

**Environmental Issues in the**  
**Southern Gulf of St. Lawrence**

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## **Executive Summary**

### **Background**

This report provides an overview of environmental issues impacting upon the Southern Gulf of St. Lawrence ecosystem. The report focuses on environmental problems caused by anthropogenic modifications including land-based activities in the Southern Gulf watershed, coastal and marine activities. The aim of this report is to identify the issues, and determine the objectives and strategies which are being used to address them. This information has been compiled as a concise summary which will provide background and discussion for the Southern Gulf of St. Lawrence Workshop to be held in the Fall of 1997.

### **Approach**

The overall purpose of the project is to synthesize existing information to provide a succinct overview of environmental issues in the Southern Gulf region. Achieving this task necessitated drawing on various information sources. The initial phase of the project required reviewing the literature to provide the necessary background and set the context for the study, as well as to compile a preliminary list of issues. Further research including reviewing numerous government publications, discussions with stakeholders and experts, and internet searches provided the most current information pertaining to environmental problems in the Southern Gulf region.

### **Organization**

The first section of the report provides background on the Southern Gulf region including a discussion of major oceanographic features, climate, coastal and marine biological characteristics. The social and economic features of the region are also presented including the primary industries and activities which occur in the watershed, coastal and marine areas of the region. Issues are categorized according to the major anthropogenic activities which cause them and are presented under activity categories in the text. The final section of the report is a conclusion which underscores the project findings.

### **Summary**

The Gulf of St. Lawrence is a unique marine region due to its enclosed nature and the large inputs of fresh water it receives. The primary feature of the Southern Gulf is the Magdalen Shallows which is a marine plateau with relatively shallow depths and warmer water temperatures than elsewhere in the Gulf. The Magdalen Shallows is a biologically productive region which supports a diversity of wildlife and critical habitats.

The Southern Gulf supports a wide range of land and marine based activities which provide the economic basis for communities along the coast and throughout the watershed. Fish processing, pulp and paper production, mining, agriculture and fishing are some of the most important economic activities in the region. Coastal areas are also highly valued and widely utilized by the region's population for recreational opportunities. While these industries and activities are economically and socially important, they are also sources of environmental stress on the Southern Gulf ecosystem.



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Stresses associated with these activities have culminated in serious environmental concerns in many areas of the Southern Gulf. Increasing pressures on resources, loss of critical habitats and degraded water quality are some of the problems threatening the integrity of the marine and coastal environment. These and other problems have been identified as important issues in the Southern Gulf and have been categorized according to their anthropogenic sources. The seven categories and issues are summarized in the following table.

## **Résumé**

### **Contexte**

Le présent rapport est un aperçu des questions environnementales ayant un impact sur l'écosystème du sud du golfe Saint-Laurent. Il s'agit essentiellement des problèmes écologiques causés par les modifications dues aux activités humaines dans les secteurs littoraux et marins du sud du Golfe et dans tout le bassin-versant. L'objectif était de cerner ces enjeux et de déterminer les objectifs et stratégies qui sont utilisés pour y faire face. L'information a été compilée sous forme de sommaire concis, lequel fournira une toile de fond et une base de discussion pour l'Atelier sur le sud du golfe Saint-Laurent qui doit avoir lieu à l'automne 1997.

### **Démarche**

De manière générale, le projet visait à synthétiser l'information existante de manière à obtenir un bref aperçu des questions environnementales qui touchent le sud du Golfe. Il a fallu puiser cette information de sources diverses. La première étape a été une recherche bibliographique, qui a permis d'obtenir les renseignements de base, de préciser le contexte du projet et de compiler une liste préliminaire des enjeux. Ensuite, l'examen de nombreuses publications gouvernementales, la consultation de divers intervenants et experts et les recherches sur Internet ont permis de rassembler les données les plus récentes sur les problèmes environnementaux de la région.

### **Organisation**

Dans la première section du rapport, nous présentons des renseignements généraux sur la région du sud du Golfe et décrivons notamment les principales caractéristiques océanographiques, climatiques et biologiques des secteurs marins et côtiers. Nous résumons également les caractéristiques socio-économiques de la région, y compris les principales activités industrielles et autres se déroulant dans le bassin-versant et les secteurs côtier et marin du sud du Golfe. Les divers enjeux environnementaux sont classés selon les principales activités humaines qui en sont la cause, et nous les présentons par catégorie d'activité dans le texte. La dernière section du rapport est une conclusion qui fait ressortir les constatations du projet.

### **Sommaire**

Le golfe Saint-Laurent est unique, car il s'agit d'une région marine relativement fermée qui reçoit un grand apport d'eau douce. Dans le sud du Golfe, l'élément océanographique le plus remarquable est le banc des îles de la Madeleine, plateau marin aux eaux relativement peu profondes et plus chaudes que celles des autres secteurs du Golfe. Ce banc a une productivité biologique élevée, héberge une faune diversifiée et renferme de nombreux habitats critiques.

La région du sud du Golfe se prête à une vaste gamme d'activités terrestres et marines, qui constituent l'assise économique des collectivités qui parsèment le littoral et l'ensemble du bassin-versant. La transformation du poisson, la production de pâte et de papier, les

mines, l'agriculture et la pêche sont parmi les principales activités économiques. Le littoral offre en outre à la population de la région des possibilités récréatives très appréciées. Toutes ces industries et activités ont une grande importance socio-économique, mais elles constituent des sources de stress pour l'écosystème du sud du Golfe.

Ces sources de stress ont fini par soulever de graves préoccupations d'ordre environnemental dans de nombreux secteurs du sud du Golfe. Parmi les problèmes qui menacent l'intégrité même des milieux marin et côtier, mentionnons la pression accrue sur les ressources, la destruction d'habitats critiques et la dégradation de la qualité de l'eau. Il a été établi que ces problèmes, de même que plusieurs autres, constituent des enjeux importants pour le sud du Golfe, que nous avons classés selon les activités humaines qui en sont la cause. Le tableau suivant énumère les sept catégories d'activité retenues et décrit sommairement les enjeux qui s'y rapportent.

#### Sommaire des catégories d'activité et des enjeux connexes

Catégorie d'activité	Enjeu	Problème
<b>Transport et navigation</b>	Dragage	Le dragage des voies navigables altère les propriétés hydrodynamiques de l'eau et contribue à la dégradation du secteur côtier.
	Immersion de déchets en mer	L'immersion de déchets contribue à la pollution du milieu marin.
	Déversements continus	Le déversement continu de contaminants associé aux activités de navigation a un impact cumulatif sur le milieu marin.
	Déversements accidentels	Les accidents et risques associés à la navigation menacent le milieu marin du sud du Golfe.
	Présence du pont de la Confédération	Le nouveau pont de la Confédération a modifié le milieu littoral et risque de nuire aux processus biologiques dans le détroit de Northumberland.
<b>Pêche commerciale</b>	Surcapacité	L'effort de récolte lié à la surcapacité de pêche a contribué à l'épuisement ou à l'effondrement de certaines ressources halieutiques du Golfe.
	Mortalité des espèces exploitées et non exploitées	Le rejet des poissons qui ne satisfont pas aux exigences réglementaires ou n'ont pas de valeur économique peut avoir un impact appréciable.
	Pêche sélective	Les techniques de pêche sélective peuvent modifier la structure génétique des populations.
	Destruction des habitats	Certaines techniques de pêche peuvent détruire les milieux benthiques ou les rendre impropres à certaine espèces.

	Pêcheries nouvelles	Le déclin des stocks exploités par les pêcheries classiques a entraîné une exploitation accrue d'autres espèces, mal connues.
	Impacts biologiques de l'aquiculture	Les pratiques aquicoles peuvent avoir des impacts biologiques nuisibles.
	Empoisonnement par les mollusques (phénomène naturel)	Les algues produisant des toxines dangereuses peuvent provoquer des empoisonnements chez les humains qui consomment des mollusques ou d'autres produits de la mer.
<b>Agriculture</b>	Lessivage des terres cultivées	Les eaux de ruissellement provenant des terres cultivées contribuent à la dégradation des milieux humides et des milieux côtiers et estuariens et sont une cause importante de contamination des mollusques.
	Erosion des sols	Certaines pratiques agricoles actuelles contribuent à l'érosion des sols et au dépôt de sédiments, qui nuisent à la qualité de l'eau et aux habitats du poisson.
	Destruction des terres humides	Le comblement de milieux humides à des fins agricoles a modifié ou détruit des milieux humides qui avaient des fonctions biologiques importantes.
<b>Industries</b>	Effluents des usines de pâte et papier	Les effluents des usines de pâte et papier peuvent nuire gravement à la qualité des eaux dans la région du Golfe.
	Mines et fonderies	Les rejets de métaux lourds toxiques et les émissions atmosphériques dus aux travaux d'extraction et de fonte nuisent à la qualité de l'environnement.
	Centrales thermiques	À l'échelle régionale, les centrales thermiques constituent une source importante de pollution des eaux et de l'air.
	Usines de chlore et de soude caustique	Les usines qui produisent du chlore et de la soude caustique pour l'industrie des pâtes et papiers sont une source de pollution par le mercure.
	Usines de transformation du poisson	Les effluents liquides des usines de transformation du poisson ont contribué à certains problèmes locaux de qualité de l'eau.
	Usines de transformation des aliments	Les effluents des usines de transformation des aliments sont riches en matières organiques et en éléments nutritifs et ont une forte demande en oxygène, ce qui pollue les eaux où ils aboutissent.

	BPC présents dans l'environnement	La présence de BPC dans le Golfe est préoccupante, puisque ces composés sont très toxiques et persistants et s'accumulent dans les tissus vivants des animaux qui les ingèrent.
<b>Urbanisation et aménagement</b>	Rejets municipaux	Le rejet d'eaux usées non traitées par les municipalités nuit à la qualité de l'eau et des milieux côtiers.
	Dégradation du littoral	L'urbanisation et l'aménagement du littoral du Golfe a entraîné la destruction de milieux humides et l'érosion de certains rivages.
	Usages incompatibles du littoral et des eaux côtières	Les eaux côtières et les rivages du sud du Golfe subissent la pression croissante d'usages qui entrent en conflit les uns avec les autres, comme la pêche, l'aquiculture, les activités récréatives, le tourisme, l'industrie et la construction de résidences.
	Activités récréatives	Les zones littorales du sud du Golfe sont devenues très populaires pour les activités récréatives et touristiques, ce qui exerce une pression supplémentaire sur les ressources naturelles et l'environnement de la région.
<b>Protection des habitats</b>	Destruction des habitats	Dans la région du Golfe, de nombreuses activités ont entraîné des pertes importantes d'habitats critiques dans les milieux marins, côtiers et littoraux.
<b>Climat et qualité de l'air</b>	Changement climatique	Le réchauffement planétaire dû à l'accroissement de la pollution atmosphérique menace les collectivités côtières du sud du Golfe.
	Transport à grande distance de polluants atmosphériques	Le golfe Saint-Laurent est sous le vent des régions industrielles du Canada et des États-Unis et reçoit ainsi des apports importants de SO <sub>2</sub> (principale cause des pluies acides) et de NO <sub>x</sub> (provoquant la formation d'ozone près du sol).

### An Overview of Categories and Associated Issues

Issue Category	Issue Title	Problem Statement
<b>Shipping and Transportation Issues</b>	<i>Dredging</i>	Dredging waterways to maintain shipping access alters hydrodynamics and contributes to degradation of near-shore.
	<i>Ocean Dumping</i>	The disposal of waste material contributes to contamination of the marine environment.
	<i>Chronic Spills</i>	Chronic spills of contaminants due to shipping practices result in cumulative impacts on the marine environment.
	<i>Accidental Spills</i>	Accidents and risks associated with shipping pose a risk to the Southern Gulf's marine environment.
	<i>Confederation Bridge - Physical Presence</i>	The physical presence of the bridge has altered the coastal environment and may adversely affect biological processes within the Northumberland Strait.
<b>Commercial Fishing Issues</b>	<i>Over-capacity</i>	Over-capacity in terms of fishing effort has contributed to depletion and collapse of some Gulf fisheries resources.
	<i>Mortality of Target and Non-Target Species</i>	Discarding fish which do not meet regulatory requirements or have economic value can have significant impacts.
	<i>Habitat Destruction</i>	Certain fishing technologies can destroy benthic habitats making them inhabitable for certain species.
	<i>Non-traditional Fisheries</i>	Decline in stocks of traditional fisheries have resulted in an increased emphasis on non-traditional species for which there is a lack of documentation.
	<i>Biological Impacts of Aquaculture</i>	Aquaculture practices can result in adverse biological impacts.

<b>Agricultural Issues</b>	<i>Agricultural Runoff</i>	Runoff from agriculture contributes to degradation of estuarine, wetland and near-shore environments and is a significant cause of shellfish contamination.
	<i>Soil Erosion</i>	Some current agricultural practices contribute to soil erosion and deposition of sediments which degrade water quality and fish habitat.
	<i>Loss of Wetlands</i>	Infilling for agricultural purposes has resulted in an alteration and loss of wetlands which serve important biological functions.
<b>Industrial Issues</b>	<i>Pulp and Paper Effluent</i>	Pulp and paper mills discharge effluents which can severely degrade water quality in the Gulf region.
	<i>Mining and Smelting Operations</i>	The discharge of toxic heavy metals and air emissions from mining and smelting operations degrade environmental quality.
	<i>Thermal Electrical Generating</i>	Thermal electric stations are significant regional sources of air and water contaminants.
	<i>Chlor-alkali Plants</i>	Chlor-alkali plants produce chlorine and caustic soda used by pulp and paper industry and are a source of mercury contamination.
	<i>Fish Processing Plants</i>	Liquid effluents released from fish processing plants have contributed to localized water quality problems.
	<i>Food Processing Plants</i>	Food processing plants discharge highly organic, nutrient rich, oxygen-demanding effluents which degrade receiving waters.
	<i>PCB's in the Environment</i>	The presence of PCB's in the Gulf are a concern since they are highly toxic substances which are persistent and accumulate in living tissues if ingested.
<b>Urbanization and Development Issues</b>	<i>Municipal Discharges</i>	Discharge of untreated municipal waste adversely effects water quality and near-shore habitats.
	<i>Shoreline Degradation</i>	The urbanization and coastal development along the Gulf of St. Lawrence has resulted in the destruction of wetlands and the erosion of shorelines.
	<i>Conflicting Uses of Coastal/Near-shore Environments</i>	Coastal waters and shores in the Southern Gulf of St. Lawrence are coming under increasing pressure from competing uses such as fishing, aquaculture, recreation, tourism, industrial and residential use.

	<i>Impacts of Recreation</i>	The coastal areas of the Southern Gulf have become popular locations for recreational and tourist activities which place additional stresses on the natural resources and environment of the region.
<b>Habitat Protection Issues</b>	<i>Loss of Critical Habitats</i>	Numerous activities in the Gulf region have resulted in significant losses of critical habitat in the marine, near-shore and coastal environments.
<b>Climate and Air Quality Issues</b>	<i>Climate Change</i>	Global warming associated with increasing air pollutants pose a threat to the Southern Gulf's coastal communities.
	<i>Long Range Atmospheric Transport</i>	The Gulf of St. Lawrence is downwind from industrial regions of Canada and the US and therefore receives significant inputs of SO <sub>2</sub> (the major factor in acid rain) and NO <sub>x</sub> (ground level ozone formation).

## ***List of Abbreviations***

ACAP	Atlantic Coastal Action Plans
AQUAMIN	Aquatic Effects of Mining in Canada
ARET	Accelerated Reduction/Elimination of Toxics
ARMA	Air Resource Management Areas
ATV	All Terrain Vehicles
BOD	Biological Oxygen Demand
CEPA	Canadian Environmental Protection Act
CSSP	Canadian Shellfish Sanitation Program
CWS	Canadian Wildlife Services
DFO	Department of Fisheries and Oceans
DOE	Department of the Environment
EEM	Environmental Effects Monitoring
EMAN	Ecological Monitoring and Assessment Network
FEARO	Federal Environmental Assessment Review Office
FRCC	Fisheries Resource Conservation Council
FPCLU	Federal Provincial Committee on Land Use
IPM	Integrated Pest Management
MEND	Mine Environmental Neutral Drainage
MEQ	Marine Environmental Quality
MMLER	Metal Mining Liquid Effluent Regulations
MPA	Marine Protected Areas
MREAC	Miramichi River Environmental Assessment Committee
NB	New Brunswick
NGO	Nongovernmental Organizations
NS	Nova Scotia
OMS	Oceans Management Strategy
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PEI	Prince Edward Island
PPER	Pulp and Paper Effluent Regulations
PSP	Paralytic Shellfish Poisoning
TAC	Total Allowable Catch
TAGS	The Atlantic Groundfish Strategy

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# **Environmental Issues in the Southern Gulf of St. Lawrence**

## **1. Introduction**

The Gulf of St. Lawrence is an important ecological and economic region of North America. Communities along the Gulf coast throughout Atlantic Canada and Québec depend on the Gulf's resources for income and recreational opportunities (McGuire, 1979). As the receiving water for the Great Lakes and St. Lawrence River system, the Gulf is subject to considerable shipping traffic en-route to the industrial corridor of southern Ontario and Québec. The Magdalen Shallows region is of particular importance to communities in the Southern Gulf since it supports numerous commercial fisheries, industrial activities and recreational uses. In addition to its economic importance, the Magdalen Shallows provides critical spawning, feeding and nursery grounds for numerous fish species. The region also supports key environments such as salt marshes, beaches, estuaries and Acadian forests which provide habitat for a diverse assortment of wildlife.

### **Purpose of the Project**

The Southern Gulf of St. Lawrence is subject to considerable environmental stress and degradation from marine and land based activities including: industry, commercial fishing, urbanization and agricultural practices. Pressures on the Gulf's resources have resulted in serious consequences including the collapse of a once thriving cod fishery, contamination of shellfish growing areas, coastal degradation and water quality problems from the release of dangerous toxins and chemicals. Although these issues have been the focus of several individual reports and studies, little has been done to provide a succinct overview of the issues and concerns in the Southern Gulf. Therefore, the purpose of this report is to:

- provide an overview of major environmental issues within the Southern Gulf of St. Lawrence ecosystem
- identify current strategies and objectives for addressing these issues
- provide background material for the Southern Gulf of St. Lawrence Workshop to be held in the Fall of 1997.

## **2. Background**

### **2.1 Setting**

The Southern Gulf of St. Lawrence is a vast and diverse region that stretches from the Gaspé peninsula along the northern coast of New Brunswick and includes the Northumberland shores of New Brunswick and Nova Scotia, the eastern coast of Cape Breton, the Magdalen Islands, and the province of Prince Edward Island. The Gulf receives fresh water inputs from a drainage basin with a surface area nine times that of the Gulf itself. Sea water enters the Southern Gulf through the Cabot Strait and to a lesser extent via a second opening at the Strait of Belle Isle (Figure 1).

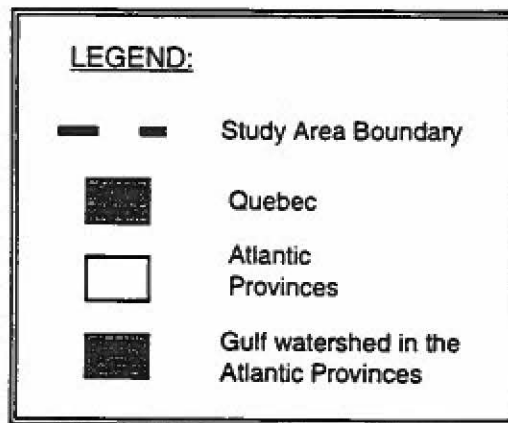
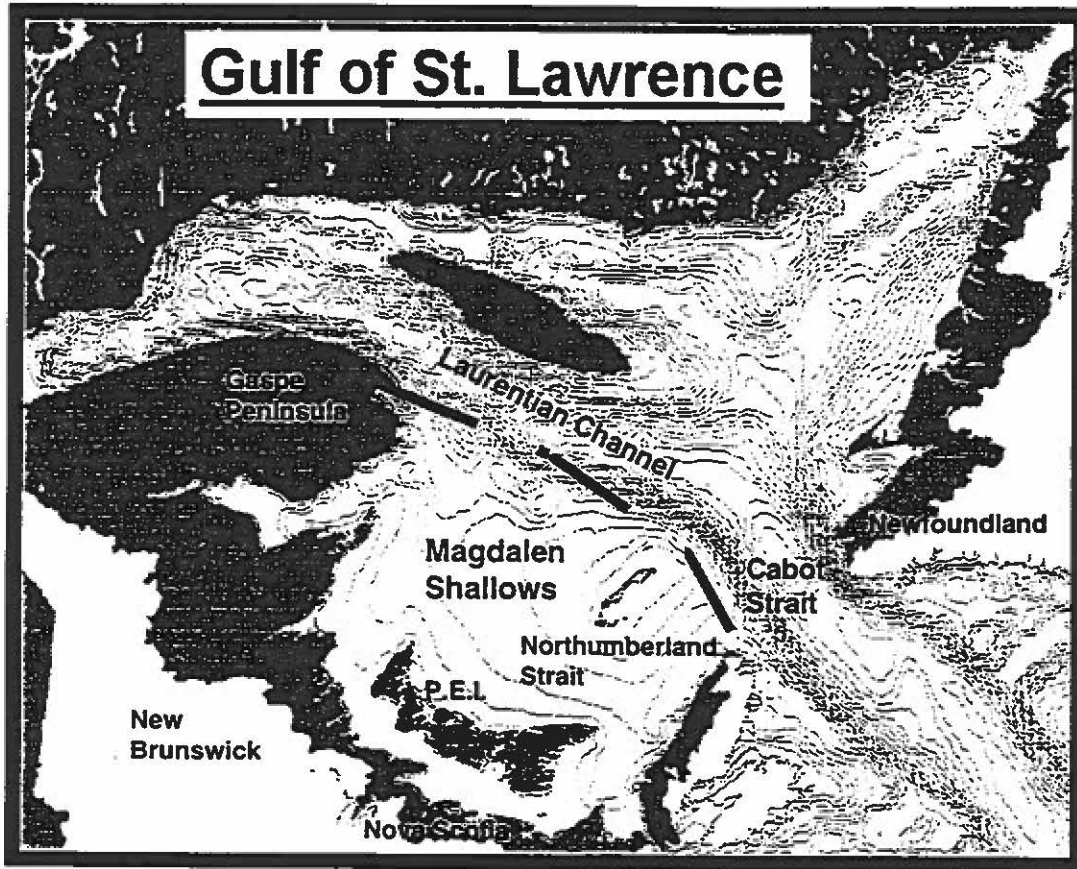


Figure 1. The Gulf of St. Lawrence.

## 2.2 Oceanographic and Biological Characteristics

The Gulf of St. Lawrence has unique oceanographic characteristics due to its enclosed nature and the large inputs of fresh water it receives. In effect, the Gulf demonstrates some characteristics more typical of a large, extended estuary (Eaton et al., 1994; White and Johns, 1996). The Gulf's physical oceanographic features are the result of a number of variables including: precipitation, fresh water discharge, wind, topography, heat transfer, tides and tidal currents (Environmental Atlas, 1979). The distinct oceanographic features of the Gulf play a significant role in determining the variety and distribution of marine life found in the region.

### (a) Oceanographic Features

The two main bathymetric features of the Gulf of St. Lawrence are:

- the Laurentian Channel which extends over 1300 km from beyond the Scotian Shelf to the Saguenay Fjord and has a maximum depth of 535 m.
- the Magdalen Shallows extending southwest from the Laurentian channel to the coasts of NS, PEI, NB and the southeastern Gaspé.

The Magdalen Shallows is the primary marine feature of Southern Gulf is. The bottom topography is characterized by a plateau with depths generally less than 80 m and warmer water temperatures than elsewhere in the Gulf (Parks Canada, 1995). The warm waters of the Magdalen Shallows supports a wider diversity of plankton than other regions of the Gulf and provide important spawning, feeding and nursery areas for many fish species (White and Johns, 1996; Lawrence et al., 1987).

The Laurentian Channel functions as a conduit for saline waters from the Atlantic Ocean to enter the Gulf. Sea water flows through the Laurentian Channel towards the Lower Estuary where a zone of intense mixing causes the colder, more saline waters to move to the surface, thereby eliciting some oceanic characteristics in the Lower Estuary (White and Johns, 1996).

Conversely, the oceanography of the Gulf is primarily influenced by large inputs of fresh water from the St. Lawrence River and the combined inputs of the rivers of the Gulf and the Estuary north shore (White and Johns, 1996; FRCC, 1996). In general, deep saline waters flow inward towards the estuary from the ocean via the Laurentian Channel, and less saline surface water flows out towards the ocean through the Cabot Strait. Water movement through the Gulf is influenced by the dominant Gaspé current which flows from the mouth of the estuary through counter-clockwise circulation around the Gulf. In the Southern Gulf, the current weakens around PEI prior to exiting via the Cabot Strait (White and Johns, 1996; Parks Canada, 1995).

Ice formation and melting also contribute a significant amount of fresh water to the Southern Gulf waters. Sea ice begins to form in December and gradually extends to include the entire Southern Gulf (Lawrence et al., 1987). During February and March, sea ice from the central Gulf advances seaward through the Cabot Strait. Heavy ice concentrations remain in the southern Gulf until spring when winds and water currents move ice out onto the Scotian Shelf (McGuire, 1979). Strong winds are another factor which influence oceanographic processes in the Gulf, particularly in the spring and winter when winds are strongest and most frequent (White and Johns, 1996). Tides are an additional factor contributing to the Gulf's oceanographic

characteristics. The Southern Gulf is subjected to diurnal tides with two low and two high tides per day.

### *(b) Regional Climatic Characteristics*

The climate of the Southern Gulf region can be described as humid temperate with a mean summer temperature of 16 °C and a mean winter temperature of -5 °C (Lawrence et al., 1987). Prevailing winds blow from the southwest in summer and the northwest in winter. Since the 1980s the Gulf region has been subject to a trend of decreasing air temperatures and lower than normal water temperatures (White and Johns, 1996; FRCC, 1996). Precipitation in the region is generally consistent throughout the year and averages 1 000 mm on the Gulf of St. Lawrence (Eaton et al., 1994).

### *(c) Biological Aspects*

The Gulf of St. Lawrence is a biologically productive marine region due to warm summer water temperatures and considerable mixing of surface waters with deeper, more nutrient rich waters (Eaton et al., 1994). The coastal zone of the Southern Gulf region is characterized by broad lowland areas with many shallow protected estuaries and bays. The Southern Gulf coast supports the most extensive barrier island system in Canada (Eaton et al., 1994). The protected bays and inlets of the area are critical habitat for numerous fish species which utilize the area for spawning and feeding. The Magdalen Shallows is noted for supporting the richest diversity and abundance of zooplankton and ichthyoplankton in the entire Gulf region (White and Johns, 1996).

### *Marine Wildlife*

Numerous finfish species are found in the Southern Gulf including important commercial species such as cod, herring, halibut, and flounder (Parks Canada, 1995). Commercially important invertebrate species found throughout the region include lobster, snow crab, and molluscs such as oysters, mussels, clams, and scallops. In addition, several of Southern Gulf's tributaries function as important spawning rivers for anadromous species including Atlantic salmon, rainbow trout, alewife and American shad (Parks Canada, 1995). The Gulf region is also an important migration route for many fish species including herring and Atlantic Cod. These species utilize the Southern Gulf primarily for feeding and spawning in the summer months. American eels are also found in the Gulf, and to a lesser degree in the southern Gulf, enroute to their adult habitat in several of the Gulf's coastal rivers (White and Johns, 1996).

In general, populations of seabirds are low in the Southern Gulf, as compared to the Gaspé peninsula and the Northeastern regions, due to a lack of breeding sites and shallow depths (White and Johns, 1996). Seabirds which are found in the Magdalen Shallows area include: gulls, terns, and cormorants in the southern portion of the shallows; in addition to black guillemot and gannets which utilize the northern Shallows area and the areas around the Gaspé Peninsula and Chaleur Bay, NB (White and Johns, 1996; Eaton et al. Atlantic, 1994).

Seals are common in the area and four species are found throughout the Gulf region: harp and hooded seals, which are migratory species; and harbour and grey seals, which are year round residents (Parks Canada, 1995). Although harbour seals live and breed in inshore areas, hooded, harp and grey seals all breed on the pack ice in the Southern Gulf, The area surrounding the

Magdalen Islands is a particularly important breeding ground for large herds of harp and hood seals during the spring ice season (Eaton et al., 1994).

Populations of cetaceans (whales, dolphins and porpoises) are relatively low in the Southern Gulf compared to larger populations around the Gaspé and primarily in the Northeastern Gulf (White and Johns, 1996). Finback, minke and blue whales are found throughout the Gulf region. In the spring, these whales migrate through the Gulf as far as the Lower Estuary. Finbacks and minkes are the most common species in the Southern Gulf. Pilot whales, white-sided and white-beaked dolphins, and harbour porpoises are also found in the throughout the region, although populations in the Southern Gulf tend to be low (Parks Canada, 1995).

### *Coastal Wildlife*

The predominant type of shoreline in the Southern Gulf is gently sloping with low cliffs. Higher cliffs up to 100 m are found only along the Cape Breton Coast and the Gaspé Peninsula (Parks Canada, 1995; Lawrence et al., 1987). The coastal zone is dominated by low-lying beaches, salt marshes and tidal flats with numerous small estuaries and sheltered bays. Salt marshes are particularly productive ecosystems and provide critical habitat for aquatic species, acting as prime nursery and feeding areas for many fish species. The region's salt marshes (primarily around PEI and along the NB Northumberland Shore) perform a host of ecological functions such as: contributing to estuarine productivity, wildlife habitat, water purification, and acting as natural shoreline buffers (Eaton et al., 1994).

Coastal habitats of the Southern Gulf support numerous shorebirds and waterfowl species including: plovers, sandpipers, Canada geese, black ducks, eiders, and scoters which migrate through the region (Eaton et al., 1994). The region is especially critical for the endangered piping plover with more than 70% of Atlantic Canada's population breeding in the area (Parks Canada, 1995). Coastal wetlands function as important habitats for breeding and migrant waterfowl. Major stopover areas are located in the estuaries on the north and south coasts of PEI and Southeastern NB. The Northumberland Strait is an important migration route and the site of a number of breeding areas primarily for eiders and black ducks (NS Land Use Committee, 1994).

### **2.3 Social and Economic Characteristics**

In addition to the biological resources found within the Southern Gulf of St. Lawrence, the region also supports a wide variety of land and marine based activities. Fish processing, manufacturing and other industrial activities provide employment and the economic basis for numerous communities throughout the Southern Gulf region. While these industries and activities are economically important, they are also significant sources of air and marine contaminants. Major activities and industries in the region are noted below.

#### *(a) Forestry*

Forestry is of considerable economic importance to Atlantic Canada as a whole, with the exception of PEI. In the Gulf region, forestry is particularly important to New Brunswick, where wood harvesting and processing are valued at \$2.7 billion per year on a provincial level (Eaton et

al., 1994). The production of pulp and paper products is the forest industry sector of greatest economic importance in the region and is the largest consumer of forest resources (Eaton et al., 1994).

#### ***(b) Pulp and Paper Production***

There are six pulp and paper mills located in the Southern Gulf of St. Lawrence which provide substantial economic benefits for the region. The mills are also important indirect sources of employment, providing jobs in the harvest and transport of pulp logs and in other support industries (Eaton et al., 1994).

#### ***(c) Mining and Associated Operations***

Three principal mining areas in the Southern Gulf region include:

- Bathurst - lead, zinc and copper
- New Glasgow - coal
- Moncton-Springhill - coal, salt and gypsum

In addition to these three areas, there is also a lead smelter operated by Brunswick Mining and Smelting Corporation in Belledune, New Brunswick. The smelter is one element of an industrial complex that also includes a phosphate fertilizer and a marine terminal.

Mining in Prince Edward Island has been limited to shale and sand/gravel removal in small degrees. However, the removal of sand in the near-shore zone has been an issue in some areas of the province (Eaton et al., 1994).

There are five thermal generating plants located within the Southern Gulf region. All five of these plants are powered through the extraction of coal or oil and provide a significant percentage of the energy supply for each of the provinces in the region.

Two chlor-alkali plants also operate in the Southern Gulf of St. Lawrence. CIL in Dalhousie, NB and Canso Chemicals Ltd. in Abercrombie, NS produce chlorine and caustic soda necessary for the pulp and paper processing industry.

#### ***d) Agriculture***

The most productive soil for farming in the Southern Gulf region are found along the Northumberland Shore of Nova Scotia and throughout most of Prince Edward Island (NS Department of Development, 1986). The cleared land of the Northumberland Shore is used mainly for the production of forage crops in support of the livestock industry - principally dairy farming. As well, a small percentage of the region's fruits, vegetables, potatoes and grains are also grown in this area (NS Department of Development, 1986).

Although the agricultural sector accounts for a fairly small portion of the region's overall economic activity, in Prince Edward Island its importance is considerably higher than the other provinces. In terms of total employment, farming accounts for 17.6% of the province's total employment.

### ***(e) Commercial Fishing and Aquaculture***

Commercial fishing represents a major contributor to the economy of the Southern Gulf region (Lawrence et al., 1987). Despite declines in some stocks in recent years, fishing continues to be the primary source of income for many coastal communities (Eaton et al., 1994). Species which form the basis of the commercial fishery include: groundfish (cod and redfish); pelagic fish (herring, mackerel and capelin) and shellfish (lobster, crab and scallops). The lobster and snow crab fisheries in the Southern Gulf have been expanding since the 1980s. These fisheries provide considerable employment and are the most lucrative in terms of economic return (White and Johns, 1996).

Aquaculture in the Gulf has been expanding rapidly in recent years. Both finfish and shellfish are cultivated in Gulf waters, although aquaculture of salmonids lags behind other regions in Atlantic Canada due to extensive ice coverage in the winter and cold surface temperatures for much of the year (White and Johns, 1996). Aquaculture of oysters and mussels has been particularly successful in PEI, with the Island accounting for over 90% of total Canadian production of blue mussels (PEI Government Website, 1997). Mussels and oysters are also being increasingly cultivated in several of the indented bays along New Brunswick's Northumberland shore (NB Government Website, 1997; Lawrence et al., 1987).

### ***(f) Processing Plants***

Fish and food processing plants play an important role in the economy of the Atlantic Region. The importance of the fishery has resulted in an extensive onshore fish processing industry. In the Southern Gulf, fish processing plants are located along the Northumberland Strait and the northern coast of New Brunswick. Other food processing plants in the region produce a wide variety of products including: fruits, vegetables, meat, poultry, dairy products and specialty foods such as potato chips (Eaton et al., 1994). Cavendish Foods potato processing plant in Prince Edward Island provides employment for hundreds of people and is the province's largest employer.

### ***(g) Recreational Uses***

The warm waters of the Northumberland Strait make the region popular for tourist homes and cottages on both Nova Scotia and Prince Edward Island shores. Lighthouses, fishing ports, wharves, coastal hiking trails, campgrounds, resorts, beaches and accommodations are some of the attractions that draw tourists during the summer and fall seasons. The region's diverse and accessible wilderness of lakes, rivers, trails and beaches provide visitors with a variety of recreational opportunities including bird watching, sport fishing and hiking.

## **2.4 Local Sources of Pollution and Areas of Concern**

The socioeconomic activities and industries in the Southern Gulf have placed the region's resources and habitats under increasing strain. In particular, a number of areas have been identified as local sources of pollution including:

- Miramichi - effluent from pulp mills, metals and toxic wastes
- Richibouctou - discharges of untreated sewage effluent
- Caraquet - impacts from dredging activities
- Bathurst - pulp and paper effluent, mining impacts

- Belledune - port activities, fertilizer and smelting operations
- Campbellton - effluent from pulp and paper mill
- Pictou Harbour - fish processing and municipal discharges
- Chaleur Bay - effluents from pulp mills, aluminum chemical plant, chlor-alkali discharges, lead smelter, fertilizer plant and municipal sewage discharges.

### **3. Issue Identification**

#### **3.1 Introduction**

The following section identifies the significant marine and land-based activities within the Southern Gulf of St. Lawrence region and provides an overview of the resulting environmental impacts. A brief background for each issue is provided, in addition to a discussion of key objectives and strategies for addressing these concerns.

### **3.2 Category: Shipping and Transportation Related Issues**

#### ***Issue Title: Dredging***

#### ***Problem Statement:***

- Dredging waterways to maintain shipping access alters hydrodynamics and contributes to degradation of near shore areas.

#### ***Description:***

- Dredging of waterways for navigational purposes can cause significant environmental impacts in near-shore areas including: decreased stability of the seabed, resuspension of contaminated sediments, smothering of benthic environment and fish spawning beds, siltation in inshore environments and estuaries, degraded water quality, altered hydrodynamics potentially contributing to shoreline erosion.

#### ***Objectives:***

- Minimize the impacts of dredging, particularly on near-shore and estuarine environments.

#### ***Strategies:***

- Restrict dredging operations to least vulnerable dates, require prior impact assessments for operations (*Ocean Dumping Regulations CEPA Part VI*).
- Use chemical criteria as well as sediment toxicity tests to determine potential toxic effects from dredged materials (Eaton et. al., 1994).
- Monitor water levels to determine how much dredging needs to be done and how often.

#### ***Information Needs/Gaps:***

- Investigate new technologies which minimize impacts.
- Further studies on effects of sediment deposition in near-shore areas are needed.

#### ***Sources:***

- Environment Canada, Ocean Dumping Regulations under CEPA Part VI , from Environment Canada's website, March 1997. Dumping
- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.

## Category: Shipping and Transportation Related Issues

### Issue Title: Ocean Dumping

#### **Problem Statement:**

- The disposal of waste material contributes to contamination of the marine environment.

#### **Description:**

- Ocean dumping (primarily of dredged materials and fish offal) cause localized environmental impacts including habitat change due to covering by dumped materials, local turbidity and visibility problems, smothering of benthic organisms, contamination from dumped materials.
- Ocean dumping poses the greatest risk for lobster, scallop and clam habitats; aquaculture sites, herring migration routes and recreational swimming areas.
- Cadmium contamination of shellfish due to dumped dredged materials has been observed in the Miramichi Estuary (Eaton et. al., 1994).
- An increase in permit fees from \$50 to \$2500 has decreased the demand for fish waste disposal - now treating and recycling wastes through fish meal plants (*Ocean Dumping Regulations CEPA Part VI*).

#### **Objectives:**

- Restrict dumping activities to include only those with minimal environmental impact and prevent the disposal of contaminated sediments.

#### **Strategies:**

- Tight regulatory control including strict adherence to the *Ocean Dumping Regulations under CEPA Part VI*.
- Rigorous review of permit applications and enforcement of permit terms - permits are not granted if practical alternatives are available (i.e. recycling, reusing and treatment of wastes).
- Careful selection of dumpsites, site monitoring and inspections of dumping projects to verify permit conditions are met according to Environment Canada's *Ocean Dumping Control Action Plan*, implemented in 1991.
- Establish rejection levels or levels above which adverse effects have been demonstrated to occur.
- Develop new marine environmental and sediment quality guidelines and biological assessment tools to support the *Ocean Dumping Regulations*.

#### **Information Needs/Gaps:**

- Further research on the effects of ocean dumping will help to improve judgment in selecting sites and issuing permits
- More research projects and studies for special dumping applications (i.e. scrap metal and other materials).

**Sources:**

- Environment Canada, Ocean Dumping Regulations under CEPA Part VI, from Environment Canada's website, March 1997.
- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.

**Category: Shipping and Transportation Related Issues**

**Issue Title: Chronic Spills**

**Problem Statement:**

- Chronic spills of contaminants due to shipping practices result in cumulative impacts on the marine environment.

**Description:**

- The Gulf is part of the busy St. Lawrence-Great Lakes shipping corridor with approximately 20% of its vessel traffic carrying hazardous materials and petroleum products (White and Johns, 1996).
- Transportation methods can result in chronic releases of oil and other hazardous materials (through operational discharges e.g. cleaning of storage and ballast tanks of tankers), as well as introduction of exotic species (during de-ballasting).
- Discharges of oil can put the Southern Gulf's marine, near-shore and coastal environments at risk.
- Seabirds in the Gaspé region (inshore and offshore species) and breeding populations of gulls, terns, and cormorants around PEI are at greatest risk due to oil spills.

**Objectives:**

- Minimize future shipping risks and potential for accidental spills.
- Promote national arrangements for emergency responses to activities which present threats to biodiversity (Canada's Biodiversity Strategy, 1995).

**Strategies:**

- Expand sensitivity mapping of the region to identify vulnerable areas.
- Integrate approach for oil spill contingency planning across the region. Environment Canada *Sensitivity Mapping Program* is coordinating a single pollution reporting/alerting system for four Atlantic provinces.
- Expand contingency plans and promote use of *Atlantic Regions Spill Trends Monitoring System* - computer program/database developed to provide users with improved access to Environment Canada's spill data (Percy et. al, 1997).
- Continue water column sampling to determine the fate and effect of spilled oil.

**Information Needs/Gaps:**

- More information is needed on the proposed Coastal Zone Classification System for the foreshore (intertidal) zone for monitoring system (Percy et. al., 1997)

**Sources:**

- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Percy, R. et. al., An Integrated Approach to Shoreline Mapping for Spill Response

Planning in Canada, 1997.

- Owens, E.H. and W.S. Davis, A Pre-Spill Shoreline Protection and Shoreline Treatment Database for Atlantic Canada, 1995.
- Environment Canada, Operation Irving Whale, from Environment Canada website, March 1997.
- A. Laflamme, personal communications, March 1997.
- E. Theriault, personal communications, March 1997.

## **Category: Shipping and Transportation Related Issues**

### ***Issue Title: Accidental Spills***

#### ***Problem Statement:***

- Accidents and risks associated with shipping pose a risk to the Southern Gulf's marine environment.

#### ***Description:***

- Navigation within the Gulf of St. Lawrence is difficult in some areas and the potential for large scale oil spills or shipping accidents is a concern (State of Canada's Environment, 1991).
- In September, 1970, the barge Irving Whale sank in the Gulf of St. Lawrence about 60 km northeast of North Point, PEI. Initially, oil leaked from the barge and washed ashore on the Magdalen Islands and western Cape Breton Island. It is estimated that 1100 tonnes of Bunker "C" oil (27% of original cargo) has leaked from the barge since it sank.
- The majority of the oil leaked has been dispersed by natural processes but concerns had been raised about a major spill from the barge and the impacts that it could have had on the fishing and tourist industries.
- In particular, there is concern over the 90 kg of PCBs and chlorobenzenes that have leaked from the barge. Bottom sediment concentrations of chlorobenzenes (Aroclor 1242) are higher than background up to 5 km radius from barge.
- contaminated snow crabs found within 2km radius of barge (White and Johns, 1996)
- The recovery project was successfully completed in the summer of 1996.

#### ***Objectives:***

- Decrease potential for accidents and risks.

#### ***Strategies:***

- Continue monitoring for long term impacts of PCB and oil leakages on the marine environment.
- Sensitivity mapping of coastal and marine areas incorporating biological, human use, geographical, and oceanographic data is important in protection planning and in developing effective contingency responses (A. Laflamme, E. Theriault, 1997).
- Integrate approach for oil spill contingency planning across the region - Environment Canada *Sensitivity Mapping Program* is coordinating a single pollution reporting/alerting system for four Atlantic provinces.
- Develop partnerships in environmental emergency field, especially with respect to provisions of comprehensive environmental advice .
- Improved navigation techniques and regulation of shipping activities under the *Canadian Shipping Act* (specifically Classed Ship Regulations and Dangerous Good Shipping Regulations) to reduce risks.

- Expand contingency plans and promote use of *Atlantic Regions Spill Trends Monitoring System* - computer program/database developed to provide users with improved access to Environment Canada's spill data (Percy et. al, 1997).
- Continue water column sampling to determine the fate and effect of spilled oil.

***Information Needs/Gaps:***

- Research required to determine long term effects of presence of Irving Whale.
- Only shorelines have been mapped, therefore risks to offshore species and strategies still need to be considered.
- Continue collection of shoreline and marine information to expand sensitivity mapping database.

***Sources:***

- Percy, R. et. al., An Integrated Approach to Shoreline Mapping for Spill Response Planning in Canada, 1997.
- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Government of Canada, The State of Canada's Environment, 1991.
- A. Laflamme, personal communications, March 1997.
- E. Theriault, personal communications, March 1997.

**Category: Shipping and Transportation Related Issues**

**Issue Title: Confederation Bridge (Fixed Link) - Physical Presence**

**Problem Statement:**

- The physical presence of the bridge has altered the coastal environment and may adversely affect biological processes within the Northumberland Strait.

**Description:**

- The Northumberland Strait is an important conduit for migratory birds during the spring and fall including seabirds, waterfowl and terrestrial birds moving between PEI and NB.
- Potential impacts include: disorienting effect of bridge lighting on nocturnal migrating and low-flying birds possibly increasing vulnerability to collisions.
- Presence of the bridge may alter the natural erosion and sediment accumulation rates/patterns along the shorelines of the Northumberland Strait.
- The impact of the bridge on physical/oceanography currents is expected to be highly localized

**Objectives:**

- Minimize the disruptive effect on wildlife which utilize the Northumberland Strait.

**Strategies:**

- Strict monitoring and rigorous species surveys to determine effects on wildlife and provide the basis for mitigation programs.
- Conduct follow-up aerial and ground truthing surveys to evaluate any effects on the erosion and accumulation processes resulting from the presence of the bridge (Strait Crossing Joint Venture, 1994).
- Complete baseline data collection and measurement of environmental variables to detect changes caused by influences directly or indirectly attributed to the project (Strait Crossing Joint Venture, 1994).

**Information Needs/Gaps:**

- Follow-up studies to determine the success of the EEM studies and impacts of the construction phase of the bridge.
- Evaluation of the effectiveness of mitigation and identify the need for improved mitigation methods.

**Sources:**

- Strait Crossing Joint Venture, Northumberland Strait Crossing Project: Marine Environmental Effect Monitoring Program, vol. A, 1994.
- A. Smith, personal communications, February 1997.
- D. Bliss, personal communications, February 1997.

### 3.3 Category: Commercial Fishing Issues

#### *Issue Title: Over-capacity*

#### *Problem Statement:*

- Over-capacity in terms of fishing effort has contributed to depletion and collapse of some Gulf fisheries resources.

#### *Description:*

- Fishery resources in the Southern Gulf are being depleted due harvesting pressures from of an overabundance of fishermen, boats, and efficient technology and over-capacity in the fish processing sector.
- Capacity in most Atlantic groundfish fisheries in excess of what is required to harvest the resource.
- Technological developments such as acoustical detection systems, improved bottom habitat detection and high powered vessels, have increased catch capacity substantially (White and Johns, 1996).
- Specific fisheries at risk: snow crab becoming more lucrative and increased demand for licenses recently; Atlantic cod; lobster.

#### *Objectives:*

- Reduce fishing effort significantly.
- Primary objective of *The Atlantic Groundfish Strategy* (TAGS) is a 50% reduction in fishing capacity (FRCC, 1996).

#### *Strategies:*

- Limit number of vessels, size and capability of vessels, amount and type of gear technology (specific restrictions for gear and TAC for individual species - see FRCC, 1996 and DFO Backgrounders for more detailed information).
- Implement more rigorous direct effort control measures particularly for fisheries being reopened i.e. limits on number of days at sea.
- Implement stiffer penalties for violators of quotas and moratoria to be increased and rigidly enforced (FRCC, 1996).
- Integrated management to address capacity issues requires collaboration of all interested stakeholders i.e. workshop between Gulf fishermen and FRCC to discuss conservation issues (FRCC, 1996).
- Promote diversification of economic base to reduce reliance on fishing and provide additional sources of income, fisheries management/conservation education, cooperative management with fishing communities,
- Habitat protection and restoration initiatives (under the *Fisheries Act* and *Oceans Act*).
- Fishermen's organizations need to take steps to regulate their own activities and act as resource stewards.

- Encourage cooperation between scientists and fishermen to promote data collection and monitoring for stock assessments (i.e. DFO's *Sentinel Survey Programs*).

***Information Needs/Gaps:***

- More research is required on fish biology, especially with respect to juvenile fish and fish habitat to ensure survival to reproductive age.

***Sources:***

- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- FRCC, Building the Bridge: 1997 Conservation Requirements for Atlantic Groundfish, 1996.
- DFO Backgrounder, Fishing for Conservation, from DFO website, March, 1997.
- DFO Backgrounder, Overview of the Status of Canadian Managed Groundfish Stocks in the Gulf of St. Lawrence and in the Canadian Arctic, from DFO website, February 1997.
- DFO News Release, 1996 Southern Gulf Sentinel Survey Program, from DFO website, March 1997.

**Category: Commercial Fishing Issues**

***Issue Title: Mortality of Target and Non-Target Species***

***Problem Statement:***

- Discarding fish which do not meet regulatory requirements or have economic value can have significant impacts.

***Description:***

- Discarding juvenile fish which do not meet regulatory standards and for which landing results in substantial fines can cause high levels of juvenile mortality (White and Johns, 1996).
- Mortality of by-catch species can affect population structures and disrupt food web interactions.
- The significance of by-catch mortality is unknown since species which are not of commercial importance are not typically monitored.
- Examples include dragger-induced mortality of scallops which were not caught in Chaleur Bay. In the Northumberland Strait, scallops in the drag track were found to be partially buried and sustained shell and tissue damage (White and Johns, 1996).

***Objectives:***

- Address the pressures which create incentives to discard species and sizes of fish.
- Avoid incidental harvesting of incidental harvesting of non-targeted species.
- Ensure survivability of escaped or released fish (FRCC, 1996).

***Strategies:***

- Develop an integrated approach to address pressures to discard species and sizes of fish including investigating measures such as: setting appropriate TAC for mixed species, gear restrictions (FRCC, 1996).

***Information Needs/Gaps:***

- More information on non-target species is required to determine impacts of fishing.
- Continue research and projects to improve the survivability of escaped or released fish.

***Sources:***

- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- FRCC, Building the Bridge: 1997 Conservation Requirements for Atlantic Groundfish, 1996.

## **Category: Commercial Fishing Issues**

### ***Issue Title: Selective Fishing***

#### ***Problem Statement:***

- Selective fishing techniques may be altering the genetic structure of populations.

#### ***Description:***

- Selective fishing pressures on animals with particular characteristics (such as size classes) may alter genetic composition of the remaining population resulting in predominance of less desirable characteristics.
- For example, selective fishing of fast growing cod in the Southern Gulf has resulted in a population dominated by slower-growing fish (White and Johns, 1996).
- Similarly, the lobster fishery may be altering the genetic composition of the lobsters in the Southern Gulf by selectively harvesting larger animals (White and Johns, 1996).

#### ***Objectives:***

- Increase understanding of the structure, function and composition of fish species to enhance conservation and management practices.
- Reduce the potential of selective fishing techniques to genetically alter populations.

#### ***Strategies:***

- Utilize fishing gear which is capable of targeting a range of fish sizes of the directed species and permits for escapement of juvenile fish (FRCC, 1996).
- Development of joint study ventures between scientists and fishermen to collect the data required.
- Implement biological and ecological inventory, monitoring programs and classification systems to determine appropriate biodiversity conservation measures (Canadian Biodiversity Strategy, 1995).

#### ***Information Needs/Gaps:***

- Further study to determine specific impacts of selective fishing pressures on population genetic structures.

#### ***Sources:***

- FRCC, Building the Bridge: 1997 Conservation Requirements for Atlantic Groundfish, 1996.
- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Environment Canada, Canada's Biodiversity Strategy, 1995.

## **Category: Commercial Fishing Issues**

### ***Issue Title: Habitat Destruction***

#### ***Problem Statement:***

- Certain fishing technologies can destroy benthic habitats making them inhabitable for certain species.

#### ***Description:***

- Trawling and dragging technologies can disturb sediments increasing suspended particular matter in localized areas, kill benthic species which are food for bottom feeders, render benthic environment inhabitable for groundfeeders and shellfish.
- Scallop dredges can crush molluscs and otter trawls can leave silt clouds in their wakes

#### ***Objectives:***

- Minimize degradation of habitat due to groundfish fishing gear i.e. trawling and dragging..

#### ***Strategies:***

- Develop more conservation oriented fishing gear.
- Continue research and development work on trawling gear to minimize damage on the bottom such as using hydrodynamic technology to keep gear from barely touching the seabed (FRCC, 1996).
- Adopt the "learn-by-doing" approach for pilot projects to provide practical guidance for the development of a network of Marine Protected Areas (DFO Backgrounder, 1997).
- Develop a system of MPAs to complement provincial and community-based conservation strategies as outlined under the new *Oceans Act, 1997*. (DFO Discussion Paper, 1997)

#### ***Information Needs/Gaps:***

- There is a need for further study on impacts of these fishing techniques due to disagreement amongst industry stakeholders (D. Fenton, 1997).

#### ***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- FRCC, Building the Bridge: 1997 Conservation Requirements for Atlantic Groundfish, 1996.
- DFO Backgrounder, Oceans Management Strategy under the *Oceans Act*, March 1997.
- DFO Discussion Paper, An Approach to the Establishment and Management of Marine Protected Areas, March 1997.
- D. Fenton, personal communications, March 1997.

## Category: Commercial Fishing Issues

### *Issue Title: Non-traditional Fisheries*

#### *Problem Statement:*

- Declines in stocks of traditional fisheries have resulted in increased emphasis on non-traditional species for which there is a lack of documentation.

#### *Description:*

- Due to moratoria on major groundfish stocks, several other species have become important sources of income for many fishermen in the Gulf area. i.e. increased demand for snow crab licenses (DFO News Releases, 1997)
- These stocks have not received sufficient research due to historical status, therefore there is a lack of scientific surveys, inefficient gear and lack of conservation strategies (FRCC, 1996).
- There is a lack of documentation for many species in the Southern Gulf (i.e. Striped Bass), particularly those with traditionally less commercial value (DFO News Release, 1997).
- Recently, certain coastal fisheries (smelts and eels) and non-traditional fisheries (sea urchins, rock and jonah crabs, elvers, jellyfish, krill) have been receiving increasing emphasis.
- However, there is a lack of documentation of smaller fisheries in terms of economic importance and a lack of understanding of stock structures and ecological importance of non-traditional species.

#### *Objectives:*

- Increase understanding and develop management plans for poorly documented fisheries.
- Adopt the precautionary principle while making management decisions and setting TACs (FRCC, 1996).

#### *Strategies:*

- Improvements in scientific capacity for stock assessments, setting total allowable catches and ecosystem modeling can aid in managing these fisheries.
- Develop partnerships with industry to expand database on minor stocks.
- Encourage cooperation between scientists and fishermen to promote data collection for stock assessments.
- Encourage effective monitoring, control and surveillance through at sea-observers, and technologies to monitor at sea practices (FRCC, 1996).

#### *Information Needs/Gaps:*

- There is clearly a need for greater research on species which are receiving increased emphasis.

#### *Sources:*

- FRCC, Building the Bridge: 1997 Conservation Requirements for Atlantic Groundfish, 1996.
- DFO News Release, 1996 Southern Gulf of St. Lawrence Snow Crab Management Plan for Crab Fishing Area 12, from DFO website, February, 1997.

- DFO News Release, Southern Gulf Striped Bass Management Plan Announced, from DFO website, March, 1997.
- A. Locke, personal communications, February 1997.

**Category: Commercial Fishing Issues**

***Issue Title: Biological Impacts of Aquaculture***

***Problem Statement:***

- Aquaculture practices can result in adverse biological impacts.

***Description:***

- Waste products (feed waste and fecal matter) from finfish aquaculture can degrade water quality and benthic habitats. In particular nitrogen in feed waste can stimulate algal growth, especially when combined with sewage and agricultural runoff.
- Potential for disease is increased in the densely populated aquaculture pens and there is risk of farmed fish escaping and spreading disease to wild populations or breeding with wild fish thereby introducing genetic traits of farmed fish.
- Antifouling agents, antibiotics and other chemicals used in aquaculture can accumulate in cultured organisms or wild stocks close to the culture
- The majority of aquaculture sites in the Gulf region have shown low to moderate impacts (Eaton et. al, 1994).

***Objectives:***

- Reduce habitat degradation
- Minimize contamination of harvested and wild fish species.

***Strategies:***

- Development of lower nitrogen food minimizes the possibility of eutrophication (State of Canada's Environment, 1991).
- Restrict aquaculture to sites with adequate circulation of water to minimize sediment build-up.
- Reduce the threat of chemical contamination by prohibiting the use of antifouling agents and prohibit the use of antibiotics for specified periods prior to harvesting (State of Canada's Environment, 1991).
- Classify coastal areas that are suitable for growing and harvesting shellfish (*Canadian Shellfish Sanitation Program*, 1996).
- Increase scrutiny of proposals for the siting of aquaculture operations (State of Canada's Environment, 1991).

***Information Needs/Gaps:***

- Although aquaculture is long established in other regions, it is relatively new to Atlantic Canada and thus requires further research and monitoring to determine impacts particular to this region.

***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Government of Canada, State of Canada's Environment, 1991.

- Environment Canada, Canadian Shellfish Sanitation Program from Environment Canada's website February 1997.
- A. Menon, personal communications, March 1997.

**Category: Commercial Fishing Issues**

**Issue Title: Shellfish Poisoning (Naturally Occurring)**

**Problem Statement:**

- Toxin-producing and harmful algae can cause poisoning of humans from consumption of affected shellfish and other fisheries related products.

**Description:**

- Marine phycotoxins are naturally-occurring toxins produced by certain marine algae.
- Bivalve molluscs (clams, mussels) concentrate the toxins by feeding on the phytoplankton and humans can then be poisoned by the accumulated toxins. Herring and mackerel have also been affected (Eaton et. al., 1994).
- Two recent examples of shellfish poisoning in the Gulf of St. Lawrence region.
  1. In 1990 paralytic shellfish poisoning (PSP) appeared in north-eastern NB and northern PEI
  2. In 1987 neurotoxic shellfish poisoning was reported from the Cardigan Bay region of eastern PEI. This resulted in banning the sale of all molluscan shellfish and a massive inspection and testing program was mounted. It was reopened a year later.

**Objectives:**

- Prevent harvesting and consumption of shellfish contaminated by natural processes.

**Strategies:**

- Identify safe shellfish growing areas to permit commercial harvesting (*Canadian Shellfish Sanitation Program (CSSP), 1996*).
- DFO conducting a phytoplankton monitoring program at aquaculture sites around Nova Scotia.
- DFO inspection services monitors levels of known phycotoxins in both wild and cultured shellfish. Sanitary surveys are completed by Environment Canada and provide the basis for the classification of coastal areas for the harvesting of shellfish (*CSSP, 1996*).

**Information Needs/Gaps:**

- There is a need for a systematic ecological survey of phytoplankton populations and extended studies using culture growths in the lab (Eaton et.al, 1994).

**Sources:**

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Environment Canada, Canadian Shellfish Sanitation Program from Environment Canada's website February 1997.

### **3.4 Category: Agricultural Issues**

#### ***Issue Title: Agricultural Runoff***

##### ***Problem Statement:***

- Runoff from agriculture contributes to degradation of estuarine, wetland and near-shore environments and is a significant cause of shellfish contamination.

##### ***Description:***

- Agricultural runoff contains organic matter, pesticides, herbicides, fertilizers (phosphate and nitrates), trace inorganics (heavy metals), bacteria from livestock and feed waste, fecal matter (coliform bacteria).
- This runoff drains into waterways and adjacent coastal and estuarine areas. These pollutants degrade estuarine and marine environments and have contributed to closures of many shellfish harvesting areas.
- Concentrations of suspended solids have been shown to adversely affect marine and estuarine fish and shellfish.
- There is difficulty in quantifying the effects of pesticides and herbicides discharge since these substances may react with other agricultural wastes as they enter waters (White and Johns, 1996).
- Inadequate manure management techniques and faulty septic tanks have been cited as contributors to this problem.

##### ***Objectives:***

- Reduce number of shellfish closures and degradation of near-shore environments from agricultural runoff.
- Reduce use of pesticides and herbicides.

##### ***Strategies:***

- Reduce reliance on pesticides through implementation of Integrated Pest Management (IPM) techniques (State of Canada's Environment, 1991).
- Increase use of organic fertilizers leading to an increase in biological activity and soil aggregation.
- Improve manure management methods and improve faulty septic tanks.
- Institute comprehensive Farm Management Plans to promote long term integrity of farming operations i.e. Bedeque Bay, PEI and Miramichi, NB (ACAP programs)
- Continue programs to educate farmers regarding uses and impacts.

##### ***Information Needs/Gaps:***

- Need to know behaviour of pesticides/herbicides and associated impacts.
- New pesticides in use which have not been subjected to significant studies.
- Effects of pesticides/herbicides in conjunction with other agricultural wastes need to be addressed.

**Sources:**

- Government of Canada, The State of Canada's Environment, 1991.
- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Environment Canada, Atlantic Region Initiatives, from Environment Canada's website, March 1997.
- C. Sharpe, personal communications, March 1997.
- D. Bliss, personal communications, February 1997.

## **Category: Agricultural Issues**

### ***Issue Title: Soil Erosion***

#### ***Problem Statement:***

- Some current agricultural practices contribute to soil erosion and deposition of sediments which degrade water quality and fish habitat.

#### ***Description:***

- Intensification of agriculture combined with other land use practices is accelerating the loss of topsoil, leading to degradation of soil quality and aquatic systems.
- Associated siltation and suspended solids in streams and estuaries adversely affects fish habitat.
- Water erosion of soils, particularly in potato growing areas, is cited as the primary soil degradation problem in both PEI and NB (Eaton et. al., 1994).
- Suspended sediment decreases the penetration of light into the water which can affect fish feeding and schooling practices.
- Soils can carry toxic agricultural and industrial compounds.

#### ***Objectives:***

- Improve agricultural practices to reduce soil erosion and associated siltation of waterways and estuaries.

#### ***Strategies:***

- Implement strategies similar to the 1987 working agreement between federal government and PEI (*Canada-PEI Water Management Agreement*) to study and resolve water resource use and associated soil erosion problems.
- Provide technical and financial assistance for soil conservation, research, monitoring and public awareness.
- Undertake long term monitoring of the rate and change of soil degradation - addressed under the *Soil Quality Evaluation Program* of Agriculture Canada's National Soil Conservation Program (State of Canada's Environment, 1991).
- Adopt sustainable agricultural/farming practices - including alternating planting and crop rotations, green manure crops, conservation tillage systems.
- Promote terracing as a structural erosion control practice - will reduce slope lengths and intercept surface runoffs into grass waterways (State of Canada's Environment, 1991).
- Continue the New Brunswick soil conservation programs in potato growing regions.
- Support and promote farm management plans (i.e. Bedeque Bay and MREAC ACAP projects).

#### ***Information Needs/Gaps:***

- Need more research for soil conservation programs and monitoring.
- Lack of inventories and assessment of the extent and severity of soil erosion in this region.

***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Government of Canada, The State of Canada's Environment, 1991.
- Environment Canada, Atlantic Region Initiatives, Environment Canada's website, March 1997.
- D. Bliss, personal communications, February 1997.
- C. Sharpe, personal communications, March 1997.

## **Category: Agricultural Issues**

### ***Issue Title: Loss of Wetlands***

#### ***Problem Statement:***

- Infilling for agricultural purposes has resulted in an alteration and loss of wetlands which serve important biological functions.

#### ***Description:***

- Alteration and loss of wetlands, particularly salt marshes, for agricultural purposes has been ongoing and widespread in the Gulf region for many years.
- Although losses tend to be localized and relatively small scale, there has been a significant cumulative impact over time.
- Wetlands are extremely productive areas which serve important functions as waterfowl habitat and fish nursery areas. Protection of wetlands is critical in ensuring that federal responsibilities are met for maintaining the quality of the environment, integrity of migratory bird populations, inland and coastal fisheries (Environment Canada, 1991 - *Federal Policy on Wetland Conservation*).
- Amount and rate of wetland losses are not adequately documented, however given the importance of these areas for wildlife it should be a concern (State of the St. Lawrence, 1996).

#### ***Objectives:***

- Adhere to “no net loss of wetland functions on all federal lands and waters” policy (as stated in *The Federal Policy on Wetland Conservation, 1991*)
- Improve soil conservation and protection of wetlands in order to sustain their ecological and socio-economic functions.

#### ***Strategies:***

- Expand protected areas system to include increased wetland habitats.
- Prevent further loss by planting grasses to protect coastal sands from erosion, build dykes or barrier islands, control water levels.
- Implement volunteer monitoring programs (i.e. CARP water quality programs).
- Management programs to rejuvenate and rehabilitate wetlands i.e. *Montague Watershed Pilot Project* which provides incentive programs for land improvement in riparian areas (State of Canada's Environment, 1991).
- Stewardship programs (i.e. *Wetland and Coastal Habitat Management Program* in NB that conserves and enhances coastal wetlands through acquisition and land stewardship).
- Develop improved approaches and technologies for ecosystem restoration and rehabilitation (Canada's Biodiversity Strategy, 1995).

#### ***Information Needs/Gaps:***

- Region-wide documentation of wetland alteration and losses and resultant impacts.
- Further study on the cumulative impacts of small, localized salt marsh losses over time.

***Sources:***

- Government of Canada, The State of Canada's Environment, 1991.
- Environment Canada, State of the Environment on the St. Lawrence River, 1996.
- Environment Canada, Canada's Biodiversity Strategy, 1995.
- A. Smith, personal communications, February 1997.

### 3.5 Category: Industrial Issues

#### *Issue Title: Pulp and Paper Effluent*

##### *Problem Statement:*

- Pulp and paper mills discharge effluents which can severely degrade water quality in the Gulf region.

##### *Description:*

- There are 6 pulp and paper mills (5 operating and 1 closed) which discharge into the waters or tributaries of the Gulf.
- In the entire drainage basin the number of pulp and paper mills increases to between 50-100 mills (White and Johns, 1996)
- Effluents from pulp mills are composed of dissolved organics, suspended solids, and inorganics which affect the water and sediment quality of receiving waters.
- In particular, suspended solids can blanket benthic environments and discharged dioxins and furans are highly toxic to shellfish and other biota.
- Within the Southern Gulf, the impacts are largely confined to the immediate vicinity of discharge. The main areas of concern are Belledune Harbour in Bay of Chaleur, NB and Boat Harbour, NS.
- Regulatory control (i.e. *1994 Pulp and Paper Regulations* under CEPA, amendments to Fisheries Act to address total BOD, suspended solids and effluents acutely lethal to fish) has resulted in decreased levels of contamination from pulp mills (White, 1996).

##### *Objectives:*

- Reduce BOD and suspended solids discharged from the plants.
- Eliminate dioxins and furans in effluent resulting from use of chlorine or chlorine dioxide in pulp bleaching.

##### *Strategies:*

- Implement primary or secondary treatment systems to reduce BOD discharges and suspended (*Pulp and Paper Effluent Regulations, 1992*)
- Ensure stringent monitoring and reporting of concentrations of dioxins and furans in effluents.
- Encourage industries to participate in the *ARET Program* which is a voluntary pollution prevention program to decrease the adverse effects of 117 toxic substances on human health.
- Assess adequacy of effluent regulations by undertaking aquatic *Environmental Effects Monitoring (EEM)* studies at all locations where effluent is discharged into the aquatic receiving waters (Environment Canada, 1997).
- Regular inspections of mills using chlorine bleaching by Environment Canada.
- Tighter regulatory control to decrease use of Cl or ClO<sub>2</sub> in bleaching processes (*Chlorinated Substances Action Plan, 1994*).

***Information Needs/Gaps:***

- Need to put into action and respond to the results from the first cycle of studies from the EEM Program. Develop the second cycle of studies.
- Increasing research activity aimed at closing up mills and achieving zero discharge (J. Clarke, 1997).

***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Parker, Roy and Natasha Smith, A Synopsis of the First Cycle of the Pulp and Paper Mill EEM Program in the Atlantic Region, February, 1997.
- Environment Canada and DFO, Environmental Effects Monitoring: Aquatic Environmental Effects Monitoring Requirements, 1992.
- Environment Canada, Status of the Pulp and Paper Industry in the Atlantic Region, from Environment Canada website, March 1997.
- Wells, Peter G. and Susan J. Rolston, Health of Our Oceans: A Status Report on Canadian Marine Environmental Quality, 1991.
- J. Clarke, personal communications, March 1997.
- R. Parker, personal communications, March 1997.

## **Category: Industrial Issues**

### ***Issue Title: Mining and Smelting Operations***

#### ***Problem Statement:***

- The discharge of toxic heavy metals and air emissions from mining and smelting operations degrades environmental quality.

#### ***Description:***

- The lead smelter and phosphate fertilizer plant (now closed) at Belledune Harbour near Bathurst, NB has contaminated fish species with discharges containing toxic heavy metals - especially cadmium in wastewater and surface runoff, and air emissions of sulfur dioxide, lead and cadmium.
- Smelters account for 51% of SO<sub>2</sub> emissions in Eastern Canada and have caused water pollution problems through mine de-watering and liquid effluents from the milling process (Environment Canada, 1996).
- Although there have been improvements in the methods used to treat effluent by the lead smelter industry there are still high levels of Cd in Belledune Harbour sediments and this could be a problem if resuspended due to dredging in the Harbour (Waldichuk, 1988).

#### ***Objectives***

- Decrease discharges of heavy metals in mine effluent.
- Decrease air emissions of SO<sub>2</sub>.
- Develop regional or site-specific water quality and sediment quality objectives for future programs to evaluate aquatic effects of mining in the region (Aquamin, 1996).

#### ***Strategies:***

- Improve/implement monitoring programs to determine the direct impacts of Cd and Hg in sediments and shellfish (White and Johns, 1996).
- *Environmental Code of Practice for Mines* should be updated and expanded to address a range of issues including: environmental management, monitoring, stakeholder involvement (AQUAMIN, 1996).
- Mines should develop and apply best practical technology to the control of their liquid effluents.
- Encourage participation in national programs such as the *Mine Environmental Neutral Drainage* (MEND) program which coordinates research on the prediction, prevention and control of acid mine drainage.
- Promote collaborations between mining stakeholders and AQUAMIN to examine the effectiveness of the *Metal Mining Liquid Effluent Regulations* (MMLER) and to implement EEM and develop revised mining regulations (J. Clarke, 1997).

***Information Needs/Gaps:***

- Need to improve the understanding of chronic and sublethal toxicity effects of metal contaminants (Aquamin, 1996).
- Examine approaches to assess the efficacy of effluent treatment and to evaluate chronic effects on organisms in receiving waters (Aquamin, 1996).

***Sources:***

- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Waldichuck, Michael, "The Nature and Extent of Marine Contamination Caused by Land-Based Sources in Canada", 1988.
- AQUAMIN, Assessment of the Aquatic Effects of Mining in Canada: Final Report, 1996.
- J. Clarke, personal communication, March 1997.
- R. Parker, personal communication March 1997.

**Category: Industrial Issues**

**Issue Title: Thermal Electrical Generating**

**Problem Statement:**

- Thermal electric stations are significant regional sources of air and water contaminants.

**Description:**

- Fossil fueled-power plants account for a significant amount of SO<sub>2</sub> emissions in Atlantic Canada. The 5 thermal generating stations within the Southern Gulf of St. Lawrence Region are primary sources of sulfur dioxide, nitrogen dioxide and carbon dioxide (Eaton et. al., 1994).
- These generating stations emit PAHs, Hg, Cu, and radionucleotides into wastewater.
- As well, the use of Cl in cooling systems can be toxic to aquatic organisms.
- The emissions also result in an accumulation of metals in soils and vegetation, especially Pb, Cd, Zn.

**Objectives:**

- Continue reduction of sulfur dioxide emissions beyond 1994 goals:
  - New Brunswick Power was required to reduce SO<sub>2</sub> below 130 kilo tonnes
  - Nova Scotia Power was required to reduce SO<sub>2</sub> levels below 160 kilo tonnes by 1994

**Strategies:**

- Virtual elimination from the environment any toxic substance that results from human activity and that are persistent and bioaccumulative (*Federal Toxic Substances Management Policy*, Track 1).
- Institute cradle to grave management of all other (Track 2) substances of concern that are released to the environment (*Federal Toxic Substances Management Policy*).
- Continue development and implementation of air emission control technology: i.e. new scrubber at Dalhousie, NB Power station; at Belledune power plant the first flue gas desulfurization system in Canada has been constructed; the implementation of SO<sub>2</sub> capture technology at Pt. Aconi Station in Cape Breton.
- Promote use of lower sulfur and clean coal alternatives.

**Information Needs/Gaps:**

- There are a lack of studies to document the direct effects/impacts.
- Studies required to investigate viability of tradable SO<sub>2</sub> emissions permits.

**Sources:**

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Environment Canada, Toxic Substances Management Policy, from Environment Canada's website, March 1997.

- Environment Canada, ARET: Accelerated Reduction/Elimination of Toxics, from ARET's website, March 1997.
- Wells, Peter G. and Susan J. Rolston, Health of Our Oceans: A Status Report on Canadian Marine Environmental Quality, 1991.
- J. Clarke, personal communication, March 1997.

## **Category: Industrial Issues**

### ***Issue Title: Chlor-alkali plants***

#### ***Problem Statement:***

- Chlor-alkali plants produce chlorine and caustic soda used by the pulp and paper industry and are a source of mercury contamination.

#### ***Description:***

- There are two chlor-alkali plants in the Gulf region: CIL Limited (ICI Limited) in Dalhousie, NB and Canso Chemicals Limited in Abercrombie, NS.
- In the past there have been problems stemming from the discharge of mercury in effluents as well as mercury lost through air emissions in the region.
- Recently, heavy metals, including mercury have re-emerged as a serious environmental health concern throughout eastern North America. The eastern provinces have released fish consumption advisories due to elevated mercury levels in many species of sport fish.

#### ***Objectives:***

- Virtual elimination of Hg emissions (*Federal Toxic Substances Management Policy*).

#### ***Strategies:***

- Following emissions regulations passed in 1978 the plants have successfully reduced Hg levels by 96%.
- Improve ventilation systems to prevent Hg escape (Beauchamp, 1997).
- Limit emissions to below 5.3g per tonne of product (Beauchamp, 1997).
- Treat solid waste such as brine sludges to remove Hg (Beauchamp, 1997).
- Environment Canada is currently monitoring gaseous mercury in ambient air and mercury in precipitation in southern NB (Beauchamp, 1997).

#### ***Information Needs/Gaps:***

- Need more research to document environmental fate of effects of Hg lost in air emissions.

#### ***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Environment Canada, Toxic Substances Management Policy, from Environment Canada's website, March 1997.
- Wells, Peter G. and Susan J. Rolston, Health of Our Oceans: A Status Report on Canadian Marine Environmental Quality, 1991.
- S. Beauchamp, Air Quality Issues in New Brunswick - Update, 1997.
- J. Abraham, personal communications, March 1997.

## **Category: Industrial Issues**

### ***Issue Title: Fish Processing Plants***

#### ***Problem Statement:***

- Liquid effluents released from fish processing plants have contributed to localized water quality problems.

#### ***Description:***

- The importance and reliance on fishing in the Southern Gulf of St. Lawrence has resulted in an extensive onshore fish processing industry.
- Processing plants release liquid effluents which are highly oxygen demanding and may also contain harmful bacteria.
- Additional impacts include: the overall depletion of water quality, a reduction in O<sub>2</sub>, contaminated sediments (i.e. with PCBs from wastewater with fish particulate matter which can contain PCBs).
- Levels of fecal coliform bacteria from fish plant waste have resulted in shellfish closures in some areas of the Gulf region.
- Fish processing plants also generate large quantities of fish waste which require ocean or land disposal.

#### ***Objectives:***

- Eliminate effluents which are highly oxygen demanding and control levels of fecal coliform bacteria in waste water

#### ***Strategies:***

- Improve inspection process for all plants - regardless of size.
- Reduce number of ocean dumping permits issued for fish waste from processing plants.
- Ensure new plants are registered for environmental assessment purposes in all provinces.
- Improve permitting system to strictly limit BOD discharges and to include smaller plants that were previously exempt from the process.
- PEI instituting permitting system for new plants (as of 1994)

#### ***Information Needs/Gaps:***

- Studies to investigate improved waste water treatment technologies to minimize effluent impacts.

#### ***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Wells, Peter G. and Susan J. Rolston, Health of Our Oceans: A Status Report on Canadian Marine Environmental Quality, 1991.
- J. Clarke, personal communication, March 1997.

## **Category: Industrial Issues**

### ***Issue Title: Food Processing Plants***

#### ***Problem Statement:***

- Food processing plants discharge highly organic, nutrient rich, oxygen-demanding effluents which degrade receiving water.

#### ***Description:***

- In New Annan, Prince Edward Island, the Cavendish Farms potato processing plant discharges more than 4 million litres per day of treated wastewater into the Barbara Weit Estuary. This estuary was rich in clams, oysters and eels but are now lost because of the resulting pollution.
- The estuary has suffered from high levels of BOD, nutrients, ammonia, suspended solids and bacteria.
- There have also been impacts on tourism and the lobster fishery in New Annan related to the processing plant and concerns have been raised about the protection of Malpeque Bay (Ramsar site).
- A Charlottetown meat processing plant discharges wastes after primary treatment into the harbour. Although the harbour can assimilate the wastes, the effluent exceeds the regulated limit of BOD (0.5kg/ton).

#### ***Objectives:***

- Eliminate effluents which are highly oxygen demanding and control levels of fecal coliform bacteria in wastewater.

#### ***Strategies:***

- Develop new wastewater treatment systems for processing plants.
- Stricter inspections are needed to ensure that plant's no longer violate the effluent limits set out in the *Meat and Poultry Regulations*.

#### ***Information Needs/Gaps:***

- Studies to investigate improved waste water treatment technologies to minimize effluent impacts.

#### ***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Wells, Peter G. and Susan J. Rolston, Health of Our Oceans: A Status Report on Canadian Marine Environmental Quality, 1991.

**Category: Industrial Issues**

**Issue Title: PCBs in the Environment**

**Problem Statement:**

- The presence of PCB's are a concern since they are highly toxic substances which are persistent and accumulate in living tissues if ingested.

**Description:**

- PCBs enter the Gulf of St. Lawrence from landfill leachate, accidental spills and atmospheric transport although concentrations decrease from the river to the estuary to the gulf region (White and Johns, 1996).
- Levels of up to 12ng/g have been found in Miramichi Estuary and Northumberland Strait (background level is 0.1ng/g).
- Data suggest that atmospheric inputs of PCBs and other organochlorines to open ocean may be more important than inputs from fresh water sources to the marine environment (White and Johns, 1996)
- PCB levels found in eels thought to be a vector to transfer PCBs to other organisms primarily beluga whales in the estuary. (White and Johns, 1996)

**Objectives:**

- Virtual elimination of PCBs from the environment in accordance with the *Federal Toxic Substances Management Policy*.
- Prevent groundwater contamination from landfill leachate.

**Strategies:**

- Monitoring programs for the presence of PCBs in representative species - monitor for bioaccumulation.
- Monitor PCB levels in landfill leachate.

**Information Needs/Gaps:**

- There is a need to determine the substance's source of release in order to select risk management strategies.

**Sources:**

- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Wells, Peter G. and Susan J. Rolston, Health of Our Oceans: A Status Report on Canadian Marine Environmental Quality, 1991.
- Environment Canada, Toxic Substances Management Policy, from Environment Canada's website, March 1997.

### **3.6 Category: Urbanization and Development Issues**

#### ***Issue Title: Municipal Discharges from Urban Areas***

##### ***Problem Statement:***

- Discharge of untreated municipal waste adversely effects water quality and near-shore habitats.

##### ***Description:***

- In the St. Lawrence River drainage area, only 8 percent of the region's 5.8 million people are served by some form of municipal wastewater treatment system (State of Canada's Environment, 1991).
- The discharge of untreated sewage has unknown biological impacts on the Estuary and the Gulf of St. Lawrence.
- Release of BOD and suspended solids results in a depletion of O<sub>2</sub> and can render habitats unsuitable for marine life (White and Johns, 1996).
- The combination of industrial and municipal discharge can create complex compounds which stress ecosystem and are the direct cause for the closure of 20% of all shellfish areas in the Atlantic Region (White & Johns, 1996).

##### ***Objectives:***

- Reduce untreated sewage discharges.
- Develop sewage treatment/waste management plans.
- Eliminate or provide treatment of all point source municipal discharges by the year 2000 (DOE, 1994).

##### ***Strategy:***

- Source control programs to reduce the overall wastewater flow (i.e. reduce the amount of waste generated).
- Promote recycling and composting programs for coastal communities.
- Integrate sewage and waste management programs into coastal zone management. plans - comprehensive approaches to managing the coastal zone (Oceans Act, 1997).
- Rehabilitate shellfish areas currently classified as "closed or unsuitable" by the *Canadian Shellfish Sanitation Program*.
- Promote marine plastics debris program.

##### ***Information Needs/Gaps:***

- Further research is needed on the appropriate level of sewage/waste treatment technologies for each municipalities.
- Unknown impacts of complex compounds formed from mixing industrial and municipal wastes in urban areas (White & Johns, 1996).

**Sources:**

- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- Department of the Environment, Coastal 2000, 1989.
- Government of Canada, The State of Canada's Environment, 1991.
- Environment Canada, Canadian Shellfish Sanitation Program from Environment Canada's website February 1997.
- J. Clarke, personal communication, March 1997.

## **Category: Urbanization and Development Issues**

### ***Issue Title: Shoreline Degradation***

#### ***Problem Statement:***

- The urbanization and coastal development along the Gulf of St. Lawrence has resulted in the destruction of wetlands and the erosion of shorelines.

#### ***Description:***

- There are a number of activities associated with urbanization and development which lead to shoreline degradation. For example:
  - ATV use in sensitive areas has negative effects on beach grasses, erodes dunes.
  - Construction projects and the development of transportation corridors has resulted in fragmentation of coastal habitats (Eaton et. al., 1994).
  - Causeways through wetlands and estuaries have eliminated habitats and resulted in water quality problems.
  - Dredging of estuaries can change flow regimes thereby contributing to beach erosion.
  - Destruction of wetlands and marsh habitats eliminate their function as natural shoreline buffers.
- Canso Causeway has disrupted the migration routes of gannets in the Gulf of St. Lawrence and has also impacted the American lobster fishery by restricting the distribution of lobster larvae (Eaton et. al., 1994).
- There are increased calls for causeways to be removed since they have restricted or prevented the flow of estuarine waters and consequent dilution of industrial discharges. (Eaton et. al., 1994) .

#### ***Objectives:***

- Improve protection of marshes and wetlands which act as natural shoreline buffers.

#### ***Strategies:***

- Implementation of detailed erosion control plans by provincial highways departments.
- Education programs to encourage responsible use of ATVs by Canadian Wildlife Service.
- The removal or modification of causeways may ameliorate some of the problems.
- Future roadways must implement strategies to minimize impacts on flow regimes, wildlife uses and water quality.

#### ***Information Needs/Gaps:***

- Lack of oceanographic, biological and hydrological data for estuaries and near-shore environments.

#### ***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.

- A. Smith, personal communication, February 1997.
- D. Bliss, personal communication, February 1997.

## **Category: Urbanization and Development Issues**

### ***Issue Title: Conflicting Uses of Coastal/Near-shore Environments***

#### ***Problem Statement:***

- Coastal waters and shores in the Southern Gulf of St. Lawrence are coming under increasing pressure from competing uses such as fishing, aquaculture, recreation, tourism, industrial and residential use.

#### ***Description:***

- The large number of user groups in the region inevitably results in conflicts over access to the land, water, resources. As well, conflicting priorities and development versus conservation strategies have arisen.
- Conflicts arising from aquaculture have increased since it tends to favour inlets and bays which are also prime recreational and traditional fishing areas.
- Conflicts have centred around aesthetic concerns from landowners, interference with recreational areas, degradation of benthic habitats and water quality in surrounding areas, interference with traditional fishing grounds.
- Conflicts with wildlife i.e. sea ducks in PEI with mussel harvesting, owners are calling for cull on ducks which feed on shellfish (D. Bliss, 1997).
- Tourism has caused stress on the water supply and important habitats are becoming degraded.

#### ***Objectives:***

- Reduce conflicts amongst competing users.
- Involve communities in management.
- Balance resource uses while maintaining ecological integrity (FPCLU, 1995).

#### ***Strategies:***

- Identify key geographic areas of coastal zone where conflicts are currently taking place.
- There is the potential for mapping and zoning of near-shore areas - inventory of existing and potential uses, determine carrying capacity of the area..
- Implement multi-use planning (DOE, 1994).
- Develop and implement an oceans management regime founded on principles of sustainable development and integrated management of activities and resources (*Oceans Act, 1997*).
- Within the OMS promote integrated management of the estuarines, coastal and marine waters through collaboration with the resources users, communities, aboriginal organizations and government agencies (*Oceans Act, 1997*).
- Promote the development of Community Action groups and projects - encourage participation in decision making by all user groups - i.e. through ACAP type programs.
- Establish forums for consultation - government and community interest groups.
- Establish conflict resolution mechanisms (FPCLU, 1995)

***Information Needs/Gaps:***

- Need for more inshore studies by multi-disciplinary teams (include oceanographers, biologists, fish scientists, marine chemists)
- Need a greater understanding of near-shore areas - provides a basis for resolving use conflicts based on scientific data (White and Johns, 1996)

***Sources:***

- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- FPCLU, Perspective On Land In Canada: A Report on a National Forum on Land Use Issues, 1995.
- Department of the Environment, Coastal 2000, 1989.
- DFO Backgrounder, Oceans Management Strategy under the Oceans Act, March 1997.
- D. Bliss, personal communications, February 1997.

## **Category: Urbanization and Development Issues**

### ***Issue Title: Impacts of Recreation***

#### ***Problem Statement:***

- The coastal areas of the Southern Gulf have become popular locations for recreational and tourist activities which place additional stresses on the natural resources and environment of the region.

#### ***Description:***

- The presence of cottages and tourist accommodations (especially along the Northumberland Strait of Nova Scotia and Prince Edward Island's south shore) has impacted the adjacent marshes
- This influx of tourists and vacationers has led to increased boating which is a disturbance in terms of noise, physical disturbance and degraded water quality due to oil/gas leaks.
- Tourism/eco-tourism pressures - i.e. Cape Breton coast, pressures on marine mammal populations due to whale watching operations, etc.
- Pollution of beaches and littering in coastal areas has become a concern i.e. marine plastic debris.
- Impacts of recreational hunting has resulted in problems when expended lead shot ends up in marsh ecosystems and is ingested by bottom feeding ducks - can cause sickness and death from ingestion of a single pellet (Bliss, 1997; CWS website, 1997).
- Impacts of ATVs on sand dunes damage beach grasses and are a significant cause of beach erosion.

#### ***Objectives:***

- Promote wise use of the coastal zone for outdoor recreation and tourism (DOE , 1994).
- Prevent sewage leakage from cottage septic tanks into adjacent water bodies (A. Smith).
- Promote ecotourism principles and goals.

#### ***Strategies:***

- Improve waste management and ensure that cottages have sufficient septic systems
- Education and community-based initiatives are a possibility for addressing issues such as litter, ATV destruction of beach grasses, tourism impacts
- This year (1997) Environment Canada is instituting a national ban on lead shot to be replaced by steel or other non-toxic shot for duck hunting (Environment Canada, 1995).
- Need to continue and intensify monitoring of migratory birds.
- Improved monitoring of numbers and movements of migratory birds.
- CWS implemented *Waterfowl Management Plans* to ensure proper management of game bird species .
- Development of provincial ecotourism councils/foundation to promote public awareness on resource issues, coordinate and disseminate information, and fund research.

***Information Needs/Gaps:***

- There is a lack of information relating to ecotourism uses and opportunities in the Gulf of St. Lawrence.
- Need research to identify tourism “hotspots” especially for ecotourism to develop management plans before key areas are degraded.

***Sources:***

- Environment Canada, Press Conference on Lead Shot and Benzene, from Environment Canada’s website, March 1997.
- Environment Canada, Canadian Wildlife Service Research, from Environment Canada website, March 1997.
- A. Smith, personal communications, February 1997.
- D. Bliss, personal communications, February 1997.

### **3.7 Category: Habitat Protection Issues**

#### ***Issue Title: Loss of Critical Habitat***

##### ***Problem Statement:***

- Numerous activities in the Gulf region have resulted in significant losses of critical habitat in the marine, near-shore and coastal environments.

##### ***Description:***

- Habitat degradation may result from a number of causes: shoreline modifications, coastal development, agricultural uses, degraded water quality, altered flow dynamics, dredging/ocean dumping, etc.
- Only 2% of the total land in Atlantic Canada is protected in some form, not all of this area is adequately protected from the effects of human activities
- Protected areas within the Gulf region include federal and provincial parks, national wildlife areas (i.e. Cape Jourimain), Ramsar sites (i.e. Malpeque Bay) and ecological reserves.
- There is a total lack of marine protected areas in the Gulf region. Three representative areas in the Magdalen Shallows region have been identified by Parks Canada as potential National marine conservation area candidates. These areas include: Baie de Gaspé, Kouchibouguac Bay, Magdalen Islands (Mercier, 1997).
- Endangered species and vulnerable habitats (i.e. piping plovers and beaches) are not adequately protected.

##### ***Objectives:***

- Eliminate threats to habitat of threatened and endangered species
- Protect representative marine regions and marine areas of key importance (*Oceans Act, 1997*).
- Expand the protected areas system to meet the federal goal of 12% of protected land
- Establish protected areas to conserve biodiversity (*Convention on Biological Diversity*).

##### ***Strategies:***

- Identify critical candidate areas for expansion of the protected areas system in all provinces.
- Identify, develop and manage coastal and marine ecological reserves (*Oceans Act, 1997*).
- Increase demarcation of ecological reserves to protect habitat of threatened and endangered species.
- Select preferred site for the establishment of a National Marine Conservation Area for the Magdalen Shallows (Mercier, 1997; Parks Canada, 1995).
- Complete mapping process of natural ecoregions and evaluate protected areas in each region (Eaton et. al., 1994).
- Encourage private conservation initiatives and formulate partnerships on private conservation initiatives with key NGOs - Nature Conservancy of Canada, Island Nature Trust, Ducks Unlimited.

***Information Needs/Gaps:***

- Research required on: determining optimal size and carrying capacities for protected areas, refining impoundment techniques, and developing approaches to ensure maximum use by wildlife of key areas (CWS - Environmental Conservation Branch, 1996)
- Research required to identify candidate areas for the network of marine protected areas and best means to implement protection of these areas (*Oceans Act*, 1997).

***Sources:***

- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Environment Canada, Canada's Biodiversity Strategy, 1995.
- DFO Discussion Paper, An Approach to the Establishment and Management of Marine Protected Areas, from DFO website, 1997
- Environment Canada, Canadian Wildlife Service Research, from Environment Canada website, March 1997.
- D. Fenton, personal communication, March 1997.
- F. Mercier, personal communication, March 1997.
- J. Tims, personal communication, March 1997.

### **3.8 Category: Climate and Air Quality Issues**

#### ***Issue Title: Climate Change***

##### ***Problem Statement:***

- Global warming associated with increasing air pollutants poses a threat to the Southern Gulf's coastal communities.

##### ***Description:***

- Potential effects of a warmer climate in the Atlantic Region include: benefits to the aquaculture industry and expansion to new areas, less ice - therefore less disruption to ferry services, shorter winters would allow longer inshore fishing seasons, summer/recreation seasons extended, average growing season for agricultural crops could be extended (some would benefit i.e. blueberries and some suffer i.e. potato).
- Adverse effects include: an expected 1 metre rise in sea level could damage and destroy various types of coastal property and infrastructure in low lying areas; increased frequency and strength of storms, flooding in coastal habitats.
- Increased stress on freshwater supply from increased evaporation and salt water intrusion (Eaton et. al., 1994).

##### ***Objective:***

- Decrease use of greenhouse gases.
- Adhere to the goal of stabilizing greenhouse gas emissions at 1990 levels by 2000 (*Biodiversity Strategy, 1995*).

##### ***Strategies:***

- *Expanded National Action Program on Climate Change* - initiatives announced Dec. 12, 1996 include research, education, technology commercialization, an enhanced Climate Change Voluntary Challenge and Registry Program and regulatory measures. (Environment Canada News Release, 1996)
- Environment Canada continues to run a network of weather and climate monitoring sites distributed throughout NB which, in conjunction with hydrometric monitoring activities, provide a large body of data used to examine trends in climate and hydrology. (Beauchamp, 1997).
- Identify Air Resource Management Areas (ARMAs) and committees to examine air quality issues and to develop objectives and recommendations (*New Brunswick Clean Air Strategy*)
- The Environment Canada's Green Lane is being modified to provide a common platform to exchange information related to climate and climate change. EC continues to work with the province and industry to control emissions of greenhouse gases (Beauchamp, 1997).

##### ***Information Needs/Gaps:***

- Difficult to address due to transjurisdictional nature of pollutants which contribute to greenhouse effect.

- Need to encourage information sharing across jurisdictional boundaries.

**Sources:**

- Beauchamp, S., Air Quality Issue in New Brunswick - Update, January 1997.
- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- Environment Canada News Release, Government of Canada Announces New and Strengthened Climate Change Initiatives, from Environment Canada's website, March 1997.
- NBDOE, Current Activities of the New Brunswick Department of the Environment, Environmental Evaluation Section: Air Quality, from NB Dept. of Natural Resources website, March 1997.
- J. Abraham, personal communication, March 1997.

## **Category: Climate and Air Quality Issues**

### ***Issue Title: Long Range Atmospheric Transport***

#### ***Problem Statement:***

- The Gulf of St. Lawrence is downwind from industrial regions of Canada and US and therefore receives significant inputs of SO<sub>2</sub> (the major factor in acid rain) and NO<sub>x</sub> (ground level ozone formation).

#### ***Description:***

- The major sources of SO<sub>2</sub> emissions are non-ferrous metal smelters and coal-fired generators. Important sources for nitrogen oxides include exhaust from motor vehicles and to a lesser extent coal fueled generators.
- Recent research has shown that ozone levels in Atlantic Canada exceed natural background levels.
- Atmospheric transport is a major contributor of Pb, Hg, Cd, PCBs, DDT, ozone and primary pollutants which create ozone.
- Ozone causes visible damage to plant foliage, decreases in productivity and yield
- Ozone damage has been observed on the leaves of some varieties of potatoes. Agricultural crops, flowers, shrubs and trees are all vulnerable to ozone pollution.

#### ***Objectives:***

- Cap sulfur dioxide emissions in eastern Canada at 2,300 kilotonnes for the period 1994 to 2000 (a 40 percent reduction from 1980 actual levels). All the eastern provinces met their emissions targets in 1994, the deadline year (*Eastern Canada Acid Rain Control Program*).
- Cooperate with the U.S. Acid Rain Program to reduce SO<sub>2</sub> emissions by 40 percent in an effort to protect moderately sensitive ecosystems from acid deposition (*Eastern Canada Acid Rain Program*)
- Reduce and control ozone primary pollutants originating from vehicle exhaust fumes and fossil fuel power plants.

#### ***Strategies:***

- Install emission control technologies in new industries and thermal generating stations.
- The federal/provincial action plan to resolve NO<sub>x</sub> and VOC related ground level ozone problems will reduce or slow the increase of these pollutants (Eaton et. al., 1994).
- Monitor ozone sensitive vegetation to determine ozone and nitrogen dioxide levels in the Atlantic provinces.
- Environment Canada has developed and applied complex computer models to examine regional acid deposition and the efficacy of local, regional and international emission control scenarios (Beauchamp, 1997).
- The expanded air quality prediction program will continue to provide warnings to sensitive individuals in order to help minimize serious health effects of existing problems while also

continuing to conduct research to understand and mitigate air quality problems (Beauchamp, 1997).

***Information Needs/Gaps:***

- There is a scarcity of data for atmospheric input due to the difficulty in sampling and lack of understanding of air-sea exchange dynamics (White and Johns, 1996).
- Difficult problem to address due to transjurisdictional issues.
- Unknown effects of long-term, chronic low-level contamination.
- Environment Canada will be releasing an acidifying emissions science assessment report in 1997 (Beauchamp, 1997).

***Sources:***

- Beauchamp, S., Air Quality Issues in New Brunswick - Update, January 1997.
- Eaton, P. et. al., State of the Environment in the Atlantic Region, 1994.
- White, L. and F. Johns, Marine Environmental Assessment of the Estuary and Gulf of St. Lawrence, 1996.
- J. Clarke, personal communication, March 1997.
- J. Abraham, personal communication, March 1997.

#### **4. Conclusions**

This report examined key environmental issues which impact on the marine ecosystem of the Southern Gulf of St. Lawrence. The region's coastal and marine environments are subjected to considerable environmental stress from resource harvesting, industrial processes, pressures of expanding urban areas, and recreational uses. Many of the issues identified in the previous section have contributed to localized environmental degradation of coastal, estuarine and marine areas within the Southern Gulf. Examination of these issues has elucidated common themes underlying the environmental problems the Southern Gulf is facing. The following three factors emerged in several of the issues and therefore warrant further consideration:

##### **1. Importance of near-shore and coastal areas**

- Near-shore and coastal areas are subject to numerous, often conflicting demands including: fisheries, aquaculture, receiving waters for municipal discharge and industrial effluents, urban development, and recreational uses. These areas are also key habitats and include tidal flats, salt marshes, beaches, and productive estuaries which are of critical importance for the Southern Gulf's wildlife populations.
- There is a lack of adequate information documenting the oceanographic and biological structure and function of near-shore ecosystems particularly given the ecological, economic and social importance of these areas.

##### **2. Habitat loss and degradation**

- All of the anthropogenic activities considered in the previous section have the potential to contribute to habitat loss and degradation. Externalities associated with these activities include: shoreline erosion, conversion of wetlands, degraded water and air quality, the elimination and fragmentation of critical habitats, and loss of biodiversity.

##### **3. Cumulative impacts**

- Although the impacts of specific activities on the Southern Gulf ecosystem produce adverse effects when considered on an individual basis, the cumulative impacts of these stresses over time can result in more severe environmental degradation.
- In many cases environmental problems arise from chronic exposures to low levels of contaminants as opposed to acute releases. This problem is compounded when there are multiple sources of chronic contamination affecting a single area.

Many of the environmental problems in the Southern Gulf are complex in nature and arise from multiple sources. Therefore, addressing these issues requires a holistic, multi-disciplinary approach which encourages cooperation between stakeholders and promotes integrated resource management.

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