



ST. LAWRENCE
Action Plan 2011-2026



PROCEEDINGS OF THE 2013 **Rendez-vous** **SAINT-LAURENT**



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PREFACE

St. Lawrence Action Plan

In 1988, the governments of Canada and Quebec began working together with various collaborators to conserve, restore, protect and enhance the St. Lawrence. Building on their existing achievements, the governments are continuing and expanding their collaboration under the St. Lawrence Action Plan 2011–2026, which consolidates the efforts of a record 18 government agencies and departments. In order to support decision-makers in governing the St. Lawrence, the Parties agree to maintain and improve decision support tools such as environmental monitoring and environmental prediction.

State of the St. Lawrence Monitoring Program

The partners of the Working Group on State of the St. Lawrence Monitoring are Environment Canada, Parks Canada, Fisheries and Oceans Canada and Quebec's Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP). Stratégies Saint-Laurent, a non-profit organization that brings together Quebec's ZIP (areas of prime concern) committees, is also associated with the program.

The purpose of the State of the St. Lawrence Monitoring Program is to pool the data collected and interpreted by the participants and collaborators in light of knowledge acquired in the course of their ongoing environmental monitoring activities. The program proposes a series of 21 indicators relating to the main components of the St. Lawrence, namely water, sediments, biological resources, uses and shorelines.

Rendez-vous St. Lawrence

Rendez-vous St. Lawrence was held on March 12 and 13, 2013, in Montréal at the Holiday Inn. Organized by the Working Group on State of the St. Lawrence Monitoring, the event provided an opportunity for participants and collaborators to present the latest results of the 21 environmental indicators of the State of the St. Lawrence Monitoring Program. Time was also set aside for other stakeholders to present and discuss their St. Lawrence monitoring activities.

This was the fourth edition of the Rendez-vous. Initially launched in Quebec City in 2003, the Rendez-vous was later held in Nicolet in 2006 and the 20th anniversary of the St. Lawrence Plan was marked in Quebec City in 2008. The Rendez-vous is one of the State of the St. Lawrence Monitoring Program's dissemination mechanisms prescribed in the St. Lawrence Action Plan 2011–2026.

Close to 110 guests turned out for the event to share and learn the latest results of the State of the St. Lawrence Monitoring Program as well as to participate in plenary discussions on how certain aspects of the current program could be improved. Participants came from (non-governmental) environmental organizations, river user groups, universities and the various levels of government concerned with the state of the St. Lawrence.



WORD OF WELCOME



We would like to thank all participants for attending this event, which brings together the various players and stakeholders who share concern for the St. Lawrence River.

The purpose of the St. Lawrence Monitoring Program is to determine the state of, and changes in the St. Lawrence, based on 21 environmental monitoring activities that cover the major components of this ecosystem, while optimizing data acquisition, taking into account the complementarity of the mandates and expertise of the partners involved and pooling efforts in order to provide an overview.

Another objective is to regularly inform decision-makers and riverside communities of the healthiness of, and changes in the St. Lawrence River. To this end, the Working Group on State of the St. Lawrence Monitoring produces a triennial event called Rendez-vous Saint-Laurent, fact sheets that are updated at varying intervals and a five-year overview.

The aim of Rendez-vous St. Lawrence is to provide up-to-date information to support informed decisions about the St. Lawrence, promote a more accurate perception of the state of the St. Lawrence, improve the State of the St. Lawrence Monitoring Program in order to optimize the indicators and their interpretation, and attract new partners to join the program. To accomplish this, the Rendez-vous Saint-Laurent encourages the participation of a hundred or so representatives of communities, universities and various levels of government.

UPDATE ON STATE OF THE ST. LAWRENCE MONITORING INDICATORS: Physical-chemical and contamination (Room BC)



Changes in Water Level and Flow in the St. Lawrence River

BIOGRAPHY

André Bouchard received his degree in geological engineering from Université Laval in 1987. He joined Environment Canada's St. Lawrence Centre in 1988 to study the effects of acid precipitation on Quebec's lacustrine ecosystems. In January 1997 Mr. Bouchard joined the Meteorological Service of Canada's Water Survey, where he managed several projects on current-meter measurements using hydroacoustic technologies, on the modernization of the federal hydrometric network in Quebec, on hydrometric data management through the new hydrometric workstation, on the hydrological characterization of the St. Lawrence River (Montréal-Trois-Rivières portion) as part of the Hydrology and Ecohydraulics section's activities for developing ecohydraulic models of the St. Lawrence River, and on the migration to hydrodynamic model operations for the St. Lawrence River at the Canadian Meteorological Centre.

ABSTRACT

Water flow fluctuations in Sorel are on the order of 14 000 m³/s (6000 to 20 000 m³/s). Alternating high and low flows have been observed there since 1930. Since 2002, there have been a few low-flow events, including one in 2007 and another in 2012. However, the low flows of recent years have not been record-breaking. The flow pattern in the St. Lawrence has changed as a result of numerous human interventions in the 1960s, making it difficult to determine a historical trend. Although the river's 2 main inputs are regulated, there is limited margin for managing extreme high- and low-flow events. The new regulation plan being considered for Lake Ontario takes into account not only the requirements of the original plan (shipping, hydroelectric generation, etc.) but also issues like erosion and the environment.

COMPLEMENT

In the existing water-level regulation plan, decisions are based primarily on considerations related to hydroelectricity and marine transportation of goods. The new regulation plan will be designed to take into account environmental issues by incorporating more indicators. The plan will be released for public consultation shortly, but no date is available at this time. The flow in Lake Saint-Pierre is calculated based on inputs, including all lateral ones.

The scope of the presentation does not allow for any conclusions concerning use of air cushion vehicles and their potential impact on the natural environment or biodiversity.

The impact of the rising tide cycle on freshwater flow at Quebec City may prove fairly significant. This presentation does not enable us to assess whether water flow is much higher at Quebec City than it was three decades ago.



André Bouchard

Senior Project Engineer

Hydrology and Ecohydraulics
Section

Meteorological Service of Canada
Environment Canada



Serge Hébert

**Coordinator, Surface Water Quality
Monitoring Networks**

Direction du suivi de l'état de
l'environnement

Ministère du Développement
durable, de l'Environnement,
de la Faune et des Parcs (MDDEFP)



Water Quality in the Fluvial Section 1995–2010

BIOGRAPHY

Trained in biology and water sciences at Université Laval and at INRS University's Eau Terre Environnement Research Centre, Serge Hébert has been a water quality specialist at the Direction du suivi de l'état de l'environnement at Quebec's Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP) since 1991. He is currently coordinator of surface water quality monitoring networks and has conducted several studies on water quality in the St. Lawrence River.

ABSTRACT

Despite a few year-to-year fluctuations between 1995 and 2010, there were no trends in the annual percentage of monitoring stations with satisfactory or good water quality (average 72%). In the reaches of the St. Lawrence near Quebec City there were no significant trends in the concentration of suspended particles and phosphorus, the median values of these parameters being 10.3 and 0.026 mg/L, respectively. By contrast, there has been a rise in the concentration of fecal coliforms, with the estimated values going from 107 UFC/100 mL at the start of the period to 171 UFC/100mL at the end of the period.

COMPLEMENT

There are three main issues to be monitored:

1. Swimming remains problematic in certain parts of the river. Additional remediation efforts (disinfection and sewer overflows), particularly for municipal contamination, will help reintroduce this use. The City of Montréal will be implementing disinfection infrastructure, which will eventually improve the situation.
2. Our intervention efforts must continue to target a reduction in phosphorous discharges.
3. Emerging contaminants are a major concern.



Myriam Rondeau

Project manager, Water Quality

Water Quality Monitoring and
Surveillance

Environment Canada



Water Quality Monitoring: Toxic Contaminants

BIOGRAPHY

Myriam Rondeau has a background in geology and holds a master's degree in geochemistry from the Université du Québec à Montréal. She has been a project manager at Environment Canada since 1990, working on water quality and, in particular, on the presence and movement of contaminants in the St. Lawrence River. Since 2006, she has been the senior specialist in fluvial geochemistry and has been involved in numerous national projects regarding water quality in Canada.

ABSTRACT

The movement of contaminants in the St. Lawrence has been evaluated by calculating the annual loads between 1995 and 2009 at two of the river's main entrances—Wolfe Island for deposits from the Great Lakes, and the Ottawa River—as well as at the exit of the St. Lawrence towards the estuary at Lévis. The sources vary as to the different contaminants found in the river (nutrients, metals, pesticides and PBDEs). Although only small temporal trends were detected for the various compounds analyzed, we can observe that the year-to-year fluctuations in the river's water level play a major role in the movement of contaminants. The supply of nutrients to the St. Lawrence comes in large part from Lake Ontario; however, suspended particles and their associated contaminants do not come from the Great Lakes.

COMPLEMENT

In the context of this presentation, it is impossible to address the impact that dredging has on contaminant levels following the resuspension of contaminated sediments. It is also impossible to comment on the water mixing and dispersion patterns update following the installation of rock cribs at Laviolette Bridge. Pharmaceutical products have in fact been detected in the river water.



Magella Pelletier

Manager, Sediment Quality
Monitoring

Water Quality Monitoring
and Surveillance –
Atlantic Ocean Watershed
Environment Canada



Sediment Quality in the St. Lawrence – Back to Square One

BIOGRAPHY

Magella Pelletier holds a master's degree in environmental geology from Université Laval and INRS University, and has been a sedimentologist at the Water Quality Monitoring and Surveillance Directorate since 2001. He is currently responsible for sediment quality monitoring for the St. Lawrence area and is national sediment supervisor for the Chemicals Management Plan (CMP). He has conducted several studies on the various fluvial lakes of the St. Lawrence River and on emerging substances.

ABSTRACT

During the 20th century, sediments in the St. Lawrence River and principally those of the fluvial lakes had been contaminated by industrial and municipal waste—a consequence of North America's economic boom. Numerous contaminants such as mercury, PCBs, dioxins and furans accumulated on the streambed, creating a harmful environment for numerous benthic and aquatic species. Recently, studies have shown that these contaminants have largely diminished in surface sediment deposits and that clean-up operations and regulations implemented in the last 20 to 30 years have proven effective for recuperating waterways.

However, for about the last dozen years, the St. Lawrence has faced a new wave of contaminants that are more diffuse but just as dangerous to aquatic life. Polybrominated diphenyl ethers (PDBEs), siloxanes and perfluorocarbons (PFCs) are only some of the examples of contaminants resistant to current wastewater treatment practices and that are found to be untreatable in the natural environment. These new contaminants require scientists to go back to the drawing board to create new methods of analysis, to re-evaluate risks to organisms and to establish new sediment evaluation criteria.

This presentation provides an overall view of contaminants in St. Lawrence sediments and the observable trends over the short and medium term for both past substances and those of emerging interest.

COMPLEMENT

This presentation describes the improvement in toxicant concentrations in sediments. There have been significant improvements compared with the 1970s. However, even if the water appears clear, it may still contain toxic contaminants. This positive finding about sediments does not mean that everything is fine. The overall health of the St. Lawrence covers many aspects. Since 1990, major efforts have been made, and a number of indicators confirm the impacts of these efforts. However, monitoring activities must continue so that we can learn how the recent changes detected by the indicators will affect the food chain.



Denis Laliberté

Aquatic environment analyst

Direction du suivi de l'état de
l'environnement

Ministère du Développement
durable, de l'Environnement,
de la Faune et des Parcs (MDDEFP)



Levels of Polybrominated Diphenyl Ethers (PBDEs) in Fish in the St. Lawrence River (2002–2008)

BIOGRAPHY

Denis Laliberté has worked as an aquatic environment analyst at the MDDEFP since 1980. He received a bachelor's degree in chemistry from Université Laval in 1975 and took master's-level courses on the environment at INRS-ETE in 1976. At the MDDEFP, he is responsible for coordinating projects to evaluate contamination in the aquatic environment by toxic substances.

ABSTRACT

This study, conducted between 2002 and 2008, examined PBDE levels in 104 fish samples from 14 sites in the St. Lawrence River. PBDEs were detected in all of the fish samples analyzed, but in concentrations that varied greatly depending on the site and the species of fish.

In the St. Lawrence River, PBDE levels in fish flesh ranged from 0.2 to 140 µg/kg, with a median of 12 µg/kg. Fish from the St. Lawrence between Montréal and Québec showed higher levels than fish from upstream, and levels were generally higher than those observed in fish from lakes and rivers in Quebec with less industrialized watersheds. Average PBDE levels in whole White Suckers captured in 2002 and in 2007 in Lake Saint-Pierre did not differ significantly.

At all sites, except for two at Lake Saint-François, average PBDE levels in whole White Suckers captured in the St. Lawrence River exceed the guidance value of 8.4 µg/kg estimated by Environment Canada to be protective of piscivorous terrestrial species.

In the flesh of fish, 7 PBDE congeners represent an average of 95 to 99% of all PBDEs. In order of importance, these are BDE 47 (47%), 99 (23%), 100 (13%), 154 (5.1%), 49 (4.1%), 153 (3.8%), and 28 (0.9%).

COMPLEMENT

There is little data on the impact of PBDE levels on fish health. No evidence has been found of a reproductive issue affecting fish in the St. Lawrence River.



Louise Champoux

Wildlife Ecotoxicologist

Ecotoxicology and Wildlife Health
Division

Environment Canada



Monitoring Contaminants in Birds of the St. Lawrence

BIOGRAPHY

Louise Champoux has worked as a wildlife ecotoxicologist at the Ecotoxicology and Wildlife Health Division (formerly part of the Canadian Wildlife Service) since 1990. She received a master's degree in biological sciences from the Université de Montréal in 1986. At Environment Canada she has conducted studies on the presence of pollutants and their effects on wildlife, and research on the use of biomarkers to assess exposure to contaminants and understand the effects of such contaminants on wildlife health.

ABSTRACT

Through the State of the St. Lawrence Monitoring Program, the Northern Gannet and Great Blue Heron have been identified as sentinel species for the Gulf of St. Lawrence and St. Lawrence River. The concentrations of major contaminants (mercury, polychlorinated biphenyls (PCBs), organochlorinated pesticides, dioxins and furans, etc.) detected in the eggs of the two species and in young herons have mainly trended downward since the late 1960s. The large number of toxic substances present in the environment and the varying sensitivity displayed by different species make it challenging to interpret cause-and-effect relationships between exposure and impacts on bird health. Contaminant concentrations are generally down or stable in Northern Gannets and Great Blue Herons, but they remain a concern for population maintenance.

COMPLEMENT to the presentations session

While polybrominated diphenyl ethers (PBDEs) do turn up in the water, approximately 90% are eliminated when this water is treated at the two sampled drinking water treatment plants. Treatment is effective in removing substances that tend to adhere to particles, including PBDEs. It is much less effective and potentially ineffective for persistent soluble substances such as perfluorinated compounds.

The 1999 mass balance factors in the loads from the tributaries (data from Quebec's Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs). Also available were data on the inputs from industry and wastewater treatment plants. Monthly sampling was conducted in the tributaries for a number of years. Models were developed to calculate annual loads. Suspended loads can double in the spring. Internal erosion was calculated using the differential between the upstream and downstream loads, taking into account the loads from the tributaries. Riverbed erosion is not a significant contaminant source, as marine clays are low in contaminants.

In terms of possible sources of contamination, the case of the Snow Goose stands out. Its population has experienced an explosion in numbers and has adapted to agriculture. Its migratory range has expanded, and the contaminant source can be linked to a multitude of possible causes. Cases where contaminant concentrations are not high are rare. There is also the issue of physical causes, including diseases. There are no test years (year 0) for commercial fishery landings, which could provide other avenues of research.

**UPDATE ON STATE OF
THE ST. LAWRENCE MONITORING
INDICATORS: Biomonitoring
(Room A)**



**Biomonitoring of
the St. Lawrence River Using
Benthic Macroinvertebrates**

BIOGRAPHY

Trained in biology as well as in Environment and Prevention at UQAM and Université de Montréal, Alain Armellin has been a specialist in water quality biomonitoring since 2004 at the Water Sciences and Technology Directorate, Water Quality Monitoring and Surveillance, Atlantic Watershed section, of Environment Canada. Since 2006, he has coordinated activities at the Canadian Aquatic Biomonitoring Network (CABIN) in Quebec.

ABSTRACT

This presentation provides an overview of the health of aquatic ecosystems through the analysis of changes in the composition of benthic invertebrate communities. Given their diversity and abundance, invertebrates exhibit a wide range of sensitivity responses to disturbances and, as a result, effectively complement physical and chemical monitoring of water and sediment. Monitoring of freshwater benthic communities has been carried out in Lake Saint-Pierre since 2004; in Lake Saint-Louis and the fluvial section between Montréal and Sorel since 2007; and in Lake Saint-François since 2009, with a total of 180 sites analyzed. Laboratory analysis of macroinvertebrate communities was conducted for each sampling site. Based on these results, researchers established a series of metrics or measurements to show each community's composition, richness, diversity and pollution tolerance. The metrics used in determining the state of benthic communities were the number of families and the percentage of Ephemeroptera, Plecoptera, Trichoptera and Oligochaetes. The most highly degraded benthic communities are those in the fluvial section, around the Berthier-Sorel archipelago and, to a lesser extent, on the north shore of Lake Saint-François. These sites were significantly less rich in macroinvertebrates and had a high proportion of Oligochaetes, which are highly pollution-tolerant worms.

COMPLEMENT

The methods used by Environment Canada and Quebec's Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP) produced comparable results. However, the MDDEFP's monitoring was designed for small watercourses, while that of Environment Canada, although initially designed for small watercourses, was adapted to large rivers such as the St. Lawrence.



Alain Armellin

**Project manager,
Aquatic Fauna and Flora**

Water Quality Monitoring and
Surveillance, Atlantic Watershed
Environment Canada



Yves Paradis

Coordinator, Réseau de suivi
ichthyologique (RSI)

Direction de la faune aquatique

Ministère du Développement
durable, de l'Environnement,
de la Faune et des Parcs



Health of Freshwater Fish Communities in the St. Lawrence

BIOGRAPHY

Yves Paradis trained in biology and environmental sciences at the Université du Québec à Trois-Rivières (UQTR), and specializes in the monitoring and management of freshwater fish in the St. Lawrence River. His work focuses on the dynamics of freshwater sport and commercial fish populations, and on the management of these stocks. He is also involved in coordinating the fish monitoring network and has participated in various studies on fish in the St. Lawrence.

ABSTRACT

Experimental fishing at monitoring network sites confirms the great diversity of fish communities in the St. Lawrence River. In all, around 100 freshwater and diadromous fish species are found in various parts of the river, depending on physical conditions and habitat preferences. Since 1995, most biotic integrity index (BII) values, developed to evaluate the health of fish communities in the St. Lawrence, have fallen into the “low” or “average” categories, with the health of the St. Lawrence showing a downward trend. In 1995 and in 1997, the health of the St. Lawrence's fish populations was considered “low” in 45% of the fluvial portion, compared to 71% in 2001 and 2006. This trend is corroborated by the decline of certain fish species. It is worth noting that the index used varies considerably based on sample years and areas. Depending on the sector, the selected descriptors show improvements or deteriorations and, in certain cases, demonstrate success in improving the state of certain fish populations through sustained efforts from management plans.

COMPLEMENT

While the fish anomaly metric took on considerable significance during the 1990s, there is a growing interest in the tumour metric. More information about the latter metric is still to come.

A large increase in the number of goby catches was observed. This increase surely affects the index calculation; too much statistical weight in the calculation can be suspected. The Striped Bass is another burgeoning indicator showing that the St. Lawrence is healthy. There are also indicators for the gulf that are the responsibility of Fisheries and Oceans Canada. Some consideration should be given to integrating the various indicators.

Yellow Perch have rapidly declined in Lake Saint-Pierre in recent years, but we are seeing the opposite in, say, Lake Saint-Louis. Sturgeon populations seem to be improving as well. It is difficult to obtain a single rating, and these mixed results make synthesis a formidable challenge.



Jean-François Rail

Seabird Biologist

Canadian Wildlife Service

Environment Canada



Monitoring of Seabird Populations in the Gulf of St. Lawrence

BIOGRAPHY

Jean-François Rail has been working with seabirds since he joined the Canadian Wildlife Service in 1995—the same year he completed a master's degree in wildlife management at Université Laval. In addition to leading surveys to monitor seabird population trends, mainly in the Gulf and estuary of the St. Lawrence, he regularly collaborates on biological studies aimed at understanding the causes of the trends observed among seabirds.

ABSTRACT

In the migratory bird sanctuaries of the North Shore, populations of the various seabird species have fluctuated in a divergent but relatively constant fashion over the last 20 years. In contrast, monitoring of the Northern Gannet on Bonaventure Island shows a major change in the environment. The population, which maintained itself well over the last 30 years, has shown a decline since 2009, as well as worrying signs that include a reproductive success rate that is too weak to maintain the population.

COMPLEMENT

Every year, Environment Canada conducts inventories in five different regions in the estuary and the Gulf of St. Lawrence (on a five-year cycle), and the staffing requirements differ according to the region. In some cases, such as the Watshishou Migratory Bird Sanctuary on the North Shore, many volunteers are needed to cover hundreds of islands. Parks Canada issues calls for volunteers in this particular case. Volunteers interested in participating in inventories should contact Jean-François Rail.



Jacques Sénéchal

Manager, Marine Water Quality
Monitoring – Quebec Region

Water Quality Monitoring and
Surveillance Division
Environment Canada



Monitoring Marine Water Quality in Shellfish Areas

BIOGRAPHY

Jacques Sénéchal has been manager of the Marine Water Quality Section (MWQS) since 1992. He received a bachelor's degree in biological sciences from Université Laval. At Environment Canada, he manages the MWQS program's activities in support of the Canadian Shellfish Sanitation Program (CSSP), assessing health-related conditions in mollusk raising and harvesting areas. He conducts sampling surveys and measures, among other things, the levels of fecal coliforms in the water. He issues classification recommendations for the shellfish sector to Fisheries and Oceans Canada. Working with local and governmental partners, he helps make users aware of how to correct sources of contamination.

ABSTRACT

The main objectives of the Canadian Shellfish Sanitation Program (CSSP) are to protect public health, promote the industry's development and eliminate pollution sources. Three federal entities are involved in implementing this program: Environment Canada, the Canadian Food Inspection Agency and Fisheries and Oceans Canada. Environment Canada's responsibilities are to identify pollution sources, monitor the bacteriological quality of water and make site classification recommendations to Fisheries and Oceans Canada. In 2012, a total of 280 shellfish areas were classified as follows: 113 approved, 22 conditionally approved and 145 restricted and prohibited. Among these 280 areas, 173 were sampled in 2012. 53 closed shellfish areas where resources are abundant have been prioritized in order to reduce the amount of contaminants and improve the quality of water. These areas were selected as indicators in order to measure changes in the health of coastal waters in the estuary and the Gulf of St. Lawrence. Over the last ten years, water quality has improved in many shellfish areas, including five that have been re-opened to harvesting. The level of monitored contaminants should diminish in the medium term.



**Peter Galbraith
(replaced
by Denis Gilbert)**

Physical oceanography researcher

Environmental and Ocean Sciences
Branch

Fisheries and Oceans Canada



Recent Trends in Physical and Chemical Conditions in the Estuary and the Gulf of St. Lawrence

BIOGRAPHY

Peter Galbraith is a physical oceanography researcher who studies the winter climate of water masses in the Gulf of St. Lawrence and its persisting influence on the summer conditions that follow. He sits on the Atlantic Zone Monitoring Program permanent management committee and is responsible for delivering its scientific program in the Quebec region. With the input of colleagues, he also produces an annual research document on the state of the ocean, on the physical oceanography of the Gulf of St. Lawrence.

ABSTRACT

Recent trends in surface, intermediate and deep water temperatures in the Gulf of St. Lawrence have shown significant changes in recent years. The May-to-November average surface temperature shows a trend towards a 0.9 °C increase per century, but the warming trend has been sharper in the past 20 years. Most of the warmest years are recent, with August 2012 likely breaking a century-old record. The summer cold intermediate layer (35 to 125 m deep) experienced the warmest temperatures since 1985 in 2012 and the coldest in 2003. The deep water temperature shows a warming trend of 2.2°C at a depth of 300 m, but this does not seem to be predictive of future changes. However, this increase in deep water temperature is accompanied by a decrease in dissolved oxygen, causing hypoxia in the environment. The length of the ice season, ice volume and ice extent have all shown a downward trend since about 1990. Since 1969, only the winters of 1969, 2010 and 2011 have seen next to no ice in the Gulf of St. Lawrence. Ocean acidification is an emerging problem associated with the increase in atmospheric CO₂ and microbial respiration. A significant decrease in pH (increase in acidity) in the bottom waters of the St. Lawrence estuary of approximately 0.3 units has been observed since the 1930s. These waters are acidifying at least three times more quickly than the open oceans. Other indicators such as the calcite and aragonite saturation states are also determined using pH and alkalinity measurements. The bottom waters of the St. Lawrence estuary are nearly undersaturated in terms of calcite and clearly undersaturated in terms of aragonite.



Patrick Ouellet

Researcher

Fisheries and Oceans Canada



Recent Changes in Phytoplankton and Zooplankton Communities in the Estuary and the Gulf of St. Lawrence

BIOGRAPHY

Patrick Ouellet has been a researcher at the Maurice Lamontagne Institute since 1993. He has led many research projects on the biology and ecology of the young stages of fish and invertebrates, as well as on the study of processes responsible for annual variations in the recruitment of harvested fish populations in the Gulf of St. Lawrence. His work applies an ecosystemic approach to the integration of oceanographic and halieutic sciences. He presided over Fisheries and Oceans Canada's (DFO) working group on the oceanography of fish and was one of the lead members of the Atlantic Zone Monitoring Program until 2010. From 2009 to 2012, he was one of the coordinators of the regional streams of DFO's Ecosystem Research Initiative (for Quebec, – a project on the lower (marine) estuary of the St. Lawrence).

ABSTRACT

Fisheries and Oceans Canada implemented the Atlantic Zone Monitoring Program (AZMP) with the aim of regularly collecting a minimum set of physical, chemical and biological oceanographic data in the estuary and the Gulf of St. Lawrence. The objective is to create databases necessary for describing and eventually predicting seasonal, interannual and decennial phenomena that govern this ecosystem.

An initial indicator relates to the change observed in phytoplankton communities. Diatom/dinoflagellate and diatom/flagellate ratios are good indicators of environmental change as these two phytoplankton groups respond differently to the environment, particularly to nutrient inputs and water column stratification. Warmer waters, increased run-off and eutrophication tend to promote dinoflagellates and flagellates. A change in the relative abundance of the groups has been observed since 1999, as has a trend towards an increase in flagellates and dinoflagellates over the past decade. A second indicator concerns mesoplankton and, more specifically, various species of the genus *Calanus*, in which significant interannual variations have been observed. The findings point to a significant decrease in size (prosoma length) of *Calanus finmarchicus* females and clutch size since 1993. A toxic algae monitoring program was launched in 1989 and put on hold in 2010. One of the program's major findings was that, although there was no clear upward trend, an unprecedented bloom had occurred in the St. Lawrence estuary in 2008. During this *Alexandrium tamarense* bloom, many marine mammals and thousands of birds and fish were found dead in the estuary.

NEW INDICATORS AND INTEGRATION OF INFORMATION (Room BC)



Nathalie Simard

Senior Biologist

Fisheries and Oceans Canada



Aquatic Invasive Species

BIOGRAPHY

Nathalie Simard has a bachelor's degree in biology (1988) and a master's degree in marine ecology from Université Laval (1994). As senior biologist, she coordinates Fisheries and Oceans Canada's monitoring program for aquatic invasive species (AIS) and participates in many research projects in this field.

ABSTRACT

Aquatic invasive species (AIS) are introduced to locations outside of their natural range by human activity. They pose a threat to the environment, the economy and society. The potential vectors of introduction may be naturally occurring or anthropogenic. The species monitored include a green alga from Japan (*Codium fragile*), the European Green Crab, the Skeleton Shrimp, several tunicate species and the bryozoan *Membranipora membranacea*. These invasive species are found at the Magdalen Islands, around the Gaspé Peninsula and along the North Shore.



Invasive Animal Species

BIOGRAPHY

Isabelle Desjardins holds a bachelor's degree in biology and is a master's degree candidate in maritime resource management at the Université du Québec à Rimouski. She has recently joined the MDDEFP and in July 2012 assumed the role of coordinator for the invasive alien wildlife species file at the MDDEFP's Direction de la biodiversité et des maladies de la faune.

ABSTRACT

Quebec has several programs and monitoring networks for invasive alien plant and animal species. Invasive alien species (IAS) monitoring programs include the Early Detection and Prevention Network for Aquatic Invasive Species in the St. Lawrence River, composed of 41 volunteer commercial fishers; the Réseau de suivi ichthyologique (RSI), an ichthyological monitoring network that identifies the presence of IAS during scientific fishing; and the Asiatic Clam monitoring program. Alien invasive species with high invasion potential that have been caught by the two networks since 2007 include the Mitten Crab, Blueback Herring, Round Goby, Tench (411 specimens for this species alone) and Roach. An initial observation of the Asiatic Clam (*Corbicula fluminea*) near the Gentilly nuclear generating station has prompted a study on the spread of this species. The first steps will be to determine whether it can reach a higher population density, whether it is occurring elsewhere in Quebec and what its dynamics are in cold water. In addition to all this is the design of an early detection protocol for invasive alien animal species that is based on two sampling methods, namely the traditional (nets), and molecular (DNA analysis) approaches.



Isabelle Desjardins

Coordinator, Invasive Alien
Wildlife Species

Direction de la biodiversité et des
maladies de la faune

Ministère du Développement
durable, de l'Environnement,
de la Faune et des Parcs



Isabelle Simard

**Coordinator, Invasive Alien
Plant Species**

Direction du patrimoine
écologique et des parcs

Ministère du Développement
durable, de l'Environnement,
de la Faune et des Parcs



Invasive Plant Species

BIOGRAPHY

Holder of a PhD in environmental sciences from the Université du Québec à Chicoutimi, Isabelle Simard has been the coordinator for the invasive alien plant species file at the MDDEFP since 2006. She is currently developing detection and monitoring networks for invasive alien plants and is creating awareness and prevention tools for limiting the introduction and propagation of invasive alien species.

ABSTRACT

The monitoring program for invasive alien plant species in the St. Lawrence River's wetlands was launched in 2004 by Environment Canada together with local communities. It was transferred to the MDDEFP in 2011 as part of the St. Lawrence Action Plan 2011–2016. The plant species invasion assessment is based on the calculation of the overall invasion index, which takes into account the median coverage of each invasive plant on a site, and the calculation of the average value of the sampling stations within a 1-km-wide hexagonal unit area. This approach makes it possible to geographically characterize the degree of invasiveness (absent, low, moderate, high). The study area includes Lake Saint-François, the Beauharnois Canal, Lake Saint-Louis, the Boucherville archipelago and SainteThérèse Island, Lake Saint-Pierre and the western part of the fluvial estuary (upstream from Portneuf). In 2012, 94 sites were sampled by 5 ZIP committees and the Société d'aménagement de la baie Lavallière. An influence marked by low water levels was observed. Among the invasive plants, the Common Reed and Reed Canary Grass are on the rise, and Purple Loosestrife, the most widespread invasive species, is dominant only in certain areas.



Caroline Savage

Environmental
Indicators Specialist

Water Quality Monitoring and
Surveillance

Environment Canada



Overview of Approaches and Methods for Integrating Environmental Information

BIOGRAPHY

Caroline Savage holds both a bachelor's and a master's degree in biological sciences from the Université de Montréal. In January 2002 she joined Environment Canada, where she has worked on many projects as a plant ecology and geomatics specialist, including the International Joint Commission's research project on the impact of water level fluctuations on the river's marsh bird habitats. She was involved in projects to monitor wetlands, invasive plants and, more recently, benthic macroinvertebrates. Her current primary field of work is the development and integration of environmental indicators.

ABSTRACT

This presentation addresses the basic concepts of indicators, their definition and functions, as well as the methods that could be used to integrate scientific data in order to provide an overview of ecosystem health. The presentation highlights the importance of carefully selecting indicators and clearly identifying the criteria and issues to be addressed. The challenge lies in actually communicating complex scientific information to our various clienteles. The approaches presented are concept maps, pooled findings, spatial interpolation and combined indices.



Facilitator: Martin Jean

The plenary session began with
the following question:

How do you feel about
continuing to work on the
integration methods for
monitoring the St. Lawrence?



Can we integrate our indicators to obtain a better picture of the St. Lawrence?

Potential considerations

A number of considerations were raised, including the linking of status indicators with other complementary indicators. The literature provides approaches for dealing with political, scientific and societal functions. Unfortunately, there is no linkage between these status indicators and pressure indicators (e.g. quantity of nutrients from agriculture, municipal sanitation, shoreline quality). There is also a lack of performance indicators for the measures implemented by the governments to improve river quality. For the time being, the various status indicators are functioning in disciplinary silos and do not provide a comprehensive answer. A question to consider is whether we should try to integrate the existing indicators or implement them in an integrated manner.

The picture painted by the indicators must also take into account the target clientele. The information presented by the State of the St. Lawrence Monitoring Program at the Rendez-vous St. Lawrence and by the fact sheets is mainly intended for an informed clientele. However, according to some stakeholders, citizen involvement is key to initiatives that could bring about political change, so the information has to be brought to multiple levels in order

to reach both scientific and public clienteles. The concept of citizen involvement puts the social, political and economic dimensions back on the table and raises the question of how we can satisfy the public while preserving the river. The public clientele also needs more specific parameters to properly understand quality indices for the natural environment. The value scales used do not seem to reach everyone; they are overly abstract for some. In addition to this level of information, raising awareness among elected municipal officials is considered essential to ensure that decisions are taken and actions are implemented wisely in an environmentally responsible manner. Certain environmental issues do not seem to be fully understood by these officials, who do not always adjust their decisions in light of the information generated by scientific monitoring.

Obstacles

In addition to the potential for integrating indicators, there are also possible obstacles. There remains a risk of trying too hard to simplify health status with a single number. Some more detailed information could be obscured, given that, while some indicators indicate improvement, others, on the contrary, indicate deterioration. Both findings must be released and not just an overall average. The example of the index of bacteriological and physico-chemical quality (IBPQ) was given to illustrate the risks of integration. There is a need for interpretation beyond the simple value of the index. The use of sub-indices (e.g. phosphorus, fecal coliforms) fosters a better understanding of the ecosystem's health status. While access to integrated information is important, access to more detailed information is also needed to adequately portray certain situations.

Another issue is the insufficient criteria. Criteria do exist for some parameters (e.g. phosphorous) but are not defined for, say, wetland area. It therefore becomes difficult to comment on the health of the St. Lawrence using these indicators, as they lack points of reference.

Next overview

In preparation for the upcoming publication of the Overview of the State of the St. Lawrence River in 2014, some points have been raised, including the expansion of target clienteles. The issue of reaching the elected officials of riverside municipalities has already been mentioned, but to that can be added the need for information tools intended to raise early awareness among children. Certain tools designed for children were on offer until recently discontinued (Fisheries and Oceans Canada, Environment Canada's Biosphère).

Two content considerations were raised. The first involves establishing a diagnosis to understand the dynamics of the environment and the causes of the current status of certain indicators rather than merely explaining how they are trending. The second involves identifying action-based objectives and targets to improve the state of the St. Lawrence. The regional round tables would benefit from engaging in this process.

The overview's format was also discussed: access to an interactive map could be used to transcend the limitations of a hardcopy report. Providing all the clienteles with electronic access to an interactive map, the data and the findings of the State of the St. Lawrence Monitoring Program's various partner organizations would lead to more effective sharing of information and could generate better decision-making support at the appropriate time.

Other points discussed

Another point raised concerns democratizing access to the river. Docking fees are now charged at many wharves that have been built with taxpayers' money. Providing access to the river is a means of raising public awareness of its state. By contrast, it will be difficult to motivate the public to protect the river if it is inaccessible.



Summary of Day 1

**Hélène Bouchard,
Patricia Robitaille, MDDEFP**

Environment

Canada;

The St. Lawrence is complex and dynamic, which makes it fascinating to study. In the morning, we examined the updated profile of numerous environmental indicators documented under the program. In the afternoon, we looked at ways to improve our monitoring activities and heard new information about the indicator for monitoring invasive alien species. Initially, the indicator dealt only with plants, but a wildlife component was added. One suggested improvement is to take into consideration the multiple ecosystems making up the St. Lawrence rather than studying them individually. These vast and diverse ecosystems can all be used to clarify complex results.

The democratization of access to the information and the data generated by the program was also determined to add value to the existing dissemination products. The need to interpret the results of various analysis scales was also identified, as a single analysis scale does not satisfy both those who need highly specific data and those who want more general information. Efforts must be made to address the needs of different clienteles.

It also emerged that there is a need for an ongoing linkage between research work and environmental monitoring to improve the indicators. Reporting processes and the type of indicators must reflect the latest knowledge to keep the monitoring relevant and scientifically valid.

The State of the St. Lawrence Monitoring Program deals only with status indicators and does not take into consideration pressure and response indicators. This choice was based on the initial fields of expertise of the program's participants and architects.

A constraining factor of this choice is that certain existing indicators do not have thresholds that would allow for optimal interpretation. How can indicators be quantified to indicate what constitutes a satisfactory situation (number of wetlands preserved or rehabilitated, amount of shoreline available for swimming, etc.)? The scientific community has not been the sole contributor to that discussion. We can sum up this day by noting that improvements have already been made to the program and that the efforts must be continued. One way to do this relates to the project's objective of working with new partners to address the needs expressed.





Word of welcome – Day 2

The St. Lawrence Action Plan website and the links to the State of the St. Lawrence Monitoring Program were presented to the participants. The aspects highlighted included the publications schedule, fact sheets on the various indicators, previous overviews and the minutes of the Rendez-vous St. Lawrence.

ENGAGING COMMUNITIES TO IMPROVE THE ST. LAWRENCE



Community Aquatic Monitoring Program

Station RVSL #1 – Côte-Nord du Golfe (CNG) ZIP Committee – Aurore Pérot

ABSTRACT

The Community Aquatic Monitoring Program (CAMP) introduces youth to marine biology and sampling techniques for fish fauna. Through this program, youth can participate in a scientific project that aims to set up a reference database on fish and crustaceans found at the mouths of rivers and in bays along the North Shore.

COMPLEMENT

Participants at this presentation were interested in the sampling area as well as the species sampled. Many questions and comments concerned this aspect of the project. The Comité ZIP Côte-Nord du Golfe (Côte-Nord du Golfe ZIP committee) selected this site based on its physical characteristics, while also taking into account youth safety and the presence of tides. The project did not target molluscs, gastropods or shellfish, which are scarce or absent at the selected sampling site. The ZIP committee did not sample aquatic invasive species as part of this project either, as the sampling site lacked them.

As for the involvement and training of target clientele, aspects questioned at the end of the presentation, the ZIP committee noted that this recently launched program (2011) has generated various degrees of involvement: some groups approached through schools, youth camps and Scouting movements actually return every year, particularly the Scouts, while others do not (as is the case with schools). It all depends on their motivation. The youth training scheduling is adapted to field conditions and particularly the fish species present at the site. A classroom session precedes the field collection work. The value placed on the data gathered was also a focus of discussions. The Comité ZIP Côte-Nord du Golfe is considering partnerships with a university and some departments (Fisheries and Oceans Canada, and Quebec's Ministère des Ressources naturelles) that could include these data in reports.

To those who expressed concerns about the value of the data gathered, the ZIP committee pointed out that the program follows a methodology recognized and used by Fisheries and Oceans Canada, that the young people were supervised by a professional project manager and that the data can therefore be viewed as scientific acquisitions.

Although the advocated approach draws on that proposed by Fisheries and Oceans Canada, the project was not initially intended to result in the development of a biotic integrity index. However, this has not been entirely ruled out and will depend on the final data analysis.



Aurore Pérot

A wildlife biologist and ornithologist, Aurore received a master's degree in biology from the Université de Moncton and went on to gain a wealth of experience in the management of natural areas. She refined her expertise during her mandate at the CNG ZIP Committee as the person charged with characterizing coastal habitats of interest in the Minganie region and the restoration and enhancement of critical plant habitats in Cap Ferré. Under her leadership, this project earned the CNG ZIP Committee a Phénix de l'environnement award in 2012. In 2009, she temporarily left the ZIP Committee to pursue a unique experience on Crozet Island in the French Southern and Antarctic Territories, where she wintered for one year as an ornithologist, conducting demographic monitoring of seabirds and marine mammals. Upon her return to the ZIP Committee in summer 2011, Aurore resumed her duties at the head of the organization.



Yves Martinet

Yves Martinet joined the Magdalen Islands ZIP Committee in 2000, first as a manager of the geomatics component, and later in various positions such as coordinator of five integrated management initiatives for inland waterways of the archipelago, project manager, assistant director, and finally director since 2006. A fervent believer in sustainable development, he tries to put this concept into practice daily by working in partnership with all stakeholders in the Magdalen coastal zone. He is particularly proud of his work to promote the development of environmental control mechanisms by the community, which uses a relationship built on trust to bring about many positive results that benefit the entire community. He participates in or coordinates various meetings for cooperation and consultation, and leads or organizes various surveys (types of clams), and data collection campaigns (bathymetry, plant characterization, wastewater effluents, reproduction of the Rainbow Smelt, water sampling, surveys etc.). He represents the organization on some twenty different work committees (issue tables, consultative committees, etc.) on various topics of interest (uses, resources etc.). He is also involved, at the local, regional and national level, with various boards of directors (Conseil régional de l'Environnement Gaspésie-Îles-de-la-Madeleine, steering committee for the Southern Gulf of St. Lawrence Coalition on Sustainability, etc.).



Characterization, Awareness and Enhancement of Wetlands in the Magdalen Islands

Station RVSL #2 – Magdalen Islands ZIP Committee – Yves Martinet

ABSTRACT

The results obtained as part of the project have allowed us to discover the importance of the diversity and extent of small wetlands (< 1 hectare) in the Magdalen Islands. While at the same time improving the cartography of wetlands and making the population (especially youth) aware of the importance of these natural gems to our quality of life, we have been able—thanks to the close cooperation of involved stakeholders—to create a standardized decision-making mechanism, based on the integration of an adapted and easy-to-use quality index, that allows us to justify the protection or possible altering of the archipelago's wetlands.

COMPLEMENT

Although interesting, the format of the presentations at the visiting stations left little time for question and answer periods. However, a number of stakeholders in attendance who were interested in this project asserted that they would later contact the ZIP committee. In particular, the stakeholders were wondering about the ZIP committee's approach of involving the Municipality of Îles-de-la-Madeleine on the one hand and the private owners of the property where interventions were planned on the other. While the collaboration with the municipality took shape fairly quickly, more time and resources had to be invested in order to persuade the private owners. Overall, their reluctance when the project started in 2005 gradually gave way to a generally positive reception in 2008. This stems not only from the ZIP committee's efforts but also from the domino effect spread from one owner to the next. Technically speaking, the ZIP committee also drew inspiration from the approach used by Ducks Unlimited, a project collaborator, particularly with respect to database processing and photo interpretation. This project is ultimately a decision support tool for the municipality and the stakeholders involved. Accordingly, the municipality has stressed that it would like to see recommendations incorporated into the tool.



Ghislain Sylvain

**Director General,
Saguenay ZIP Committee**

A geographer by training (B.Sc., UQAC, 1976), Mr. Sylvain worked for numerous private firms before being named to the position of director general of the Saguenay ZIP Committee in 1993. He has led several hundred environmental projects with different partners from the municipal, governmental, community and environmental sectors.

Sébastien Cloutier

Project manager

Sébastien Cloutier received technical training in construction at the CÉGEP de Saint-Félicien (2000) before studying geography (B.Sc. U de S, 2005) and oceanography (M.Sc. UQAR, 2009). Mr. Cloutier joined the Saguenay ZIP Committee in 2009. With many collaborations under his belt, both in Quebec and elsewhere, he holds the position of oceanographic specialist for Aecom and is sometimes involved with the Saguenay ZIP Committee as a consultant.



Plan for the Protection of Rainbow Smelt Spawning Grounds in the Saguenay River

**Station RVSL #3 – Saguenay ZIP Committee – Ghislain Sylvain (DG)
and Sébastien Cloutier (project manager)**

ABSTRACT

The Saguenay River is one of the largest rivers in Quebec. The City of Saguenay, Quebec's fifth-largest urban area, borders the section of the river known as Moya Saguenay. The Moya Saguenay has recently been identified as a unique place for Rainbow Smelt gathering and spawning in the Saguenay. The smelt is the base of the food chain in the Saguenay River and it is also fished for sport. Winter fishing activities bring in over \$4 million annually in economic benefits for the area. However, in addition to being located in an urban zone, the Moya Saguenay drains a watershed that is strongly affected by human activities. This troubling state of affairs was the motivation, in 2009, for the creation of a summary of knowledge. Following the distribution of this summary, two issue tables were set up, between 2010 and 2011, in order to gather recommendations and develop action plans to follow as part of a protection plan. These reflections have revealed a lack of knowledge regarding the biology of, and use of the area by, Rainbow Smelt in the Saguenay River. From this arose a proposal for a research project to study the reproduction of the species. This research project seeks to establish the scientific foundations for perennial management of smelt in the Saguenay, and includes three (3) components:

- 1- Spawning and the upward migration of spawners
- 2- The conditions for egg incubation
- 3- The conditions for the larvae drift

The first phase of this study has been in progress since 2011, and a summary of results is currently being prepared. The final document may be available by the end of this year. The two other components combine the expertise of many scientists from UQAC and UQAR. The Saguenay ZIP Committee and its partners are currently searching for financing in order to advance this study.

COMPLEMENT

The main topic discussed by participants in the Comité ZIP Saguenay's (Saguenay ZIP committee's) presentation involved granting protected status for the Saguenay River's Rainbow Smelt. In light of the resource's economic importance (Saguenay ice fishing alone brings in \$4 million annually) and ecological significance (important link in the food chain) and given that the species occurs, in part, in environments likely to affect it (industrial presence, urbanization and intensive farming), a number of stakeholders present asserted that smelt should receive special treatment and be managed to ensure sustainability. Participants also took an interest in the ZIP committee's work, which, in this instance, mainly consists of coordinating and educating the various stakeholders (users, including marina managers, recreational boaters and fishers; the mining and paper mill industry; agricultural representatives [UPA], managers and elected municipal officials) with respect to the resource's sustainable use and the protection of its ecosystem. The current project for establishing sustainable management is in the knowledge acquisition phase. This phase is necessary and conditional on the implementation of a management plan. This acquisition of data will focus on three aspects: the spawning run, hydrodynamic conditions, and the physical and chemical monitoring of the environment in which the larvae grow (larval drift conditions).



Étienne Bachand

Étienne Bachand, MSc, was selected to lead this project. He is a 2010 graduate of the UQAR coastal geoscience research chair. In July 2010, Mr. Bachand joined the Southern Estuary ZIP Committee team and was tasked with continuing the “Côtes à côtes face aux risques côtiers” tour as project leader (<http://www.cotesacotes.org>). Mr. Bachand also helped create and disseminate the “Guide de bonnes pratiques au Bas-Saint-Laurent, restauration et aménagement du littoral” good practices guide for shoreline restoration and development in the Lower St. Lawrence region.. He participated in various shorefront restoration projects, namely at the mouth of the Mitis River in Rivière Ouelle and Sainte Flavie.



Restoration and Development of the Lower St. Lawrence Shorefront

Station RVSL #4 – Southern Estuary ZIP Committee – Étienne Bachand (project leader)

ABSTRACT

Our project addresses the restoration and development of the Lower St. Lawrence shoreline using environmentally friendly techniques, such as sand covering and plant-based engineering. The first part of the project consisted of developing a good practice guide that proposed various “green” techniques for stabilizing banks and a list of native plants adapted to marine conditions in the Lower St. Lawrence. The second part of the project involved applying these restoration techniques to two natural beaches in Sainte Flavie and Rivière Ouelle that were affected by the December 2010 storm. The guide and restoration work sought to provide coastal communities with various alternatives that are less costly and more environmentally friendly than traditional rigid structures (walls, riprap, etc.).

COMPLEMENT

To address coastal issues, the Comité ZIP du Sud-de-l’Estuaire (ZIP committee for the southern estuary) has taken an alternative citizen engagement approach, the main benefits of which will include minimizing the costs of restoration and development approaches (\$350/linear metre compared with an average \$5,000/linear metre for riprap). The response to the use of an alternative to riprapping was divided: some approved while others are more skeptical and still need convincing (riprapping gives the impression of safety). The citizens and authorities of the municipalities of Sainte-Flavie and Rivière-Ouelle have cooperated. Implementing this type of approach is facilitated when municipalities are involved. In the context of this project, they provided machinery and covered planting costs, particularly in Rivière-Ouelle. The plants mainly came from Jardins Métis, which prepared wildrye plants and sold them at a good price (\$0.75 per plant). The work was carried out on public lands belonging to the municipalities, but this type of project could certainly be applied to private lands. However, the mandate would then fall to citizens’ groups. The Comité ZIP du Sud-de-l’Estuaire will be providing the monitoring until the end of 2013. Those responsible for subsequent years will have to be designated. Recommendations have been made to the municipalities regarding the required upkeep. For example, additional sediment refills will be needed about every three to seven years.



Louise Corriveau

Louise Corriveau is passionate about wild spaces. Her lengthy career began with her position as director and assistant for wildlife protection at the ZEC des Nymphes controlled harvesting zone from 1987 to 2000. She then joined the Lake Saint Pierre ZIP Committee and quickly became director general (in 2004). Ms. Corriveau has close to 10 years of experience as director general of the ZIP Committee and has over 20 years of administrative, technical and environmental management experience. Her experience enables her to participate in, implement and supervise over 130 protection and development projects for the Lake Saint Pierre region. Additionally, she worked to create the Aire faunique du Lac Saint-Pierre community wildlife area and acted as its director from 2006 to 2010. With her team, she participates in some 30 action and issue tables, all targeting the Lake Saint Pierre region.



Conservation and Development Plan for Public Lands on the North Shore

Station RVSL #5 – Lake Saint Pierre ZIP Committee – Louise Corriveau

ABSTRACT

Some past activities were mindful of the environment, but others contributed to the degradation of wetlands on the north shore of Lake Saint Pierre. Although the area is known as a World Biosphere Reserve and a Ramsar site, few wildlife and plant data were available. Along with waste recovery by young socio professionals, in 2005 we conducted wildlife and plant surveys for the entire area (1010 ha). This work made it possible to begin several other outstanding projects: issue table on land procurement, construction of footbridges, deer project, monitoring of nest boxes, monitoring of invasive plants, etc.

COMPLEMENT

Participants at this presentation were interested in the Comité ZIP du lac Saint-Pierre's (ZIP committee for Lake St-Pierre's) approach to coordinating and engaging the many partners associated with the project. The success of this process depends primarily on the ZIP committee's expertise in regional engagement and coordination: the committee is well known and recognized by all the regional stakeholders. In addition, the project itself inspired action. Participants were surprised by the level of engagement of the municipal partners. The scope of the work performed and the funding raised also elicited positive feedback. The project relied on a complex financing package that brought together local, regional, provincial and federal partners via standard programs and public, government, private and industry contributions. Technically, it was the waste disposal and reclamation methods that elicited the most feedback and questions. The Comité ZIP du lac Saint-Pierre had prior waste disposal arrangements with municipal authorities and regional recyclers providing one container for materials destined for landfill and another destined for recycling. Recyclers accepted the metals. There were few questions about the scientific methodology used to acquire plant and wildlife data, as the presentation and documents provided to the audience were very detailed in this regard.



Marie-Kim Boucher

Ms. Marie-Kim Boucher holds a bachelor's degree in biology with a major in wildlife and habitats from the Université du Québec à Rimouski (UQAR) and a graduate degree in environmental management from the Université de Sherbrooke. She has worked for the Des Seigneuries ZIP Committee since January 2013 as the organization's director general. Prior to this she had several years of field experience through participating in many wildlife inventories, and she has worked in the offices of various municipalities in the Laurentides and Estrie regions, where she was responsible for enforcing municipal environmental by-laws on such issues as the replanting of riparian strips and waste management. Ms Boucher has also worked for several organizations to raise awareness and disseminate scientific information.



Characterization and Remediation of Riparian Strips on the Banks of the St. Lawrence River at Repentigny: from Dialogue to Action

Station RVSL #6 – Des Seigneuries ZIP Committee – Marie-Kim Boucher (DG)

ABSTRACT

Of the environmental problems related to the St. Lawrence River (SLR), the modification of the structure and composition of riparian strips is by far the most widespread throughout the fluvial corridor. The problem is most severe near large urban centres. In this context, and being mindful of ensuring continued use of the river and shoreline and the sustainable use of resources, the Des Seigneuries Zone d'Intervention Prioritaire (ZIP) Committee, in partnership with the City of Repentigny, developed a project to characterize and remediate the riparian strips on the banks of the St. Lawrence River on land in the city of Repentigny. The project, carried out between 2008 and 2011, was based in part on the guidelines of Repentigny's environmental policy and sought to raise awareness among shoreline residents of the profound negative effects of shoreline clearing and hardening on the St. Lawrence. Its objectives were (1) to stimulate citizens' interest for protecting the environment in order to promote the adoption of environmentally responsible behaviour that helps improve the quality of the fluvial environment, and (2) to offer tools to the community for restoring riparian strips. The project had three components: the characterization of riparian strips to obtain both an overall view and a detailed picture and to evaluate the health of these strips; awareness raising and training by addressing various themes related to the protection and development of riparian strips; and the development of two model riparian strips to show that the establishment of a good riparian strip is compatible with the concerns of shoreline residents. The project helped inform close to 400 people of this local environmental issue.

COMPLEMENT

The project was made possible in particular through the support of private partners and the St. Lawrence Action Plan's Community Interaction Program. To carry out this project, the ZIP committee used approaches that increased societal acceptance and involvement by an initially reluctant public. To this end, the horticultural society offered its support in the form of discounts on certain plants, but the city did not create incentives to encourage citizen engagement. The Comité ZIP Baie des Chaleurs (Chaleur Bay ZIP committee), which participated in the presentation, suggested selling shrubs at discount once a year to encourage riverside participation. The project mobilized a large number of participants (about 100), but few remained involved. Therefore, citizen and volunteer engagement seems to be attributable to oversight provided by a structured organization, such as the Comité ZIP des Seigneuries (Des Seigneuries ZIP committee). The project has not altered access to the river, including at Parc de Île Lebel, where, incidentally, access was already difficult.



Sylvie Bibeau

Sylvie Bibeau is a new member of the Stratégies Saint-Laurent board of directors. She has a bachelor's degree in biology, a graduate degree in toxicology and two certificates in environmental studies and ecology, and is also a member of the Association des biologistes du Québec. She started working at the Jacques Cartier ZIP Committee in 2005 as project leader before being appointed director general in 2008. Previously, she was the director general of the Gardiens de l'environnement environmental stewardship organization, where she operated an education centre on recovery and recycling in the east end of Montréal. She later worked as a research assistant for Dr. Christian Blaise at Environment Canada's St. Lawrence Centre, where she conducted scientific research for the publication of the Small scale Freshwater Toxicity Investigations book. She is very involved in the environmental community and sits on several boards of directors, including that of the Comité mixte municipal, industrie et citoyens de l'Est de Montréal (CMMIC-EM) and the Conseil régional de l'environnement de la Montérégie (CRE Montérégie).



Biogeophysical Characterization of Japanese Knotweed Colonies: Study of Their Impact on Plant and Entomological Communities

Station RVSL #7 – Jacques Cartier ZIP Committee –
Sylvie Bibeau

ABSTRACT

The Japanese Knotweed and its different varieties are some of the most noxious exotic plants from a social, economic and environmental point of view. It modifies the structure and composition of plant communities and, as a result, has an impact on associated food chains. It limits the availability of soil nutrients by shading. It also affects the growth of native species by releasing toxins in rhizomes. Shorelines seem to be particularly affected by the problem of Japanese knotweed colonization. Shorelines have sparked great interest because they form a transition zone between the terrestrial and water environment. They also provide significant wildlife habitats, especially in highly urbanized landscapes. Through this project, we aim to deepen the understanding of communities in the CMM with respect to this invasive alien species and promote awareness of the issue in order to reduce the impact on shoreline communities. The objectives are to (1) increase our knowledge of this invasive alien species, (2) document its distribution in southern Quebec, (3) develop awareness raising tools for decision makers and nursery operators, and (4) identify control and eradication measures for fragile environments such as wetlands.

COMPLEMENT

Participants were particularly concerned about the reasons for the Japanese Knotweed's presence and its spread through the territory. According to the ZIP committee, it entered Quebec through horticulture. It occurs where humans are present, generally spreading from southern to northern Quebec. Once citizens have introduced the species and it rapidly spreads, they try to get rid of it. Many dispose of it in vacant lots. Excavating the soil that hosted the plant and reusing the same earth for backfill at another site also spreads Japanese Knotweed. In terms of eradication measures, another topic addressed, studies show that it is possible to control the species by combining two methods: pulling out the stems, which must be done five to six times from spring to late summer, and injecting a bioherbicide in the stems. To control or eradicate this species, the priorities should be to stop selling the plant in gardening stores, check backfill soil and educate the public about means of disposing of it. As for the capacity of this invasive alien species (IAS) to proliferate, the Comité ZIP Jacques-Cartier (Jacques Cartier ZIP committee) said that Japanese Knotweed has deep rhizomes that can extend up to 10 m. It can reproduce from the rhizome, even after 10 years, as well as via the stem. These characteristics make it a difficult IAS to control or eradicate.

DISSEMINATION OF INFORMATION



Taking Advantage of New Technologies to Reach Audiences



Stéphane Richard

Director General

St. Lawrence Global Observatory

BIOGRAPHY

Stéphane Richard holds a bachelor's degree in business administration from the Université du Québec à Rimouski. He played a key role in the expansion and development of "Globetrotter" Internet services, a pioneer in the advent of the Internet in our daily lives. He then took on various duties as an analyst and manager in the telecommunications, (Internet, airwire and wireless), informatics and manufactured goods sectors. Since September 2011, he has been the director general of the St. Lawrence Global Observatory (SLGO), whose mission is to promote and facilitate the accessibility, dissemination and exchange of data and electronic information on the global St. Lawrence system.

ABSTRACT

Producers and disseminators of scientific information can benefit from using Web dissemination tools and mechanisms that meet the needs of targeted audiences, thereby ensuring that disseminators achieve their objectives. Information in a format that is appropriate to the producer or disseminator's organization may not meet the needs of an external user, which in turn means that the objective of communicating the information may not be met. To counter such situations, this presentation provides an overview of best practices in the field, including a look at the issues and informatics structures as well as several examples of recent applications developed by the SLGO that demonstrate the "client oriented" application concept.



Brigitte Robineau

Scientific Coordinator

Québec-Océan



Québec-Océan: A Group of Researchers, for What Purpose?

BIOGRAPHY

Ms. Robineau obtained a PhD in oceanography from the Université de Bretagne Occidentale (Brest, France) in 1986. From 1988 to 1991, she did a postdoctoral fellowship at Université Laval and at the Maurice Lamontagne Institute (Fisheries and Oceans Canada). She then worked as a research associate with Professor Louis Legendre for six years at Université Laval. The wide variety of her research work in marine ecology led her to focus on both benthos and fish, with additional work on microalgae, in the Loire and St. Lawrence estuaries and in the Arctic. She has worked as a coordinator since 1996, first at GIROQ, and then at Québec Ocean.

ABSTRACT

Québec-Océan is the Groupe interinstitutionnel de recherche océanographique du Québec, a group that brings together researchers working in the field of marine science. In addition to training and research activities conducted at several universities and institutes in Quebec, the centre aims to transfer and disseminate knowledge acquired mainly on the Arctic Ocean and the St. Lawrence. The members of Québec-Océan seek to improve knowledge or solve environmental problems that are highly relevant to Quebec society. The results of their research are often used by funding organizations, either public or private, or lead to new standards and policies. Québec-Océan disseminates its information via the Web, regularly publishes a newsletter, responds to media inquiries and organizes activities each year for World Oceans Day.

COMPLEMENT to the presentations session

Organizations interested in working with Québec-Océan can contact Rachel Picard in Rimouski or Brigitte Robineau in Quebec City. The two will direct organizations to the right contact person.

It was deemed necessary approach people and sustain the interest of the various audiences through more frequent events. World Oceans Day provides an excellent opportunity to maintain contact, and Québec-Océan's social networks help disseminate its partners' information, particularly through the newsletter distributed to the media, government departments, universities and any interested people or organizations. The newsletter is a platform for reaching different audiences and maintaining contact.

Stratégies Saint-Laurent proposes to use the ZIP committees as channels to disseminate the scientific knowledge of its partners Québec-Océan and the St. Lawrence Global Observatory (in addition to government partners from the St. Lawrence Action Plan) to riverside communities and to bring the communities' concerns to researchers to get them involved in turn.

GLOBAL ISSUES ON THE STATE OF THE ST. LAWRENCE



Collapse of the Yellow Perch in Lake Saint Pierre: How Did We Get There and What Can We Do About It?

BIOGRAPHY

Christiane Hudon focuses on the cumulative effects of human activities on the productivity and metabolism of major rivers, specifically the St. Lawrence. She uses microscopic algae and aquatic plants as indicators of water quality and quantity. Christiane obtained a PhD in marine biology from Université Laval and has worked as a research scientist at Environment Canada since 1993. As an expert for the Government of Canada, she offered her scientific opinion on the evaluation of alternative plans for regulating the flow from Lake Ontario to the St. Lawrence (International Joint Commission) and on adopting Canadian regulations for the reduction of phosphorus levels in household detergents

Philippe Brodeur has a master's degree in environmental science from the Université du Québec à Trois Rivières, where his research focused on controlling White Suckers in brook trout lakes in Quebec. He has worked as a biologist for Quebec's Ministère des Ressources naturelles since 2002 and is currently assigned to the monitoring and management of St. Lawrence fish populations in the Mauricie and Centre du-Québec regions. Over the past few years, he has taken part in several research and monitoring projects on the state of wetlands and fish populations, as well as work on habitat restoration in the St. Lawrence flood plain.

ABSTRACT

Collaborative presentation by Antonella Cattaneo, Anne-Marie Tourville Poirier, Pierre Dumont, Yves Mailhot, Jean-Pierre Amyot, Simon-Pierre Despatie and Yves de Lafontaine. In the mid 1990s, there was a significant drop in the abundance of Yellow Perch. Despite restrictive fisheries management measures between 1997 and 2008, the Yellow Perch population collapsed. Various components of the Lake Saint Pierre ecosystem (submerged macrophytes, benthic invertebrates, fish communities and juvenile Yellow Perch) were sampled on the southern shoreline during the Yellow Perch decline period. A vegetation bed fed by agricultural streams and a nitrogen-deficient treated area located further downstream were compared. In addition to a reduction in macrophyte biomass in the treated area, the replacement of green filamentous algae in the agricultural area by mats of benthic cyanobacteria in the treated area was documented. Those changes led to cascading effects, from the decline in the abundance of macrophytes to a decreased availability of invertebrates and a reduction in the growth and survival potential of Yellow Perch. Further to this deterioration of growing zones was the anthropogenic modification of spawning and fry rearing areas in flood plains as well as the arrival of new competitors and predators. Findings on the poor state of Lake Saint Pierre indicate that the situation will only recover once the Yellow Perch is able to breed and develop in a healthy environment. Specifically, vital habitats in the Lake Saint Pierre shorefront will need to be restored, and the water quality from streams will need to be improved. The success of this large restoration project will largely depend on our ability to reduce anthropogenic pressures on this ecosystem.



Christiane Hudon

**Researcher,
plant community dynamics**

Fluvial Ecosystem
Research Section
Environment Canada



Philippe Brodeur

Biologiste

Ministère des Ressources
naturelles du Québec

COMPLEMENT

One hypothesis is that the stocks collapsed around 1994 or 1995. There is indeed a study that indicates a good brood year followed by a significant decline.

For a long time, there was a link between the growth and size of the Yellow Perch cohort. However, during the 2000s, this correlation weakened, which therefore seems to be more of an argument for habitat degradation as the cause. There is no information linking this issue to the opening of the Montréal water treatment plant.



12 Years of Monitoring Emerging Contaminants: St. Lawrence Results and Perspectives

BIOGRAPHY

David Berryman holds a bachelor's degree in biology from the Université du Québec à Rimouski and a master's degree in water science from the Institut national de la recherche scientifique (INRS-ETE). Over the course of his work for the MDDEFP, he has conducted several studies on the contamination of southern Quebec watercourses by toxic substances, including several emerging contaminants.

ABSTRACT

The MDDEFP started monitoring emerging contaminants in southern Quebec watercourses at the end of the 1990s. Studies have been conducted on ethoxylated nonylphenol, phthalates, polybrominated diphenyl ethers (PBDEs), perfluorinated compounds, drug residues, hormones, bisphenol A, triclosan and other products. What lessons have we learned from monitoring?



David Berryman

Analyst

Ministère du Développement
durable, de l'Environnement,
de la Faune et des Parcs



Jonathan Verreault

Centre de recherche en
toxicologie de
l'environnement (TOXEN)

Département des sciences
biologiques, Université
du Québec à Montréal



Identifying a New Generation of Flame Retardants in a St. Lawrence Seagull: Is the PBDE Saga Repeating Itself?

BIOGRAPHY

Jonathan Verreault is a professor at the Département des sciences biologiques at UQAM and is a member of TOXEN. He also holds the Canada Research Chair in comparative toxicology in avian species. His research program aims to better understand the fate, sources and health impacts of emerging contaminants on wildlife species in at-risk ecosystems in industrialized regions and in the Arctic.

ABSTRACT

Polybrominated diphenyl ethers (PBDEs) have been used on a massive scale over the last few decades in consumer products (electronic devices, textiles, construction materials, etc.) to reduce their flammability. Recent international restrictions on the use of penta-BDE and octa-BDE mixtures, as well as the coming restriction on deca-BDE mixtures (2013) are such that the use of certain unregulated flame retardants has risen and that new compounds are appearing on the market. These emerging flame retardants include 2 ethylhexyl-tetrabromophthalate (TBPH), 2-ethylhexyl-2,3,4,5-tetrabromobenzoate (TBB), Dechlorane-Plus (DP) and organophosphate triesters (RFOP). The aim of this presentation is to give a brief overview of PBDEs and the “new generation” of flame retardants identified in samples from gulls nesting along the St. Lawrence River downstream from Montréal. Do these new flame retardants require more rigorous environmental monitoring? Should we be concerned about their potential impact on the health of wildlife species?



Biljana Music

Chercheure
Ouranos



Impacts of Climate Change on Hydrologic Inputs of the Great Lakes and St. Lawrence River Watersheds

BIOGRAPHY

Biljana Music has worked as a researcher at Ouranos since 2007 in the field of climate science. She has extensive training in atmospheric sciences (BSc and MSc in meteorology from the University of Belgrade and a Diplôme d'études supérieures spécialisées in meteorology from UQAM) and holds a PhD in environmental sciences from UQAM. Her research contributes to advancements in knowledge regarding the capabilities and limitations of climatic models in quantifying the water cycle at the watershed level. She is currently leading a project on the impacts of climate change on water inputs of the Great Lakes–St. Lawrence system.



Richard Turcotte

Centre d'expertise
hydrique du Québec

Ministère du Développement
durable, de l'Environnement,
de la Faune et des Parcs

BIOGRAPHY

Richard Turcotte has training in civil engineering from Université Laval, including master's studies with a specialization in hydrodynamic modelling. He also has a PhD in water science from the Institut national de la recherche scientifique (INRS) in the field of hydrological modelling. He worked at the INRS from 1994 to 2000 in the development and application of hydrological modelling in the integrated management of watersheds. In 2000 he joined the Centre d'expertise hydrique du Québec—an agency of Quebec's Ministère du Développement durable, de l'Environnement et de la Faune et des Parcs—where he is currently the scientific assistant to the director of water expertise.

His main area of activity involves applying hydrological and hydrodynamic modelling to a variety of applied mandates (flow forecasting, projection of climate changes, water management, flood prone areas, etc.). Since January 2008, Dr. Turcotte has been coordinating departmental activities in parallel with activities from the water resources component of Ouranos' "Impacts et Adaptation" group.

ABSTRACT

The presentation has two parts. The first will address the Great Lakes watershed (by Biljana Music, Ouranos). This watershed will mainly be examined through components of its water balance, namely the precipitation that falls on the lakes, the evaporation from the surface of the lakes and the drainage from their watersheds. These components will be analyzed in order to provide an overview of anticipated future changes. Our analyses will be put into perspective using recent studies in the Great Lakes scientific community. The second part will address inputs from the watersheds of St. Lawrence tributaries along the Montréal Tadoussac section (by Richard Turcotte, CEHQ). Based on a wide range of climate projections, the second presentation will outline the changes expected from these watersheds' natural surface water regime. It should be noted that the analyses presented address the subwatersheds of St. Lawrence tributaries and are limited to changes in the inputs entering the St. Lawrence from these subwatersheds. The possible impacts on levels and flows in the St. Lawrence have not been included in the analysis at this stage.

COMPLEMENT

The content of the presentation did not explain whether the storm track is influencing the local increase in flow despite the decreasing water levels in the Great Lakes. However, over the long term, all weather elements are significant and depend on location. The low water levels will likely be more pronounced in the future.

Over the years, water levels will undergo moderate change. However, over short periods (seasons), more severe changes are expected, with more pronounced low water levels. A good example would be the Montréal situation in 2012, where the water level was 1 m lower than the 0 of the hydrographic charts.



Denis Gilbert

Physical oceanographer

Environmental and Ocean Sciences
Branch

Fisheries and Oceans Canada



Deoxygenation and Acidification of the Deep Waters in the Gulf of St. Lawrence

BIOGRAPHY

Denis Gilbert is an oceanographer with 21 years of experience researching the ocean's climate. From 2005 to 2010, he led an international working group on the causes and effects of low dissolved oxygen levels in coastal areas. He is a member of the national executive committee for the Canadian Meteorological and Oceanographic Society (CMOS). He directs the Argo Canada program, which conducts long-term monitoring of the worldwide oceanic climate using autonomous subsurface floats.

ABSTRACT

South of Newfoundland, the proportion of Gulf Stream waters entering the Laurentian Channel has gone from 28% in the 1930s to 47% in the mid 1980s, creating a rise in temperature and salinity, along with a drop in oxygen and pH (acidification) in the deep waters of the Gulf of St. Lawrence. At this time, it is not possible to attribute these major changes to global warming due to the low spatial resolution of the computational grids used in the currently available ocean-ice-atmosphere coupled models.

GLOBAL ISSUES ON THE STATE OF THE ST. LAWRENCE: DISCUSSION SESSIONS



Deoxygenation and Acidification of the Deep Waters in the Gulf of St. Lawrence



Facilitator: Serge Hébert, Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs; Secretary: Céline Schaldembrand, Stratégies Saint-Laurent

Dams have brought an end to major floods; they therefore have an impact. It is reasonable to assume that there is a cumulative effect from all the dams. However, dams have only a local impact when it comes to water oxygenation. Surface water reoxygenation through exchanges with the atmosphere takes place over a fairly short time span (two weeks), which is not the case with carbon dioxide (much slower).

A meaningful indicator for the St. Lawrence's hypoxia that would be simple to compile would be based on the concentration of oxygen and temperature at a depth of 300 m in the lower estuary. This index would be measured using sensors and chemical titration.

Are there modifications or solutions that can be used to combat deoxygenation?

Whereas in the Baltic Sea, for example, the water is aerated to evaporate the sulfuric acid, there is no such solution in Canada. However, a key approach would be to implement actions to not only address climate change but also to reduce nutrient inputs and study the cumulative effects of harnessing rivers.

Climate change is giving rise to significant alterations, including ones to the major ocean currents that enter the gulf. However, the mix ratio of water from the Labrador Current and Gulf Stream tends to change. This change has a significant effect on hypoxia, as the higher proportion of water from the Gulf Stream is more poorly oxygenated.

Does the quantity of anthropogenic nutrients play a role in hypoxia?

An important thesis is being prepared, and results on this subject are coming. However, anthropogenic nutrients can be considered to have a rather low impact on hypoxia but that, relatively speaking, nitrites and nitrates are still interesting anyway, as their role is by no means insignificant, especially when the critical threshold for hypoxia is reached. However, they do play an important role in toxic algal blooms and promote, for example, flagellates.

Would it be worthwhile to determine the quantity of anthropogenic nutrients entering certain parts of the St. Lawrence?

It would be even more important to know the nitrogen/phosphorus (N/P) ratio and the nitrogen/silica (N/Si) ratios, as they are indicators of ecosystem change. However, Year 1 does not yet exist. The nitrogen/phosphorous (N/P) ratio could be regarded as an unexpected result.

There is a direct/linear relationship between water temperature and toxic algae. In the cases examined, it is easier to identify factors because there is longer-term data. Benthos monitoring could be a good indicator, even if there is very little monitoring—just ad hoc studies.

Which species are likely to be favoured or hindered by a decrease in oxygen? How will the ecosystem be affected?

Studies have been conducted, particularly on the Northern Shrimp and the Greenland Halibut (or Black Turbot). For the latter species, an oxygen level becomes problematic above 15% saturation.

If I had to draw up a wish list, mooring and measuring the oxygen in the ocean (and not just salinity and temperature measurements) would be on it. Many effective methods are too onerous to be used on a large scale. For a number of important aspects that could be used as indicators (e.g. benthos), there is a lack of monitoring programs and access only to ad hoc studies.



Impacts of Climate Change on Hydrologic Inputs of the Great Lakes and St. Lawrence River Watersheds



Facilitator: Martin Jean, Environment Canada; Secretary: Caroline Girard, Environment Canada

From the outset, the participants agreed that the issue of climate change was critical in accurately determining the state of the St. Lawrence. They also agreed that it was difficult to develop an indicator based on this issue, particularly given the uncertainties surrounding the measurement and prediction of climate-related changes. Climate prediction models are not yet well developed, so it is still difficult to accurately predict the impacts of these changes.

Various concerns about climate change in the St. Lawrence were raised: the movement of the estuarine salinity front and impacts on drinking water intakes; the variable range of low-water periods and impacts on water quality (overflows, emergence of contaminated sediments, etc.); and the reliability of climate change prediction models.

Participants identified more specific needs regarding climate change information. In particular, municipalities require information that would make it possible to better manage the risks of degradation of water management infrastructure, natural environments and navigation infrastructure. Better knowledge of future changes would therefore increase the chances of adapting and limiting losses over the short and long terms.

These are a few points to consider when climate change indicators are determined through the State of the St. Lawrence Monitoring Program:

- Take climate change into account when analyzing the existing indicators of the State of the St. Lawrence Monitoring Program. This could mean establishing a shared pool of climate change information in order to analyze each indicator consistently. It would therefore be worthwhile to develop climate change scenarios with components on the direction, scope and dispersion of climate-related changes that would enhance the existing indicators of the state of the St. Lawrence.
- Develop new prediction tools (or use existing indicators) to add an estimate of future climate change and offer decision-makers tools for assessing infrastructure vulnerability and land use prospects (e.g. intensity and frequency curves for extreme weather events such as precipitation).
- Include economic indicators to assess the state of the ecosystem in relation to climate change (e.g. the economic impacts of water-level variations at the Port of Montreal).



12 Years of Monitoring Emerging Contaminants: St. Lawrence Results and Perspectives & Identifying a New Generation of Flame Retardants in a St. Lawrence Seagull: Is the PBDE Saga Repeating Itself?

Facilitator: Louise Champoux, Environment Canada
**Secretary: David Berryman, Ministère du Développement durable,
de l'Environnement, de la Faune et des Parcs (MDDEFP)**



Participants began by noting that it was troubling, even alarming, that all these products are present in aquatic environments, including the St. Lawrence. It is disconcerting to know that all organisms, including humans, are exposed to them. The discussion covered a number of points concerning emerging contaminants, but they did not all relate to the monitoring of these substances in the St. Lawrence.

Some felt more information should be provided to the media on the issue of emerging contaminants to inform the public and prompt it to put pressure on political authorities. Participants are aware that governmental and academic specialists do not have equal freedom to do this.

Concern was expressed that, barring a few exceptions, there is no way of knowing what is in the consumer goods we buy. This prevents us from shifting our purchases to goods such as flame retardants free of harmful products.

Canada's launch of an environmental study on the chemicals used in its territory was noted and applauded. This study has sped up government action on products deemed harmful such as nonylphenol ethoxylates, pentaBDEs and perfluorooctanesulfonate (PFOS). In addition to this government initiative, a reverse onus, as with Europe's REACH regulation, is needed.

Participants were also displeased that the Maurice Lamontagne Institute's ecotoxicology team had been disbanded. The result is an inability to determine the significance and extent of the emerging contaminant problem in the St. Lawrence marine ecosystem. For example, the ingestion of plastics by marine mammals and marine reptiles, a problem observed in many parts of the world, is not being studied in the St. Lawrence.

The complexity of monitoring emerging contaminants was noted, particularly because the ecosystem compartment to be sampled is not the same for all contaminants. Take, for example, decaBDE, which is found in Ring-billed Gulls, but only rarely in the eggs of the Great Blue Heron and Northern Gannet. According to some, there is not enough data on the presence of emerging contaminants in sediments, particularly in the marine environment.

It was noted that the United Nations and World Health Organization had recently published a joint report on endocrine disruptors. The report summarizes and describes the existing knowledge on this issue, adding weight to the evidence respecting both human health and the effects on other species. However, workshop participants pointed out that endocrine disruption problems in humans may stem from contaminants whose primary exposure routes are not drinking water. In the case of nonylphenol ethoxylates, polybrominated diphenyl ethers (PBDEs), perfluorinated compounds and medications, the MDDEFP's monitoring has confirmed that drinking water is not the primary route of human exposure. As one participant pointed out, «We will all die from a good many things before succumbing to the water quality of the St. Lawrence.» The conclusions regarding the potential effects on other species are much less clear.

Some participants indicated that we have a lot more data on the presence of emerging contaminants in the St. Lawrence than on their effects. We have known for some time now that, downstream from Montréal, the *Elliptio complanata* mussel and the Spottail Shiner are exhibiting endocrine disruption problems. However, not many studies have been conducted to check for the problem among other species. We do not know the spatial extent of the problem or its magnitude in terms of the number of species affected.

Participants noted the importance of continuing to monitor emerging contaminants and their effects in the St. Lawrence River.



Collapse of the Yellow Perch in Lake Saint Pierre: How Did We Get There and What Can We Do About It?



Facilitator: Yves Paradis, Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (MDDEFP); Secretary: Élise Mercure, Stratégies Saint-Laurent

Summary of discussions from the session

Participants shared comments about two major areas of concern:

1- The hydraulic changes to the river and its tributaries, which indirectly affect fish habitats along the shores of Lake Saint-Pierre: the effects of the shipping channel, reduction in ice jams, decrease in traffic along the shores, sediment accumulation downstream from the tributaries and dams in the tributaries.

2- Reduced water quality and phosphorus enrichment of waters along the shores, particularly in relation to agricultural pollution. The comments underscored that the ecosystem health indicators for Lake Saint-Pierre should

- 1 - be simple, easily understood and easy to illustrate to the public (e.g. Yellow Perch catches);
- 2 - address the practical concerns of those who live in the region and not just scientists' concerns (e.g. corn acreage in a watershed);
- 3 - have an economic value in dollar terms (e.g. the services provided by water-purifying wetlands, the revenue generated by eco-tourism);
- 4 - get the public involved in indicator measurements and observations (e.g. monthly survey of the presence of cyanobacteria along the shores, quantifying and collecting litter in certain areas);
- 5 - faire en sorte que tous les Québécois (et non pas seulement les personnes engagées présentement) apprécient la valeur du Saint-Laurent et veuillent le préserver.



CLOSING REMARKS



Patricia Robitaille, Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs, and Hélène Bouchard, Environment Canada

The visiting stations have illustrated the contribution made by community organizations in monitoring environmental indicators, raising public awareness and implementing field initiatives. They have highlighted the importance of communicating results and the link to be made with objectives.

The St. Lawrence Global Observatory and Québec-Océan have underscored the importance of communicating results to the communities and especially the necessity of understanding the needs of the target clientele. A vast array of tools is available, such as websites, newsletters and forums. The challenge is to find the best medium for sharing information. To reach the various clienteles in the community, it seems appropriate to have a holistic view of the state of the St. Lawrence.

Establishing the link between research activities and monitoring activities is key. Research can help environmental monitors identify future contaminants, and the monitors in turn can report changes in trends that would require special research attention. An ecosystem approach should be followed, and it is important to communicate issues and risks. We can therefore see the relevance of pairing long-term monitoring activities (systematic over the long term) with short-term monitoring activities but in a more concentrated way in time or space.

The year 2014 will be marked by the submission of the Overview of the State of the St. Lawrence River. The next Rendez-vous St. Lawrence is scheduled for 2015.

APPENDIX A



SCHEDULE Day 1

10:00 a.m. Welcome and coffee

BC Room

10:15 a.m. Word of welcome

Hélène Bouchard, EC
Patricia Robitaille, MDDEFP

UPDATE ON STATE OF THE ST. LAWRENCE MONITORING INDICATORS: Parallel sessions

BC Room

10:30 a.m. **Changes in Water Level and Flow in the St. Lawrence Rivert**

André Bouchard, EC

10:50 a.m. **Water Quality in the Fluvial Section 1995–2010**

Serge Hébert, MDDEFP

11:10 a.m. **Water Quality Monitoring: Toxic Contaminants**

Myriam Rondeau, EC

11:30 a.m. **Sediment Quality in the St. Lawrence – Back to Square One**

Magella Pelletier, EC

A Room

Biomonitoring of the St. Lawrence River Using Benthic Macroinvertebrates

Alain Armellin, EC

Health of Freshwater Fish Communities in the St. Lawrence

Yves Paradis, MDDEFP

Monitoring of Seabird Populations in the Gulf of St. Lawrence

Jean-François Rail, EC

Monitoring de la qualité des eaux marines dans les secteurs coquilliers

Jacques Sénéchal, EC

11:50 a.m. **Lunch in BC Room**

BC Room

1:15 p.m. **Levels of Polybrominated Diphenyl Ethers (PBDEs) in Fish in the St. Lawrence River (2002–2008)**

Denis Laliberté, MDDEFP

1:35 p.m. **Monitoring Contaminants in Birds of the St. Lawrence**

Louise Champoux, EC

Salle A

Recent Trends in Physical and Chemical Conditions in the Estuary and the Gulf of St. Lawrence

Peter Galbraith (the presentation will be given by Denis Gilbert), DFO

Recent Changes in Phytoplankton and Zooplankton Communities in the Estuary and the Gulf of St. Lawrence

Patrick Ouellet, MPO

NEW INDICATORS AND INTEGRATION OF INFORMATION

Salle BC

2:00 p.m. **Invasive Species: New Activities and Transfers**

Nathalie Simard, MPO
Isabelle Desjardins, MDDEFP
Isabelle Simard, MDDEFP

2:50 p.m. **Overview of Approaches and Methods for Integrating Environmental Information**

Caroline Savage, EC

3:15 p.m. **Coffee break**

3:45 p.m. Open discussions – Can we integrate our indicators to obtain a better picture of the St. Lawrence?

4:30 p.m. Summary of the day's information



SCHEDULE Day 2

Welcome in BC Room		
8:00 a.m.	Word of welcome (brief presentation of the new Action Plan site, links to the Monitoring Program and our products for distribution) and description of the morning's activities	Hélène Bouchard, EC Patricia Robitaille, MDDEFP
ENGAGING COMMUNITIES TO IMPROVE THE ST. LAWRENCE		
Sharing Our Experiences		
VISITING STATIONS (Carousel) – Group locations (See the “seating plan” document for the locations of the stations.)		
#1 – Côte-Nord du Golfe ZIP Committee – Aurore Pérot Community Aquatic Monitoring Program		
#2 – Magdalen Islands ZIP Committee – Yves Martinet Caractérisation, sensibilisation et mise en valeur des milieux humides des Îles-de-la-Madeleine		
9:00 a.m.	#3 – Saguenay ZIP Committee – Ghislain Sylvain and Sébastien Cloutier Plan for the Protection of Rainbow Smelt Spawning Grounds in the Saguenay River	
#4 – Southern Estuary ZIP Committee – Étienne Bachand Restoration and Development of the Lower St. Lawrence Shorefront		
#5 – Lake Saint-Pierre ZIP Committee – Louise Corriveau Conservation and Development Plan for Public Lands on the North Shore		
#6 – Des Seigneuries ZIP Committee – Marie-Kim Boucher Characterization and Remediation of Riparian Strips on the Banks of the St. Lawrence River at Repentigny: from Dialogue to Action		
#7 – Jacques Cartier ZIP Committee – Sylvie Bibeau Biogeophysical Characterization of Japanese Knotweed Colonies: Study of Their Impact on Plant and Entomological Communities		
11:00 a.m.	Coffee break	
BC Room		
Dissemination of information on the river followed by open discussions: How can we better adapt products to audiences targeted by the State of the St. Lawrence Monitoring Program?		
11:15 a.m.	The St. Lawrence Global Observatory: Taking Advantage of New technologies to Reach Audiences Stéphane Richard, SLGO	
Québec-Ocean: A Group of Researchers, for What Purpose? Brigitte Robineau, Québec-Ocean		
11:00 p.m.	Lunch	



Day 2 (following)

GLOBAL ISSUES ON THE STATE OF THE ST. LAWRENCE: Presentations and discussions in parallel sessions

	BC Room	A Room
13:15 p.m.	Collapse of the Yellow Perch in Lake SaintPierre: How Did We Get There and What Can We Do About It? Christiane Hudon, EC Philippe Brodeur, MNR	Impacts of Climate Change on Hydrologic Inputs of the Great Lakes and St. Lawrence River Watersheds Biljana Music, Ouranos Richard Turcotte, CEHQ
	12 Years of Monitoring Emerging Contaminants: St. Lawrence Results and Perspectives David Berryman, MDDEFP	Deoxygenation and Acidification of the Deep Waters in the Gulf of St. Lawrence Denis Gilbert, DFO
14:00 p.m.	Identifying a New Generation of Flame Retardants in a St. Lawrence Seagull: Is the PBDE Saga Repeating Itself? Jonathan Verreault, UQAM	
14:45 p.m.	Group discussions: perception of these issues and monitoring opportunitie	Group discussions: perception of these issues and monitoring opportunities
14:15 p.m.	Coffee break	
	BC Room	
15:30 p.m.	Plenary session	
16:00 p.m.	Closing Remarks Hélène Bouchard, EC and Patricia Robitaille, MDDEFP	

APPENDIX B



LIST OF PARTICIPANTS

In alphabetic order by organisations

Alexandre Joly

Accès Fleuve / ZIP Ville-Marie

Carole Descheneaux

ACP Ste-Anne de Sorel

Réjean Valois

ACP Ste-Anne de Sorel

Suzan Dionne

Agence Parcs Canada

Philippe Chenard

Alliance des villes des Grands Lacs et du Saint-Laurent

Robert Masson

Alliance des villes des Grands Lacs et du Saint-Laurent

Gaston Déry

Amis de la vallée du Saint-Laurent

Jacqueline Romano-Toramanian

AQPERE (Association québécoise pour la promotion de l'éducation relative à l'environnement)

Stéphane Masson

Aquarium du Québec, SEPAQ

Delphine Deléglise

Association de la gestion intégrée de la rivière Maskinongé (AGIR Maskinongé)

Anne-Marie Roy

Association maritime du Québec

André Michaud

Canards Illimités Canada

Richard Turcotte

Centre d'expertise hydrique du Québec

Geneviève Lemoyne

Comité ZIP Baie des Chaleurs

Aurore Pérot

Comité ZIP Côte-Nord du Golfe

Marie-Pier Cloutier

Comité ZIP de la rive nord de l'estuaire

Yves Martinet

Comité ZIP des Îles-de-la-Madeleine

Erin O'Hare

Comité ZIP du Haut Saint-Laurent

Louise Corriveau

Comité ZIP du lac Saint-Pierre

Sylvie Bibeau

Comité ZIP Jacques-Cartier

Élise Mercure

Comité ZIP Jacques-Cartier

Mylène Vallée

Comité ZIP Les Deux Rives

Hamida Hassein-Bey

Comité ZIP de Québec et Chaudière-Appalaches

Sébastien Cloutier

Comité ZIP Saguenay

Ghislain Sylvain

Comité ZIP Saguenay

Marie-Kim Boucher

Comité ZIP des Seigneuries

Jacques Durocher

Comité ZIP des Seigneuries

Étienne Bachand

Comité ZIP du Sud-de-l'Estuaire

Françoise Bruaux

Comité ZIP du Sud-de-l'Estuaire

Marie-Christine Bellemare

Conseil régional de l'environnement de Laval

Joël Bonin

Conservation de la nature

Chantale Chatelain

COVABAR

Louise Champoux

Direction de la science de la faune et des paysages

Simon Paquin

ÉcoMaris

Johanne Whitmore

ÉcoMaris

Alain Armellin

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Catherine Bolduc

Environnement Canada

André Bouchard

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Hélène Bouchard

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Anne Gauthier

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APPENDIX B

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Caroline Savage
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Jacques Sénéchal
Environnement Canada

Michel Durand Nolett
Environnement et Terre ODANAK

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Fédération québécoise des chasseurs et pêcheurs

Éric Gagnon
Groupe d'éducation et d'écovigilance de l'eau

Jason Di Fiore
Héritage Laurentien

Serge Demers
Institut des sciences de la mer de Rimouski (ISMER)

Jean Robert Faucher
Les Amis de la vallée du Saint-Laurent

Denise Cloutier
Les OBV du Québec (ROBVQ)

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Ministère des Ressources naturelles

Philippe Brodeur
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Stéphane Richard
Observatoire global du Saint-Laurent

Karine Dauphin
Organisme de concertation pour l'eau des bassins
versants de la rivière Nicolet (COPERNIC)

Caroline Brodeur
Organisme des bassins versants de la Capitale

Jean-Pierre Gagnon
Organisme des bassins versants de la zone Bayonne

Marc Corriveau
Organisme des bassins versants de la zone Bayonne

Nicolas Audet
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Biljana Music
Ouranos

Jean Painchaud
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ANNEXE B

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Patrick Ouellet

Pêches et Océans Canada/Institut Maurice-Lamontagne

Nathalie Simard

Pêches et Océans Canada/Institut Maurice-Lamontagne

Brigitte Robineau

Québec-Océan

Philippe Bourke

Regroupement national des conseils régionaux de l'environnement du Québec (RNCREQ)

Philippe Kouadio

Réseau Environnement

Guy Hamelin

Réseaux des milieux naturels

Christian Hart

Réserve mondiale de la biosphère du Lac-Saint-Pierre

Daniel Desgagné

ROBVQ

Marie-Claude Leclerc

ROBVQ

Marie-Josée Poulin

Santé Canada

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Paul Messier

Société d'aménagement de la baie Lavallière

Jeff Ridal

St. Lawrence River Institute of Environmental Sciences

Louis Charest

Stratégies Saint-Laurent

Céline Schaldembrand

Stratégies Saint-Laurent

Jean-Éric Turcotte

Stratégies Saint-Laurent

Nicolas Roy

Terraformex

Jonathan Verreault

Université du Québec à Montréal

Steve Girard

Ville de Matane

Gilles Breton

Ville de Montréal

Denis Lapointe

Ville de Salaberry-de-Valleyfield

Julie Adams

Ville de Trois-Rivières

Marie-Claude Lemieux

WWF-Canada