Craft Harbours	South Bar Fishermen's Harbour Authority	67	\$ 568,775
Colchester	Tatamagouche	Barrachois	Non Profit Organization	Barrachois Harbour Fisherman's Association	N/A	N/A
Colchester	Wallace	Malagash	Small Craft Harbours	Harbour Authority of Malagash	137	\$ 750,143
Cumberland	Advocate Harbour	Advocate	Small Craft Harbours	Harbour Authority of Advocate	121	\$ 258,302
Cumberland	Pugwash	Pugwash	Small Craft Harbours	Harbour Authority of Pugwash	105	\$ 477,870
Cumberland	Tidnish	Northport	Small Craft Harbours	Harbour Authority of Northport	84	\$ 153,142
Cumberland	Wallace	Wallace	Small Craft Harbours	Harbour Authority of Wallace	187	\$ 601,998
Digby	Digby	Culloden (Culloden Cove/Broad)	Non Profit Organization	Rossway & Culloden Wharf Preserv Soc	87	N/A
Digby	Digby Neck	Centreville (Trout Cove)	Small Craft Harbours	Harbour Authority of Centreville (Trout Cove)	304	\$ 375,025
Digby	Digby Neck	East Ferry	Small Craft Harbours	Harbour Authority of East Ferry	68	\$ 984,884
Digby	Digby Neck	Freeport (South Cove)	Small Craft Harbours	Harbour Authority of Freeport	87	\$ 1,389,807

County	CC Community*	Community**	Ownership	Management	Length (M)	Value (2004)
Digby	Digby Neck	Freeport-Fish Point Wharf	Small Craft Harbours	Harbour Authority of Freeport	109	\$ 251,468
Digby	Digby Neck	Little River (Digby Co.)	Small Craft Harbours	Harbour Authority of Little River - Digby County	101	\$ 1,373,077
Digby	Digby Neck	Rossway	Non Profit Organization	Rossway Wharf Society	N/A	N/A
Digby	Digby Neck	Sandy Cove East	Small Craft Harbours	Harbour Authority of Sandy Cove East	194	\$ 2,201,215
Digby	Digby Neck	Tiverton -Fishermen's Wharf	Small Craft Harbours	Harbour Authority of Tiverton	73	\$ 382,821
Digby	Digby Neck	Westport	Small Craft Harbours	Westport Harbour Authority	78	\$ 355,624
Digby	Digby Neck	Whale Cove	Small Craft Harbours	Harbour Authority of Whale Cove	467	\$ 4,233,407
Digby	Meteghan	Meteghan River	Small Craft Harbours	Harbour Authority of Meteghan	114	N/A
Digby	Meteghan	Cape St.Marys	Non Profit Organization	Melegan River Harbour Development & Preservation Society	277	\$ 739,354
Digby	Saulnierville	Saulnierville	Small Craft Harbours	Harbour Authority of Cape St. Mary	278	N/A
Guysborough	Canso	Dover (Little Dover)	Small Craft Harbours	Saulnierville Harbour Authority	N/A	N/A
Guysborough	Canso	Canso	Small Craft Harbours	Harbour Authority of Little Dover	123	\$ 543,532
Guysborough	Cross Roads Country Harbour	Drum Head	Small Craft Harbours	Canso Harbour Authority	287	\$ 1,162,521
Guysborough	Cross Roads Country Harbour	Goldboro	Small Craft Harbours	Harbour Authority of Drum Head	199	\$ 336,368
Guysborough	Cross Roads Country Harbour	Isaacs Harbour	Municipality	Municipality of the District of Guysborough	N/A	N/A
Guysborough	Cooks Cove	Cooks Cove	Private	E.G. Langille	N/A	N/A
Guysborough	Larry River	Charles Cove -Breakwater/Groyne	Non Profit Organization	Cooks Cove Wharf Association	N/A	N/A
Guysborough	Larry River	Little Harbour	Non Profit Organization	Charles Cove Preserv. Soc.	N/A	N/A
Guysborough	Larry River	New Harbour	Private	W.Grover, L+R-Jamieson, H.Webber	N/A	N/A
Guysborough	Larry River	Port Felix	Small Craft Harbours	Harbour Authority of New Harbour	96	\$ 755,890
Guysborough	Larry River	Queensport	Non Profit Organization	Port Felix Wharf Preservation Society	N/A	N/A
Guysborough	Larry River	Upper Whitehead	Small Craft Harbours	Harbour Authority of Queensport	45	\$ 79,038
Guysborough	Larry River	Half Island Cove	Small Craft Harbours	Whitehead Harbour Authority	119	\$ 44,224
Guysborough	Larry River	Larrys River	Small Craft Harbours	Harbour Authority of Queensport	128	\$ 4,900
Guysborough	Moser River	Ecum Secum	Small Craft Harbours	Harbour Authority of Larry's River	82	\$ 863,916
Guysborough	Mulgrave	Pirate Harbour	Non Profit Organization	Ecum Secum Wharf Preservation Soc	N/A	N/A
Guysborough	Sherbrooke	Fishermans Harbour	Non Profit Organization	Mulgrave Marina Association	N/A	N/A
Guysborough	Sherbrooke	Little Liscomb	Small Craft Harbours	Fisherman's Harbour Wharf Preservation Society	N/A	N/A
Guysborough	Sherbrooke	Marie Joseph	Small Craft Harbours	Harbour Authority of Liscomb/Little Liscomb	61	\$ 146,982
Guysborough	Sherbrooke	Port Bickerton East	Small Craft Harbours	Harbour Authority of Marie Joseph	81	\$ 101,349
Guysborough	Sherbrooke	Port Bickerton West	Small Craft Harbours	Harbour Authority of Port Bickerton	157	\$ 428,951
Guysborough	Sherbrooke	Sonora	Small Craft Harbours	Harbour Authority of Port Bickerton	148	\$ 244,220
Guysborough	Sherbrooke	Wine Harbour	Non Profit Organization	Harbour Authority of Sonora	124	\$ 211,044
Halifax	Chezetcook	East Chezetcook	Small Craft Harbours	Wine Harbour Wharf Society	N/A	N/A
Halifax	Chezetcook	Gammons Creek	Small Craft Harbours	Harbour Authority of East Chezetcook	38	\$ 27,730
Halifax	Chezetcook	Three Fathom Harbour	Small Craft Harbours	Harbour Authority of West Quoddy	80	\$ 659,925
Halifax	Dingwall	Factory Cove	Non Profit Organization	Harbour Authority of Fishermans Reserve	46	\$ 233,537
Halifax	Eastern Passage	Eastern Passage	Small Craft Harbours	Factory Cove Preservation Society	N/A	N/A
Halifax	Hacketts Cove	Indian Harbour (Yankee Cove)	Non Profit Organization	Harbour Authority of Eastern Passage	153	\$ 966,454
Halifax	Herring Cove	Bear Cove	Private	Indian Harbour Wharf Association	N/A	N/A
Halifax	Jeddore	East Jeddore (Bakers Point)	Non Profit Organization	Highview Investments Ltd.	N/A	N/A
Halifax	Moser River	Ecum Secum West	Non Profit Organization	Jeddore Fisheries Infrastructure	N/A	N/A
Halifax	Musquodoboit Harbour	Coopers Point	Small Craft Harbours	Ecum Secum West Port Authority Society	N/A	N/A
Halifax				TBA (Harbour Authority of Coopers Point?)	60	\$ 1,095,757

County	CC Community*	Community**	Ownership	Management	Length (M)	Value (2004)
Halifax	Musquodoboit Harbour	East Petpeswick	Non Profit Organization	East Petpeswick Wharf Preserv. Soc.	N/A	N/A
Halifax	Musquodoboit Harbour	Ostrea Lake	Non Profit Organization	Ostrea Lake Wharf Preservation Soc.	N/A	N/A
Halifax	Peggys Cove	East Dover	Small Craft Harbours	Harbour Authority of East & West Dover	50	\$ 44,842
Halifax	Peggys Cove	Peggys Cove	Small Craft Harbours	Harbour Authority of Peggys Cove	38	\$ 84,303
Halifax	Peggys Cove	West Dover	Small Craft Harbours	Harbour Authority of East & West Dover	63	\$ 177,606
Halifax	Prospect	Prospect	Non Profit Organization	Propect Peninsula Residents Association	N/A	N/A
Halifax	Prospect	Shad Bay	Small Craft Harbours	Harbour Authority of Shad Bay	24	\$ 182,737
Halifax	Sambro	Ketch Harbour	Non Profit Organization	Ketch Harbour Area Residents Association	45	N/A
Halifax	Sambro	Sambro	Small Craft Harbours	Harbour Authority of Sambro	192	\$ 1,119,774
Halifax	Ship Harbour	Carters Point (Murphy Cove)	Small Craft Harbours	Harbour Authority of Carters Point	N/A	\$ 75,067
Halifax	Ship Harbour	Little Harbour (Halifax Co.)	Small Craft Harbours	Harbour Authority of Little Harbour - Halifax Count	87	\$ 424,693
Halifax	Ship Harbour	Owls Head	Small Craft Harbours	Owls Head Harbour Authority	66	\$ 149,651
Halifax	St. Margarets Bay	Boulliers Point	Municipality	Halifax Regional Municipality	N/A	N/A
Halifax	Terence Bay	Terence Bay	Small Craft Harbours	Harbour Authority of Terence Bay/Lower Prospect	83	\$ 725,587
Inverness	Cheticamp	Cheticamp (La Digue)	Small Craft Harbours	Harbour Authority of Cheticamp	477	\$ 3,530,071
Inverness	Cheticamp	Cheticamp Point (La Pointe)	Small Craft Harbours	Harbour Authority of Cheticamp	142	\$ 550,761
Inverness	Cheticamp	Grand Etang	Small Craft Harbours	Harbour Authority of Grand Etang	162	\$ 1,478,991
Inverness	Cheticamp	Murphys Pond	Small Craft Harbours	Harbour Authority of Port Hood	261	\$ 1,247,665
Inverness	Cheticamp	Cheticamp - Town Wharf	Small Craft Harbours	Harbour Authority of Cheticamp	N/A	N/A
Inverness	Dingwall	Meat Cove	Municipality	Municipality of Inverness	N/A	N/A
Inverness	Dingwall	Pleasant Bay	Small Craft Harbours	Harbour Authority of Pleasant Bay	225	\$ 1,408,644
Inverness	Glendale	Marble Mountain	Non Profit Organization	Marble Mountain Wharf Preservation Society	N/A	N/A
Inverness	Inverness	Inverness (McIsaac Pond)	Small Craft Harbours	Harbour Authority of Inverness	148	\$ 751,556
Inverness	Long Point	Judique (Baxters Cove)	Small Craft Harbours	Harbour Authority of Judique Baxter's	173	\$ 536,742
Inverness	Mabou	Finlay Point	Small Craft Harbours	Harbour Authority of Finlay Point	159	\$ 849,416
Inverness	Mabou	Mabou Harbour	Small Craft Harbours	Harbour Authority of Mabou Harbour	125	\$ 1,055,582
Inverness	Margaree	Margaree Harbour (Belle Cote)	Small Craft Harbours	Harbour Authority of Margaree Harbour	166	\$ 1,473,388
Inverness	Port Hood	Little Judique Harbour	Non Profit Organization	Lit Judique Harbour Fishermen's Assoc	229	N/A
Inverness	Port Hood	Little Judique Ponds (Maryville)	Small Craft Harbours`	Harbour Authority of Maryville	92	\$ 347,207
Inverness	Port Hood	Port Hood	Municipality	Municipality of Inverness	N/A	N/A
Inverness	Port Hood	Port Hood Island	Municipality	Municipality of Inverness	N/A	N/A
Kings	Blomidon	Scots Bay (Little Cove)	Small Craft Harbours	Harbour Authority of Scot's Bay	111	\$ 173,672
Kings	Blomidon	Halls Harbour	Small Craft Harbours	Harbour Authority of Hall's Harbour N.S.	208	\$ 1,322,936
Kings	Canning	Kingsport	Non Profit Organization	Kingsport Community Association	N/A	N/A
Kings	Canning	Pereaux (Delhaven)	Small Craft Harbours	Harbour Authority of Pereau (Delhaven)/Kingsport	80	\$ 1,529,023
Kings	Harbourville	Harbourville	Harbourville Restoration Society	Harbourville Restoration Society		
Lunenburg	Blandford	Aspotogan	Municipality	Municipality of Lunenburg	36	\$ 19,701
Lunenburg	Blandford	Blandford (Shoal Cove)	Small Craft Harbours	Harbour Authority of Blandford	82	\$ 497,677
Lunenburg	Blandford	Mill Cove	Small Craft Harbours	Harbour Authority of Mill Cove	164	\$ 221,412
Lunenburg	Blandford	Northwest Cove	Small Craft Harbours	Harbour Authority of North West Cove	63	\$ 165,253
Lunenburg	Broad Cove	Little Harbour (Cherry Hill)	Small Craft Harbours	Harbour Authority of United Communities	73	\$ 76,837
Lunenburg	Broad Cove	Voglers Cove East	Small Craft Harbours/ Historic Wharf	Harbour Authority of United Communities	32	\$ 20,181
Lunenburg	Chester Basin	Chester Basin	Municipality	Municipality of Chester	N/A	N/A
Lunenburg	Hubbards	Fox Point	Small Craft Harbours	Harbour Authority of Fox Point	133	\$ 235,869
Lunenburg	LaHave	Back Harbour (Chester)	Municipality	Municipality of Chester	N/A	N/A
Lunenburg	LaHave	Bush Island	Small Craft Harbours	Harbour Authority of Bush Island	159	\$ 36,562

County	CC Community*	Community**	Ownership	Management	Length (M)	Value (2004)
Lunenburg	LaHave	Kings Bay	Municipality	Municipality of the District of Lunenburg	N/A	N/A
Lunenburg	LaHave	Kraut Point (Riverport)	Small Craft Harbours	Harbour Authority of Riverport (Kraut Point)	276	\$ 508,294
Lunenburg	LaHave	Saw Pt (Lunenburg) - Back Harbour	Municipality	Municipality of the District of Lunenburg	N/A	N/A
Lunenburg	Lunenburg	Bayport	Small Craft Harbours	Harbour Authority of Bayport	46	\$ 202,806
Lunenburg	Lunenburg	Blue Rocks (Sand Cove)	Private	James L. Anderson	N/A	\$ 137,738
Lunenburg	Lunenburg	Felzen South	Small Craft Harbours	Harbour Authority of Felzen South	135	\$ 384,616
Lunenburg	Lunenburg	Lunenburg - Fishermen's Wharf	Small Craft Harbours	Harbour Authority of Lunenburg	110	\$ 947,826
Lunenburg	Lunenburg	Lunenburg - Railway Wharf	Small Craft Harbours	Harbour Authority of Lunenburg	84	\$ 46,072
Lunenburg	Lunenburg	Lunenburg (Battery Point)	Small Craft Harbours	National Sea Products	N/A	N/A
Lunenburg	Mahone Bay	Mahone Bay	Town	Town of Mahone Bay	N/A	N/A
Lunenburg	Western Shore	Big Tancook Island	Small Craft Harbours	Harbour Authority of Big Tancook Island	171	\$ 1,029,563
Lunenburg	Western Shore	Indian Point	Small Craft Harbours	Harbour Authority of Indian Point	63	N/A
Lunenburg	Western Shore	Western Shore	Municipality	Municipality of Chester	N/A	N/A
Pictou	Little Harbour	Little Harbour (Pictou Co.)	Small Craft Harbours	Harbour Authority of Little Harbour	88	\$ 601,907
Pictou	Merigomish	Big Island	Non Profit Organization	Big Island Wharf Society	37	N/A
Pictou	Merigomish	Merigomish	Province	Department of Natural Resources	N/A	N/A
Pictou	Pictou	Caribou (Narrow Entrance)	Small Craft Harbours	Harbour Authority of Caribou Ferry	61	\$ 82,736
Pictou	Pictou	Caribou Ferry	Small Craft Harbours	Harbour Authority of Caribou Ferry	293	\$ 1,651,127
Pictou	Pictou	Pictou Island	Small Craft Harbours	Harbour Authority of Pictou Island	221	\$ 1,401,220
Pictou	Pictou	Skinner's Cove	Small Craft Harbours	Harbour Authority of Skinner's Cove	173	\$ 472,908
Pictou	River John	Cape John	Small Craft Harbours	Harbour Authority of Cape John	186	\$ 278,899
Pictou	River John	Toney River	Small Craft Harbours	Harbour Authority of Toney River	288	\$ 1,036,261
Pictou	Merigomish	Baileys Brook (Lismore)	Small Craft Harbours	Harbour Authority of Bailey's Brook	260	\$ 1,986,827
Queens	Liverpool	Liverpool	Private	Mersey Seafoods	384	N/A
Queens	Liverpool	Moose Harbour	Small Craft Harbours	Harbour Authority of Moose Harbour	133	\$ 320,843
Queens	Liverpool	West Berlin	Small Craft Harbours	Harbour Authority of West Berlin	39	\$ 128,913
Queens	Liverpool	Brooklyn-Fishermen's Wharf/Ski	Small Craft Harbours	Harbour Authority of Brooklyn	50	\$ 24,616
Queens	Medway	Port Medway	Small Craft Harbours	Harbour Authority of Port Medway	144	\$ 1,826,256
Queens	Port Mouton	Central Port Mouton (Nickersons)	Private	Nickersons	226	\$ 1,221,357
Queens	Port Mouton	East Side Port L'Hebert (East)	Small Craft Harbours	Harbour Authority of East Side Port L'Hebert	169	\$ 657,279
Queens	Port Mouton	Hunts Point	Small Craft Harbours	Harbour Authority of Hunts Point	115	N/A
Queens	Port Mouton	Port Mouton	Small Craft Harbours	Harbour Authority of Port Mouton	60	\$ 356,793
Queens	Port Mouton	South West Port Mouton	Municipality	Region of Queen's Municipality	N/A	N/A
Queens	Port Mouton	St. Catharines River	Municipality	Region of Queen's Municipality	N/A	N/A
Richmond	Isle Madame	Arrow Point	Non Profit Organization	Arrow Point Wharf Preservation Society	N/A	N/A
Richmond	Isle Madame	Boudreauville (Cowley Point)	Private	Philip Boudreau & Glen Boudreau	N/A	N/A
Richmond	Isle Madame	D'escousse	Non Profit Organization	Lennox Passage Yacht Club	N/A	N/A
Richmond	Isle Madame	Janvrin Harbour	Non Profit Organization	Janvrin's Island Community Centre	N/A	N/A
Richmond	Isle Madame	Poirerville	Non Profit Organization	Poirerville Wharf Preservation Society	N/A	N/A
Richmond	Isle Madame	Arichat	Private	Premium Seafoods Ltd.	N/A	N/A
Richmond	L'Ardoise	Chapel Cove (L'Ardoise West)	Non Profit Organization	Chapel Cove Wlf Preservation Soc.	N/A	N/A
Richmond	L'Ardoise	Fouchu	Non Profit Organization	Fouchu Wharf Preservation Society	N/A	N/A
Richmond	L'Ardoise	L'Archeveque	Non Profit Organization	L'Archeveque Whf Preservation Soc	N/A	N/A
Richmond	L'Ardoise	Little Harbour (L'Ardoise)	Small Craft Harbours	Harbour Authority of Little Harbour	154	\$ 672,611
Richmond	Louisedale	River Bourgeois (Bissetts)	Non Profit Organization	River Bourgeois Preservation Society	N/A	N/A
Shelburne	Barrington	Bear Point	Small Craft Harbours	Harbour Authority of Bear Point	160	\$ 663,700

County	CC Community*	Community**	Ownership	Management	Length (M)	Value (2004)
Shelburne	Barrington	Cripple Creek	Small Craft Harbours	Harbour Authority of Cripple Creek	N/A	\$ 1,214,184
Shelburne	Barrington	Lower Woods Harbour	Small Craft Harbours	Harbour Authority of Woods Harbour	210	\$ 1,358,669
Shelburne	Barrington	Lower Woods Harbour (Falls Point)	Small Craft Harbours	Harbour Authority of Woods Harbour	605	\$ 2,316,406
Shelburne	Barrington	Lower Woods Harbour (Forbes Point)	Small Craft Harbours	Harbour Authority of Woods Harbour	92	\$ 379,181
Shelburne	Barrington	Seal Island (Crowell's Cove)	Non Profit Organization	Seal Island Wharf Society	N/A	N/A
Shelburne	Barrington	Shag Harbour	Small Craft Harbours	Harbour Authority of Shag Harbour	230	\$ 1,588,905
Shelburne	Barrington	Shag Harbour (Prospect Point)	Small Craft Harbours	Harbour Authority of Shag Harbour	121	\$ 331,544
Shelburne	Cape Sable Island	Clark's Harbour	Small Craft Harbours	Harbour Authority of Clarks Harbour	559	\$ 1,905,295
Shelburne	Cape Sable Island	Newellton	Small Craft Harbours	Harbour Authority of Newellton	221	\$ 2,332,489
Shelburne	Cape Sable Island	South Side	Small Craft Harbours	Harbour Authority of South Side	148	\$ 3,560,240
Shelburne	Cape Sable Island	Stoney Island	Small Craft Harbours	Harbour Authority of Stoney Island	187	\$ 1,622,813
Shelburne	Cape Sable Island	Swims Point	Small Craft Harbours	Harbour Authority of Clarks Harbour	127	\$ 397,434
Shelburne	Cape Sable Island	West Head	Small Craft Harbours	Harbour Authority of West Head	400	\$ 4,971,483
Shelburne	Clyde River	Cape Negro	Municipality	Municipality of Barrington	N/A	N/A
Shelburne	Clyde River	Gunning Cove	Small Craft Harbours	Harbour Authority of Gunning Cove	203	\$ 1,593,831
Shelburne	Clyde River	Ingomar (Black Point)	Small Craft Harbours	Harbour Authority of Ingomar	164	\$ 2,095,524
Shelburne	Clyde River	Port La Tour	Small Craft Harbours	Harbour Authority of Port La Tour	32	\$ 1,233,627
Shelburne	Clyde River	Seal Island (East Cove)	Non Profit Organization	Seal Island East Cove Preservation Society	N/A	N/A
Shelburne	Clyde River	Smithsville	Small Craft Harbours	Harbour Authority of Port La Tour	69	\$ 133,438
Shelburne	Clyde River	Upper Port La Tour	Small Craft Harbours	Harbour Authority of Port La Tour	315	\$ 1,361,370
Shelburne	Lockeport	Jones Harbour	Small Craft Harbours	Harbour Authority of Jones Harbour	61	\$ 118,254
Shelburne	Lockeport	Little Harbour	Small Craft Harbours	Harbour Authority of Little Harbour	178	\$ 339,640
Shelburne	Lockeport	Lockeport	Small Craft Harbours	Harbour Authority of Lockeport	292	\$ 1,283,305
Shelburne	Lockeport	Osborne Harbour	Non Profit Organization	Osborne Harbour Wharf Association	N/A	N/A
Shelburne	Lockeport	Townsend's Harbour	Non Profit Organization	Townsend's Harbour Fishermens Association	N/A	N/A
Shelburne	Lockeport	West Green Harbour	Small Craft Harbours	Harbour Authority of West Green Harbour	101	\$ 656,585
Shelburne	Lockeport	Allendale	Non Profit Organization	Allendale Wharf Preservation Soc.	N/A	N/A
Shelburne	Shelburne	Lower Jordan Bay	Small Craft Harbours	Harbour Authority of Lower Jordan Bay	71	\$ 452,419
Shelburne	Shelburne	Lower Sandy Point	Small Craft Harbours	Harbour Authority of Lower Sandy Point	220	\$ 352,156
Shelburne	Shelburne	Shelburne	Town	Town of Shelburne	293	N/A
Victoria	Baddeck	Nyanza	Non Profit Organization	Wegmatcookway Wharf Society	N/A	N/A
Victoria	Boularderie Island	Big Bras D'or	Small Craft Harbours	Harbour Authority of Big Bras d'Or	N/A	\$ 476,819
Victoria	Dingwall	Dingwall	Small Craft Harbours	Harbour Authority of Dingwall	65	\$ 619,055
Victoria	Dingwall	Neils Harbour	Small Craft Harbours	Harbour Authority of Neils Harbour/New Haven	180	\$ 3,186,994
Victoria	Dingwall	New Haven	Small Craft Harbours	Harbour Authority of Neils Harbour/New Haven	206	\$ 508,488
Victoria	Dingwall	Smelt Brook	Non Profit Organization	Smelt Brook Harbour Association	N/A	N/A
Victoria	Dingwall	White Point	Historic Wharf	Harbour Authority of White Point/Smelt Brook	N/A	\$ 1,125,489
Victoria	Dingwall	Bay St. Lawrence	Small Craft Harbours	Harbour Authority of Bay St. Lawrence	438	\$ 1,963,498
Victoria	Englishtown	Englishtown	Non Profit Organization	St. Ann's Fisheman's Association	N/A	N/A
Victoria	Englishtown	New Campbellton	Non Profit Organization	Kelly Cove Heritage Society	N/A	N/A
Victoria	Ingonish	Ingonish (Macleods Point)	Small Craft Harbours	Harbour Authority of Ingonish	113	\$ 174,504
Victoria	Ingonish	Ingonish Beach	Small Craft Harbours	Harbour Authority of Ingonish Beach	N/A	\$ 34,934
Victoria	Ingonish	Ingonish Ferry (South Ingonish)	Small Craft Harbours	Harbour Authority of Ingonish Beach	61	\$ 478,341

County	CC Community*	Community**	Ownership	Management	Length (M)	Value (2004)
Victoria	Ingonish	Little River (Breton Cove, Victoria Co.)	Small Craft Harbours	Harbour Authority of Little River - Victoria Co.	114	\$ 1,152,068
Victoria	Ingonish	Wreck Cove	Private	Simon R. & Judy Jessome	N/A	N/A
Victoria	Little Narrows	Iona	Non Profit Organization	Central Cape Breton Community Ventures Incorporated	N/A	N/A
Yarmouth	Amiraults Hill	Morris Island	Small Craft Harbours	Harbour Authority of Two Islands	52	\$ 420,734
Yarmouth	Amiraults Hill	Suice Point	Small Craft Harbours	Harbour Authority of Suice Point	100	\$ 648,999
Yarmouth	Amiraults Hill	Surettes Island (The Title)	Small Craft Harbours	Harbour Authority of Two Islands	51	\$ 163,940
Yarmouth	Arcadia	Chebogue (Town Point Hill)	Small Craft Harbours	Harbour Authority of Chebogue	136	\$ 777,214
Yarmouth	Arcadia	Deep Cove Island	Private	Patrick J. LeBlanc	N/A	N/A
Yarmouth	Arcadia	Johns Island	Private	Mark Nickerson & Brian Nickerson	N/A	N/A
Yarmouth	Arcadia	Little River Harbour (Yarmouth)	Small Craft Harbours	Harbour Authority of Little River Harbour	124	\$ 1,211,760
Yarmouth	Arcadia	Pinkneys Point	Small Craft Harbours	Harbour Authority of Pinkney's Point	205	\$ 1,431,566
Yarmouth	Argyle	Camp Cove (Lower Argyle)	Small Craft Harbours	Harbour Authority of Camp Cove	182	\$ 2,812,142
Yarmouth	Hebron	Cheggogin (Pembroke Dyke Channel)	Small Craft Harbours	Harbour Authority of Cheggogin Point	102	\$ 204,939
Yarmouth	Hebron	Cheggogin Point	Small Craft Harbours	Harbour Authority of Cheggogin Point	174	\$ 2,440,934
Yarmouth	Hebron	Sandford	Small Craft Harbours	Harbour Authority of Sandford	524	\$ 2,196,820
Yarmouth	Port Maitland	Port Maitland	Small Craft Harbours	Harbour Authority of Port Maitland	456	N/A
Yarmouth	Pubnico	Dennis Point (Lower West Pubnico)	Small Craft Harbours	Harbour Authority of Dennis Point	489	\$ 4,028,568
Yarmouth	Pubnico	Ledge Harbour	Small Craft Harbours	Harbour Authority of Ledge Harbour	80	\$ 376,937
Yarmouth	Pubnico	Lower East Pubnico	Small Craft Harbours	Harbour Authority of Lower East Pubnico	449	\$ 3,149,288
Yarmouth	Pubnico	Abbotts Harbour	Small Craft Harbours	Harbour Authority of Abbots Harbour	98	\$ 529,536
Yarmouth	Tusket	Hubbards Point	Non Profit Organization	Hubbards Point & Area Community Development Association	N/A	N/A
Yarmouth	Tusket	Lower Eel Brook	Private	Mr. Duncan & Mrs. Campbell	N/A	N/A
Yarmouth	Wedgeport	Lower Wedgeport - Tuna Wharf	Small Craft Harbours	Wedgeport Harbour Authority	249	\$ 1,842,946
Yarmouth	Wedgeport	Plymouth	Non Profit Organization	Hubbards Point & Area Community Development Association	N/A	N/A
Yarmouth	Wedgeport	Wedge Point (Wedgeport)	Small Craft Harbours	Wedgeport Harbour Authority	295	\$ 3,189,746
Yarmouth	Yarmouth	Yarmouth Bar	Small Craft Harbours	Harbour Authority of Yarmouth Bar	N/A	\$ 1,762,242

* Community Name and Boundaries as provided by Community Counts.

** Community Name as provided by the Coastal Communities Network

Source: Nova Scotia Wharves, Coastal Communities Network, http://www.database.coastalcommunities.ns.ca/maps/wharves_map.asp

Source: Monique Cormier, Small Craft Harbours. pers. com. 2009

Source: Nova Scotia Atlas 2003, V 2.01. Service Nova scotia ad Municipal Relations, Nova Scotia Geomatics Centre.

Source: **Jobs, Management & Economics**

Appendix 5

b) 1991 Classification of Working Waterfront Communities by County

Table A5.2-1: 1991 Classification of Working Waterfront Communities, by County

<i>Type 1</i>		<i>Type 2</i>		<i>Type 3</i>		<i>Type 4</i>	
<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>
Antigonish	Mahoneys Beach	Annapolis	Granville Ferry	Annapolis	Margaretsville	Cape Breton	Eskasoni IR 3
Antigonish	Malignant Cove	Cape Breton	Florence	Annapolis	Port Lorne		
Cape Breton	Boularderie Island	Cape Breton	Louisbourg	Annapolis	Port Royal		
Cape Breton	Mira East	Digby	Saulnierville	Antigonish	Tracadie		
Cape Breton	Mira West	Halifax	Prospect	Cape Breton	Glace Bay		
Digby	Meteghan	Halifax	Terence Bay	Cape Breton	New Waterford		
Halifax	Chezzetcook	Inverness	Cheticamp	Cape Breton	North Sydney		
Halifax	Eastern Passage	Invernes	Long Point	Cape Breton	Port Morien		
Halifax	Hacketts Cove	Invernes	Mabou	Cape Breton	Sydney Northwest		
Halifax	Herring Cove	Invernes	Margaree	Colchester	Tatamagouche		
Halifax	Hubbards	Invernes	Port Hood	Cumberland	Advocate Harbour		
Halifax	Jeddore	Kings	Canning	Cumberland	Pugwash		
Halifax	Musquodoboit Harbour	Lunenburg	Blandford	Cumberland	Tidnish		
Halifax	Peggys Cove	Lunenburg	LaHave	Cumberland	Wallace		
Halifax	Sambro	Lunenburg	Lunenburg	Digby	Digby		
Halifax	Ship Harbour	Pictou	Pictou	Digby	Digby Neck		
Halifax	St. Margarets Bay	Pictou	River John	Digby	Weymouth		
Lunenburg	Chester Basin	Queens	Liverpool	Guysborough	Canso		
Lunenburg	Mahone Bay	Queens	Medway	Guysborough	Cross Roads Country Harbour		
Pictou	Little Harbour	Richmond	Louisdale	Guysborough	Guysborough		
Shelburne	Barrington	Shelburne	Shelburne	Guysborough	Larrys River		
Shelburne	Cape Sable Island	Victoria	Baddeck	Guysborough	Mulgrave		
Shelburne	Clyde River	Victoria	Ingonish	Guysborough	Sherbrooke		
Yarmouth	Arcadia	Yarmouth	Argyle	Halifax	Moser River		

<i>Type 1</i>		<i>Type 2</i>		<i>Type 3</i>		<i>Type 4</i>	
<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>
Yarmouth	Hebron	Yarmouth	Port Maitland	Inverness	Glendale		
Yarmouth	Pubnico	Yarmouth	Wedgeport	Inverness	Inverness		
		Yarmouth	Yarmouth	Kings	Blomidon		
				Lunenburg	Broad Cove		
				Lunenburg	Western Shore		
				Pictou	Merigomish		
				Queens	Port Mouton		
				Richmond	Isle Madame		
				Richmond	L'Ardoise		
				Shelburne	Lockeport		
				Victoria	Dingwall		
				Victoria	Englishtown		
				Victoria	Little Narrows		
				Yarmouth	Amiraults Hill		
				Yarmouth	Tusket		

Appendix 5

c) 2006 Classification of Working Waterfront Communities by County

Table A5.2-1: 2006 Classification of Working Waterfront Communities, by County

<i>Type 1</i>		<i>Type 2</i>		<i>Type 3</i>		<i>Type 4</i>	
<i>County</i>	<i>Community</i>	<i>NA</i>		<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>
Antigonish	Mahoneys Beach			Annapolis	Granville Ferry	Cape Breton	Eskasoni IR 3
Antigonish	Malignant Cove			Annapolis	Margaretsville		
Cape Breton	Mira East			Annapolis	Port Lorne		
Cape Breton	Mira West			Annapolis	Port Royal		
Cumberland	Tidnish			Annapolis	Tracadie		
Digby	Meteghan			Cape Breton	Boularderie Island		
Halifax	Chezzetcook			Cape Breton	Florence		
Halifax	Eastern Passage			Cape Breton	Glace Bay		
Halifax	Hacketts Cove			Cape Breton	Louisbourg		
Halifax	Herring Cove			Cape Breton	New Waterford		
Halifax	Hubbards			Cape Breton	North Sydney		
Halifax	Jeddore			Cape Breton	Port Morien		
Halifax	Musquodoboit			Cape Breton	Sydney Northwest		

<i>Type 1</i>		<i>Type 2</i>		<i>Type 3</i>		<i>Type 4</i>	
<i>County</i>	<i>Community</i>	<i>NA</i>		<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>
	Harbour						
Halifax	Prospect			Colchester	Tatamagouche		
Halifax	Sambro			Cumberland	Advocate Harbour		
Halifax	St. Margarets Bay			Cumberland	Pugwash		
Halifax	Terence Bay			Cumberland	Wallace		
Inverness	Cheticamp			Digby	Digby		
Inverness	Port Hood			Digby	Digby Neck		
Kings	Canning			Digby	Saulnierville		
Lunenburg	Blandford			Digby	Weymouth		
Lunenburg	Chester Basin			Guysborough	Canso		
Lunenburg	LaHave			Guysborough	Cross Roads Country Harbour		
Shelburne	Barrington			Guysborough	Guysborough		
Shelburne	Clyde River			Guysborough	Larrys River		
Victoria	Englishtown			Guysborough	Mulgrave		
Yarmouth	Amiraults Hill			Guysborough	Sherbrooke		
Yarmouth	Hebron			Halifax	Moser River		
Yarmouth	Port Maitland			Halifax	Peggys Cove		
Yarmouth	Pubnico			Halifax	Ship Harbour		
Yarmouth	Wedgeport			Inverness	Glendale		
				Inverness	Inverness		
				Inverness	Long Point		
				Inverness	Mabou		
				Inverness	Margaree		
				Kings	Blomidon		
				Lunenburg	Broad Cove		
				Lunenburg	Lunenburg		
				Lunenburg	Mahone Bay		
				Lunenburg	Western Shore		
				Pictou	Little Harbour		
				Pictou	Merigomish		
				Pictou	Pictou		
				Pictou	River John		
				Queens	Liverpool		
				Queens	Medway		
				Queens	Port Mouton		
				Richmond	Isle Madame		
				Richmond	L'Ardoise		
				Richmond	Louisdale		
				Shelburne	Cape Sable Island		
				Shelburne	Lockeport		

<i>Type 1</i>		<i>Type 2</i>		<i>Type 3</i>		<i>Type 4</i>	
<i>County</i>	<i>Community</i>	<i>NA</i>		<i>County</i>	<i>Community</i>	<i>County</i>	<i>Community</i>
				Shelburne	Shelburne		
				Victoria	Baddeck		
				Victoria	Dingwall		
				Victoria	Ingonish		
				Victoria	Little Narrows		
				Yarmouth	Arcadia		
				Yarmouth	Argyle		
				Yarmouth	Tusket		
				Yarmouth	Yarmouth		




NOVA SCOTIA

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