

STATUS OF

Shediac Bay

AND ITS WATERSHED - *An Introduction*



PARTNERS IN WATER QUALITY



New
Nouveau  **Brunswick**
Your Environmental Trust Fund at Work



Fisheries and Oceans Canada / Pêches et Océans Canada

Report for the communities, 2006



SHEDIAC BAY WATERSHED ASSOCIATION

The Shediac Bay Watershed Association (SBWA) was founded in 1999 as a result of growing concerns among residents from various local communities over the ecological health of Shediac Bay. The Association deals with issues related to water quality and habitat integrity.

The SBWA has been involved in numerous projects and initiatives over the past seven years including water quality monitoring and remediation projects as well as awareness programs.

Our Vision – Communities working together to foster a healthy ecosystem that will sustain the quality of water for future generations.

Our Mission – The SBWA will accomplish its vision through education and community stewardship.

Our Purpose – To enable persons, associations and communities within the Shediac Bay watershed to participate in the development and implementation of a comprehensive environmental management plan for the bodies of water within the coastal area of Shediac Bay.



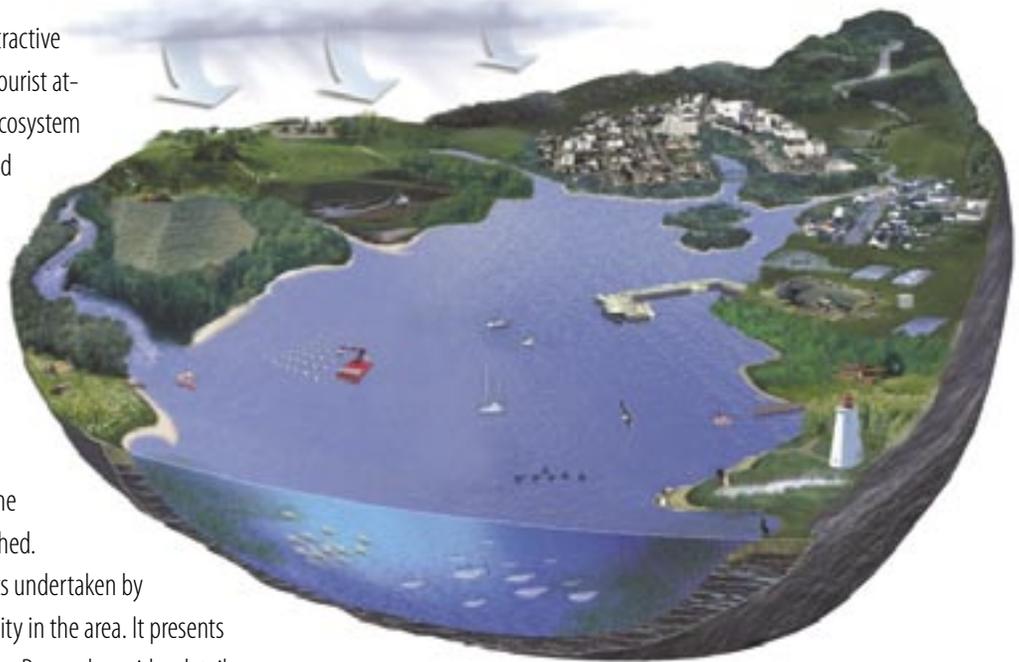
Crossing on Cornwall Brook near Scoudouc River



STATUS OF OUR BAY AND ITS WATERSHED



Shediac Bay is a beautiful and attractive body of water, important for its tourist attractions, economic values and ecosystem richness. The future of the Bay and its watershed is in our hands, the people who are using it and enjoying it. The water quality of the Bay is of major importance for our continued enjoyment of its resources.



This report is addressed to you, the citizens of the Bay and its watershed. It offers an overview of the efforts undertaken by the SBWA to enhance water quality in the area. It presents an introduction to the status of the Bay and provides details on the future direction of the SBWA.

Integrated Management of Our Watershed
(Fisheries and Oceans Canada, 2001)

What is a Watershed?

A watershed is a geographic concept representing the area of land from which runoff (from rain, snow, and springs) drains to a body of water. Within each watershed, all water flows down to a common point such as a river, lake or bay.

On its way, water travels over the surface and across farm fields, forest land, suburban lawns, and city streets, or it seeps into the soil and travels as groundwater.

Shediac River

Every stream and brook needs to remain in the best possible condition because they all flow to coastal areas. Healthy inland freshwater sources mean healthier coastal waters. All the water on the land eventually makes its way to a watershed system nearby. Humans make decisions that affect the quality of the water as it journeys all the way to the oceans.

Understanding our watershed is key to making better decisions and using sound environmental practices to protect the water resource. These practices will help preserve our resources and minimize our impact on the water quality.

SHEDIAC BAY WATERSHED

The Shediac Bay watershed area covers 420 km² of land area and stretches along approximately 36 km of coastline, from Cap de Cocagne to Cap Bimet, in south-eastern New Brunswick (NB). The watershed's boundaries extend inland from Scoudouc to Lutes Mountain. The watershed region consists of a population of approximately 15,000 people, but the population swells to over 100,000 during the summer months.



The Shediac Bay watershed is composed of two major river systems: the Shediac River and the Scoudouc River. Both rivers empty into Shediac Bay which drains directly into the Northumberland Strait.

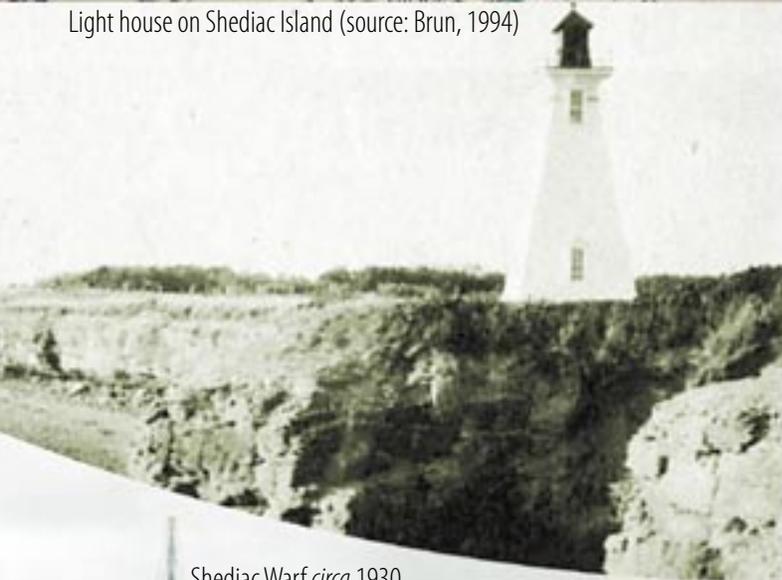
The Shediac River is divided in two major water arms. The northern water arm is created by the convergence of the McQuade, Weisner and Calhoun Brooks. The southern large water arm of the Shediac River is the continuation of the Batemans Brook. Water velocity in both rivers is weak due to the gentle regional elevation.



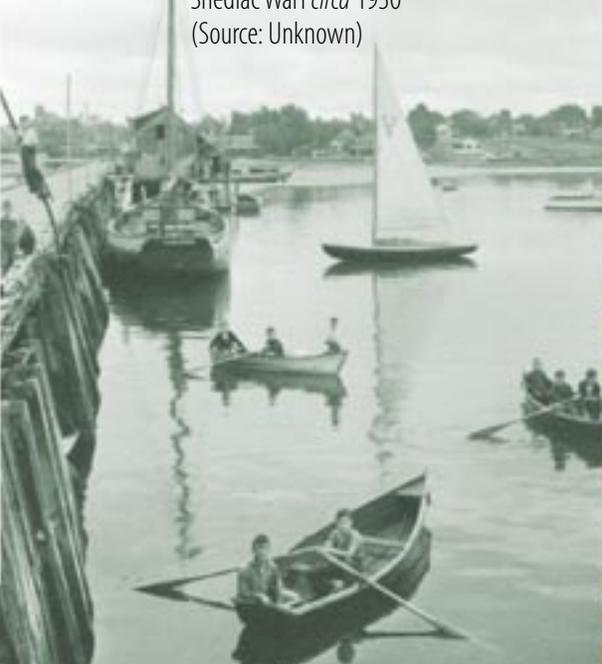
HISTORY



Light house on Shediac Island (source: Brun, 1994)



Shediac Warf circa 1930
(Source: Unknown)



Harvesting time on an oyster bed (source: Brun, 1994)



The name Shediac comes from the Mi'kmag word "Es-ed-ei-ik" meaning "a stream between two lands" or "running far in". Shediac was the location of the most important Mi'kmag encampment of Westmorland County. The Shediac Harbour had many resources to offer the Mi'kmag families such as an abundance of fish and big game species.

Acadians named the actual location of the Town of Shediac "La Batture" because of the abundance of oysters (*Crassostrea virginica*) at the mouth of the Scoudouc River. Few Acadians were already established during the 1760's, but the first Acadian families settled permanently in what would become the Town of Shediac, between 1798 and 1805. Mainly English families settled at Pointe-du-Chêne after 1855 to take advantage of the wharf and railway. By the beginning of the 20th century, Shediac and surroundings had ferry service to Prince Edward Island, a wharf, a lighthouse, roads, houses and a school.

The local economy took advantage of the geographic location and its many forms of transportation by ship, train and public roads. Shipbuilding yards, steam sawmills, the timber industry, agriculture and seafood products were among the most important industries in the 19th and beginning of the 20th centuries.

Shediac area's present economic development is comprised of diverse industries in tourism, retail and services, government services, manufacturing, seafood production and information technology.



COASTAL ECOSYSTEM

Shediac Bay is considered a shallow embayment with a general depth of 2 to 3 m and a maximum depth of 6.7 m. Water temperatures can reach over 20 °C during the warm summer months. The landscape is characterized as gently undulating slopes, rising from sea to land reaching an elevation of 560 meters inland, near Lutes Mountain. The Shediac Bay watershed has many coastal features and natural attributes that provide essential habitats for a diversity of terrestrial and aquatic wildlife.

Coastal landscapes not only play a vital role for wildlife but also for residents of the watershed. The coastline consists of a variety of habitats such as sandstone

cliffs, mud flats, saltmarshes and barrier beaches. Kilometres of sandy beaches and renowned beautiful coastal sceneries make this area one of the most popular tourist destinations in the province.

Saltmarshes are essential habitats for the species and the general stability of the ecosystem. Wetlands are rich in nutrients and serve as nursery and faunal shelter. Furthermore, these natural filters can retain large quantities of water, which allow water level regulations during storm surges.

Multiple saltmarshes are still found on the coast between Cap Bimet and Cap de Caissie. Also, approximately 20% of the surface of Shediac Island is comprised of wetlands and saltmarshes, creating an ideal habitat for a wide range of species.

What is an ecosystem?

The basic ecological unit consisting of a life environment and the organisms, animals and plants living in it.



INLAND ECOSYSTEM

The Shediac Bay Watershed lies within the Acadian forest of the Eastern Lowland Region. The Acadian forest is described as a mixed assemblage of coniferous and deciduous type species. The forest covers approximately 50% of the terrestrial landscape of the Shediac watershed.

A dozen bogs, representing 1489 hectares of land surface area, are found within the watershed boundaries. They are generally concentrated inland on the east side of the watershed along the Scoudouc River system. The Big Meadow (part of the upper section of the Scoudouc River) is a unique ecosystem with a particular composition suggesting high biodiversity.

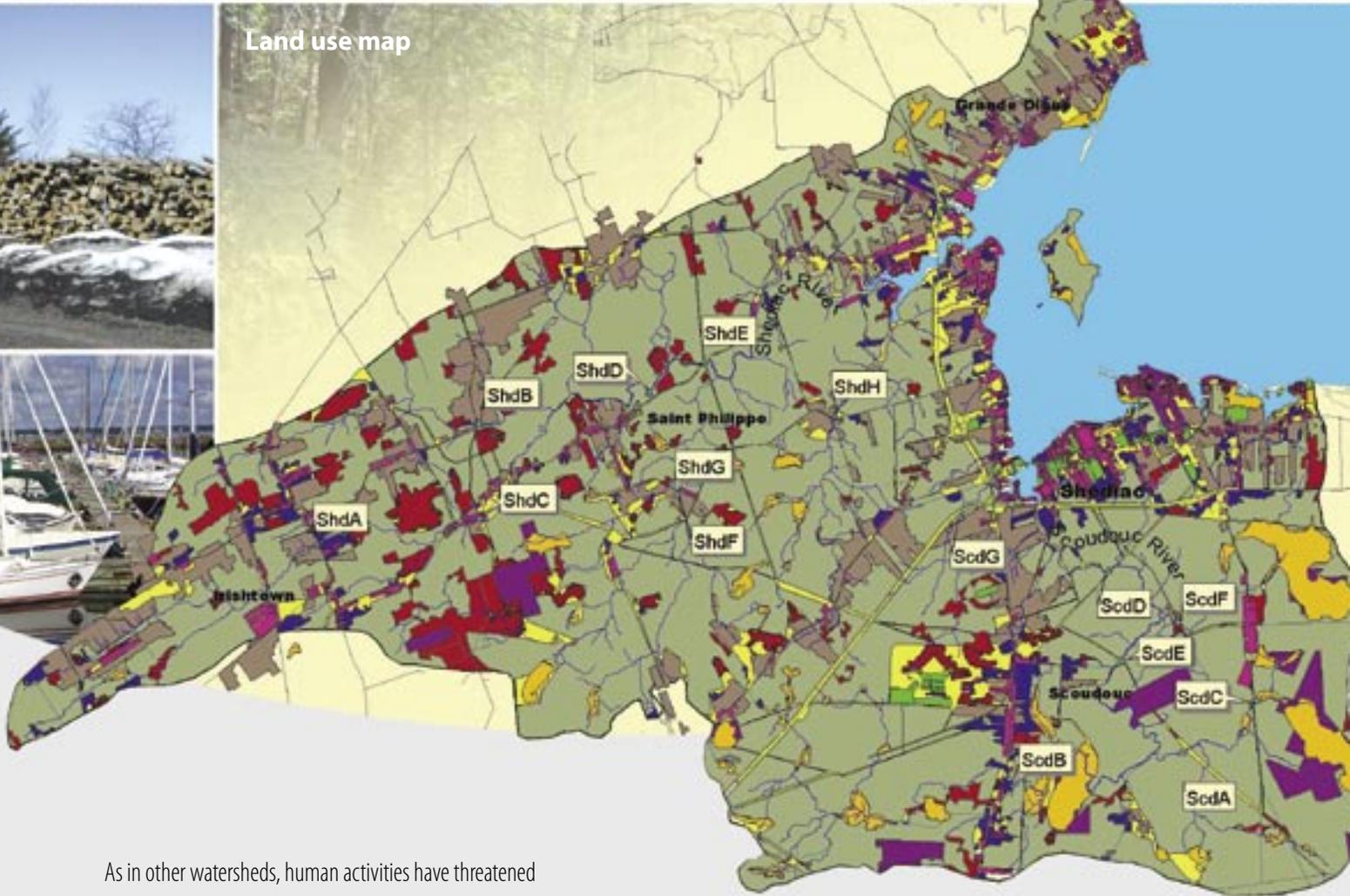
Agricultural lands are interspersed throughout the landscape and are principally present in Irishtown and Scoudouc areas. Agricultural lands represent approximately 10% of the land surface area of the Shediac Bay watershed.



HABITAT INTEGRITY STRESSORS



Land use map



As in other watersheds, human activities have threatened and degraded the health of the ecosystem. The main issues of concern include poor water quality and the loss of important coastal habitats. The SBWA deals with issues such as improper agricultural activities, poor forestry practices, effluents from industrial waste, and faulty septic systems. We are faced with problems that cause shellfish harvesting closures due to poor water quality, nutrient pollution, and sediment loading in watercourses. Infilling of saltmarshes, coastal flooding and erosion, are also issues that lead to habitat and species loss.

- | | |
|---------------------------------------|-------------|
| SBWA sampling site | Public Land |
| Residential | Woodland |
| Marshland | Fields |
| Industrial, Commercial, Institutional | Cut areas |
| Agricultural | Unknown |

NUTRIENT LOADING

Anoxic condition: a condition in which oxygen levels are depleted and aerobic bacteria are replaced by anaerobic bacteria.

Eutrophication: Pollution of salt or fresh water by nutrients, in particular phosphorus and nitrogen compounds that cause the excessive growth of algae and other more developed plant forms.

Intertidal zone: The area covered by water at high tide and exposed to the air at low tide.

Phosphorus (P) and Nitrogen (N) are essential nutrients for algal growth. Excess nutrients in aquatic habitats, known as eutrophication, is considered one of the most significant environmental problems in coastal ecosystems. Excessive amounts of decomposing algae can deplete oxygen levels in the water and produce anoxic conditions thus creating lethal conditions for aquatic life. In addition, large amounts of organic material decaying in anoxic conditions produce hydrogen sulphide (H_2S) gases that produce a foul odour. In Shediac Bay, mats of decomposing green algae lying in the intertidal zone are visible at low tide. Industrial effluents rich in nutrients, municipal wastewater, faulty septic systems, agriculture and land runoff can increase nutrient levels in aquatic ecosystems resulting in excessive algal growth.

Explanation:

Effect of increasing nutrient loading on marine plants and phytoplankton in coastal waters.



Source: Conservation Council of New Brunswick
(Lotze et al. 2003 (modified from Raffaelli et al. 1998)).

nutrient loading

EROSION

Flood risk model

Erosion is a natural process in coastal ecosystems; however, it can be accelerated by human activities. Gradual submersion of the land is becoming an economic and social concern in coastal communities. Coastal infrastructures and residences can be at risk during storm surges and coastal flooding.

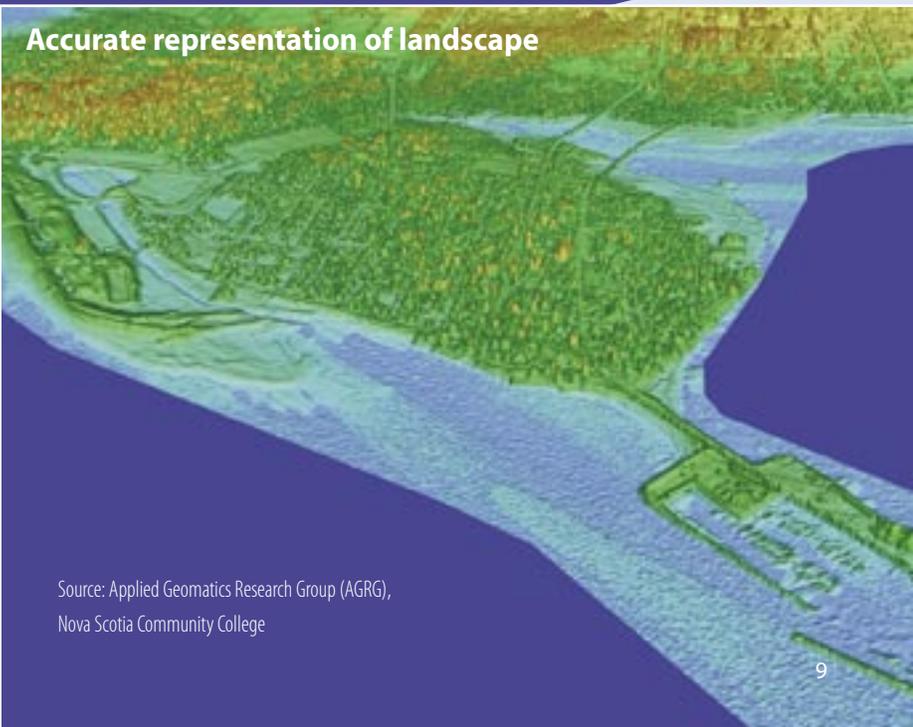
Rising sea level is a serious threat to coastal habitats as it accelerates the natural erosion process. Increased sea levels combined with increased frequency and severity of storms, also predicted to occur as a result of global warming, are likely to substantially increase shoreline erosion and negatively impact the habitat of coastal species.

The erosion process can also be accelerated by some coastal activities such as deforestation or vehicle use in riparian zones. Much land-based erosion contributes to silt loading in our estuaries and affects the spawning habitats of several fish species.

explanation:

The main purpose of this project conducted by Applied Geomatics Research Group, was to generate flood maps and digital elevation models with better than 30 cm vertical accuracy for the coastal area of southeastern NB. Airborne LIDAR systems (Light Detection and Ranging) can obtain high-resolution elevation data that can be processed to produce accurate topographic representations. This project used LIDAR data to produce accurate representations of the landscape and to provide high resolution hydrological digital elevation models that are necessary to perform accurate flood risk modelling for the Shediac and Cap Pele areas.

Accurate representation of landscape



Source: Applied Geomatics Research Group (AGRG),
Nova Scotia Community College

WATER CLASSIFICATION PROGRAM

The Water Classification Regulation commenced on March 1st, 2002 and is a regulation under the provincial Clean Water Act. The regulation emphasizes a multi-stakeholder approach to water planning and enables watershed groups to partner with stakeholders from all sectors to set goals for surface water quality and to promote management of water on an individual watershed basis.

The regulation enables classifications to be assigned to the water of rivers, streams, and lakes within watersheds and applies water quality and management standards to those waters.

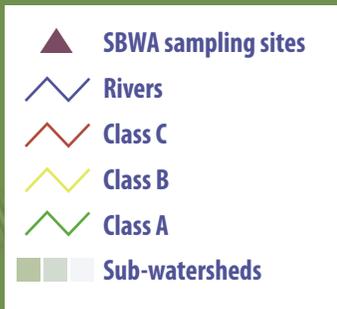
Water classification has six possible classes or categories for the water of lakes and rivers or segments of rivers based on water quality goals (The Water Classification Regulation, 2002). The classes include the following categories:

NW: Outstanding natural waters; **AP:** drinking water supplies; **AL:** all lakes, ponds and impoundments not classified Outstanding or AP; **A:** excellent water quality; **B:** good water quality; **C:** acceptable water quality

The main objective of the Water Classification Regulation is to protect aquatic life so that even in a Class C section of a river, the water quality must be acceptable and support a viable aquatic community.

Sources of data: Service New Brunswick's digital property maps and ETB98 topographic layers provided by the New Brunswick Dept. of the Environment.

Suggested Water Classification for the Shediac Bay Watershed (2003)



WATER QUALITY: OUR RIVERS



The SBWA participated in the provincial Water Classification Program from 2000 to 2003. The following are some of the results obtained.

The majority of the parameters tested in the Shediac Bay watershed were found to be below the Canadian Water Quality Guidelines for the protection of aquatic life with the exception of Aluminium, Chromium, Calcium and Iron. These three measured parameters can be considered as background levels since they are found throughout the watershed. High levels of iron and Aluminium are often attributed to their natural abundance in soils, sediments and bedrock and the weathering thereof.



Road culvert

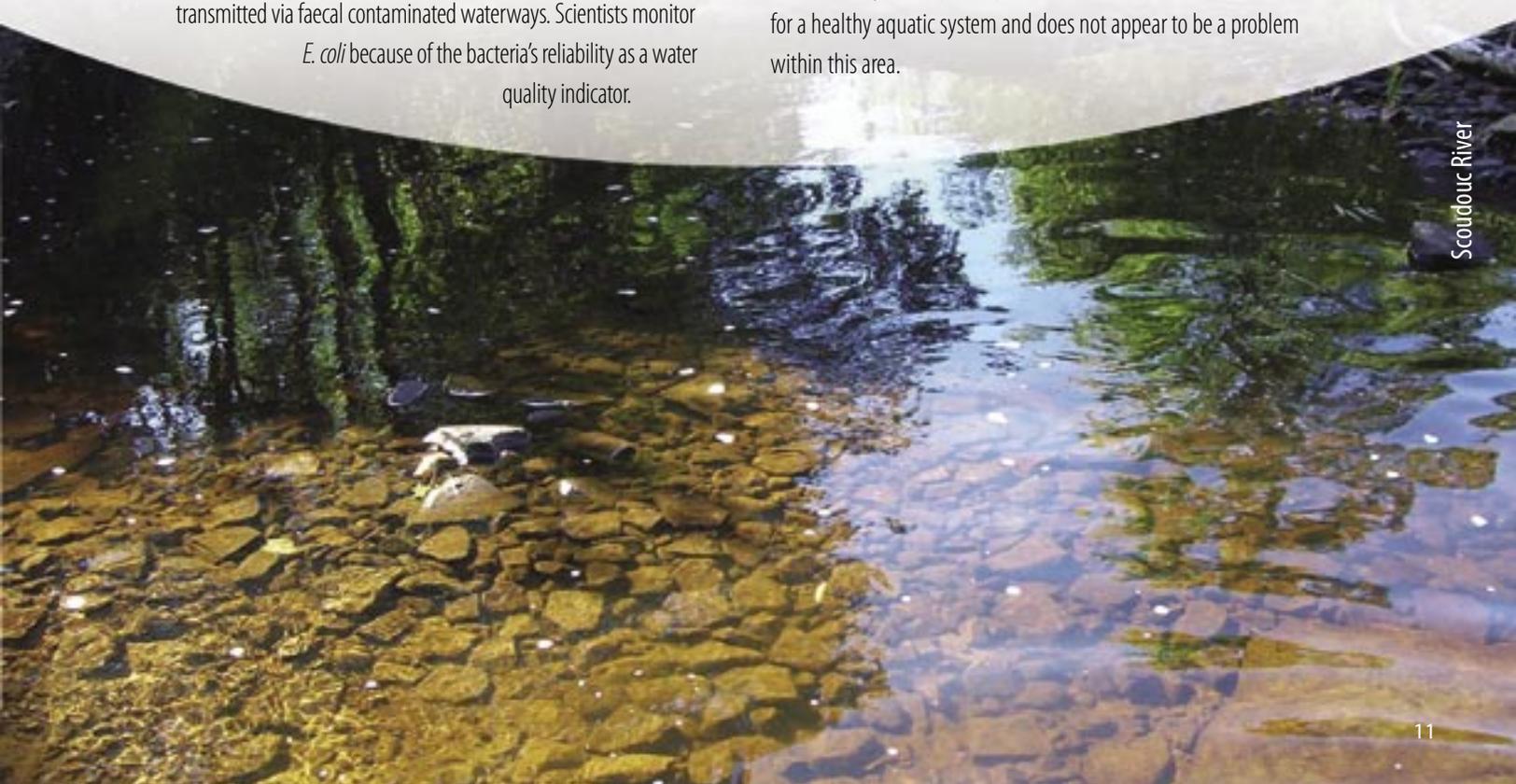
The presence of faecal coliform bacteria in water indicates that faecal waste from warm blooded animals is contaminating that lake, pond or stream. Although *Escherichia coli* are rarely pathogenic, many other disease-causing organisms, including cholera and cold viruses, can be transmitted via faecal contaminated waterways. Scientists monitor *E. coli* because of the bacteria's reliability as a water quality indicator.

Most of the sampling sites in both river systems showed *E. coli* levels below the critical point of 400 MPN/100ml (critical point characterizing the reach of a class C). High occurring levels of *E. coli* were observed in agricultural areas where sections of both Scoudouc and Shediac Rivers were classified as C. These high levels can be attributed to agricultural runoff, but also to faulty septic systems or even flooding outbreaks.



Erosion on riparian section of the Shediac River

Dissolved oxygen (DO) in water is used for respiration by most aquatic life. DO levels are influenced by temperature and aeration conditions and are an indicator of the health of the ecosystem. DO levels throughout the watershed met the requirements for both early and other life stages of aquatic species. Sufficient DO is fundamental for a healthy aquatic system and does not appear to be a problem within this area.



Scoudouc River

WATER QUALITY: OUR BAY

In 1940, the first concerns regarding the water quality of Shediac Bay were raised. It was identified that contamination due to sewage originating from cottages, campgrounds and municipalities could affect the water quality. In 1947, the first shellfish harvesting area was closed. Today, many of these sources were properly addressed but a few scattered sources are found throughout the watershed. They can include faulty septic systems, agricultural runoff, industrial effluent, improper boating practices, municipal wastewater facilities, etc. Pollution conditions are usually aggravated by rainfall and spring thaw.

Drainage ditches, can also adversely affect water quality as they continuously discharge water of unknown quality into receiving waters. Since 1999, the SBWA tackled many of these issues and a significant improvement of the water quality should be measured. Moreover, industry owners and residents among the watershed seem more aware of the importance of the environment and many are doing considerable efforts to help the Bay stay cleaner.

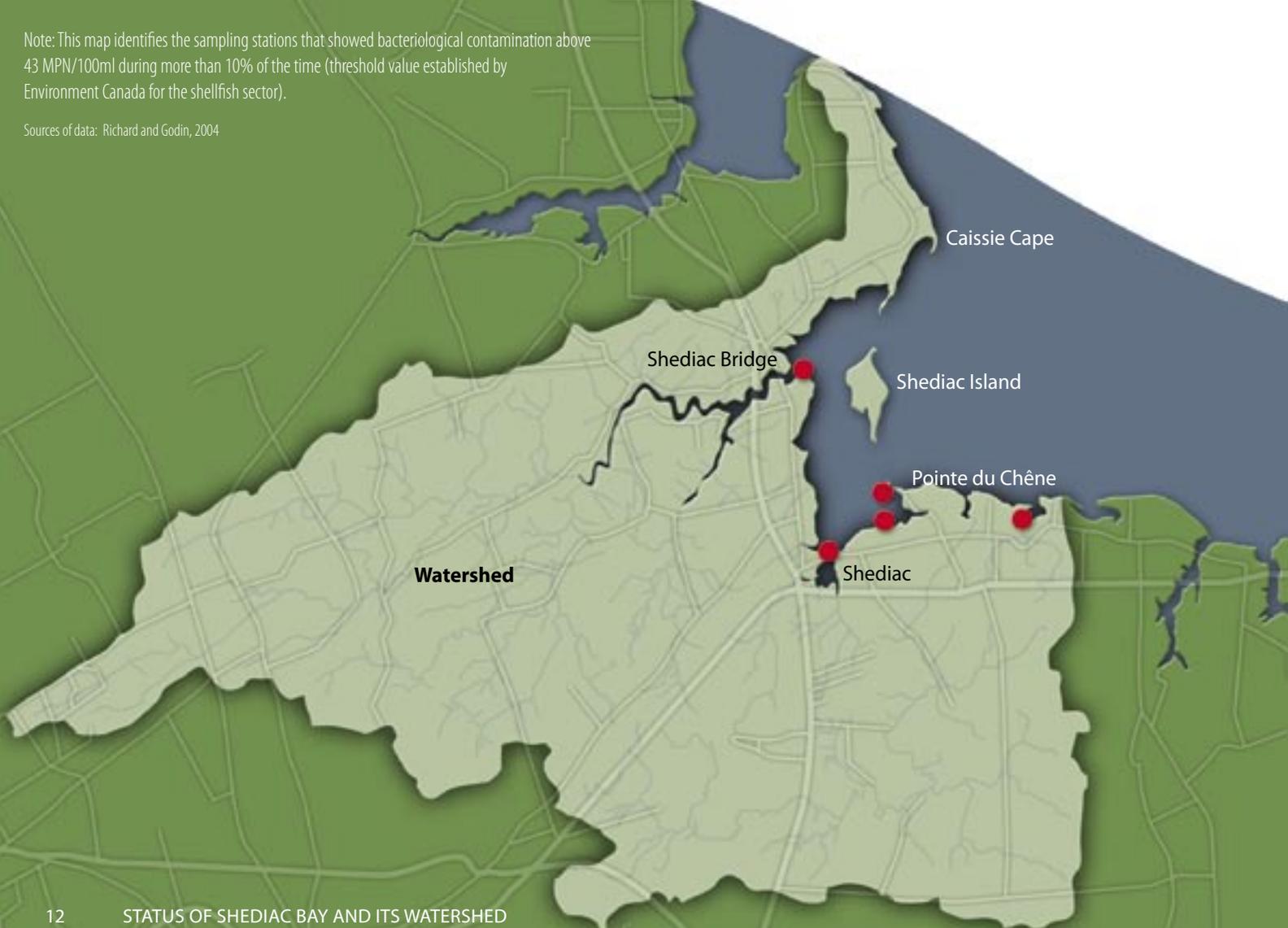
Since 2003, the Shediac Bay Watershed Association, through funding from the NB Environmental Trust Fund, has provided subsidies to residences in need of an upgrade of their failing septic systems. A total of 37 households received new septic systems.

Also, the SBWA has carried out a Green Boating Program that aims to promote environmental practices during boating activities by raising awareness among boat owners.

● High faecal coliform contamination areas

Note: This map identifies the sampling stations that showed bacteriological contamination above 43 MPN/100ml during more than 10% of the time (threshold value established by Environment Canada for the shellfish sector).

Sources of data: Richard and Godin, 2004



WORKING TOGETHER TOWARD A HEALTHY AND SUSTAINABLE BAY



Shellfish Restoration

In eastern NB, native oyster beds are merely 10% of their original biomass. Oyster populations never fully recovered from the effect of Malpeque Disease in the late 1950's. Quahog (*Mercenaria mercenaria*) populations in the southern Gulf of St. Lawrence have also declined over the past five decades largely due to increasing harvesting pressures. The Shellfish Habitat Restoration project was set up to enhance oyster habitat as well as to help increase the quahog natural stock in Shediac Bay. Shell material was added to the sea floor (shelling) to create recruitment substrate for oyster spats.



Oyster spat collected on shell

Oyster habitat restoration – shelling



This habitat restoration work could in the long term create new oyster reef structures, which would contribute to increase biodiversity and provide a viable food source as well as habitat for many species. Shellfish play an ecologically important role by filtering the water column. They contribute by reducing water turbidity and nutrient pollution.



Shell of Eastern pearl shell

WORKING TOGETHER TOWARD A HEALTHY AND SUSTAINABLE BAY

Cattle Fencing

SBWA has also undertaken cattle fencing projects to restrict cattle from having direct access to the watercourses and protect the stream from contamination and bank erosion. These projects were done in collaboration with local farmers, which contributed to the enhancement of fish habitat.



Species Inventory and Monitoring

Estuarine species monitoring has been conducted in partnership with the Department of Fisheries and Oceans on the Community Aquatic Monitoring Program (CAMP). This long-term monitoring program is aimed at studying the relationship between the ecological health of an estuary and the diversity and abundance of the species within that estuary. Data collection is expected to continue annually on a monthly basis.

Freshwater fish species monitoring started in 2005. The electrofishing survey revealed that Atlantic salmon parr (*Salmo salar*) and other salmonids such as the brook trout (*Salvelinus fontinalis*) were present in both main river systems of the watershed. These two species are hosts for some freshwater mussels larvae. Freshwater mussels, as well as salmonidae species, are considered excellent ecological indicators of water quality and ecosystem integrity. They survive only in clean and unspoiled rivers. Therefore, the presence of healthy freshwater mussel and salmonidae populations is representative of a healthy aquatic ecosystem.

Stream Restoration

The main objective of the restoration of tributaries is to re-establish fish habitat and return streams to their natural state. Sites are selected based on the state and the cause of the alteration. Criteria include the presence of in-stream siltation, fish migration barriers, improper buffer zones, poor oxygenation, weak riparian zones and degraded fish habitat. Preliminary stream sanitary surveys performed during the Water Classification Program contributed to the identification of critical stream sections and problem areas.

Salmon parr captured during stream monitoring



Awareness, Education and Stewardship

An ongoing education program is offered to community groups and schools to increase public awareness regarding environmental issues affecting our watershed. This awareness campaign contributes to the protection and conservation of our marine environment and its natural resources.



Community Aquatic Monitoring Program in Scoudouc River estuary

Monitoring of shellfish habitat restoration



What is stewardship?

Environmental stewardship is a way of thinking and acting, an attitude, a form of dedication and a sense of responsibility to do the best we can for the natural resources for future generations.

BAY HEALTH MONITORING PROGRAM

The SBWA is spearheading this Status of the Bay program because it wants to ensure that future uses of the watershed are managed using a proactive approach. This means that the SBWA is committed to working with every watershed stakeholders using an integrated management approach to achieve the sustainability of the Bay.

A long-term monitoring program based on the use of environmental indicators is being developed to understand and track changes in the watershed. Different categories, such as pollution status (e.g. eutrophication, plant effluent, faulty septic systems, faecal matter discharge, etc.) and habitat status (e.g. wetlands coverage and loss, fish passage, siltation and erosion levels, oyster population status, eel grass bed status, forestry status, etc.) will be targeted to measure the Status of the Bay. This will provide information needed to establish remediation and restoration goals.

What is integrated management?

Integrated Management is a proactive approach towards sound habitat management. It is an ongoing and collaborative planning process that brings together interested parties, stakeholders and regulators to reach general agreement on the best mix of conservation, sustainable use and economic development of coastal, marine and riparian zones for the benefit of the entire population within the watershed.



Cattle fencing project along the Scoudouc River.

OUR FUTURE

Much has been accomplished and much remains to be done to fully understand the complexity of this ecosystem. Many restoration efforts and awareness programs were conducted in recent years. The success of our efforts will be evaluated using health indicators developed within the Status of the Bay program. The ultimate objective is to be able to measure health improvements and track changes in the Shediac Bay watershed during its evolution.



Monitoring in the Scoudouc River Estuary

As a resident of the Shediac Bay watershed, you can play your part to ensure your continued enjoyment of the waterways you use and value. Help us restore, enhance and protect living resources, their habitats and ecological relationships to sustain all economical activities in our watershed and provide for a balanced ecosystem.

Contact info:

For more information on how you can get involved in your community to help keep the Bay and its rivers clean, please contact us:

Shediac Bay Watershed Association
164-A Pleasant Street, Shediac, NB, E4P 2L8
(506) 533-8880

www.sbwa-abvbs.net

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Shediac Bay Watershed Association

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