Pollution in the St. Lawrence River

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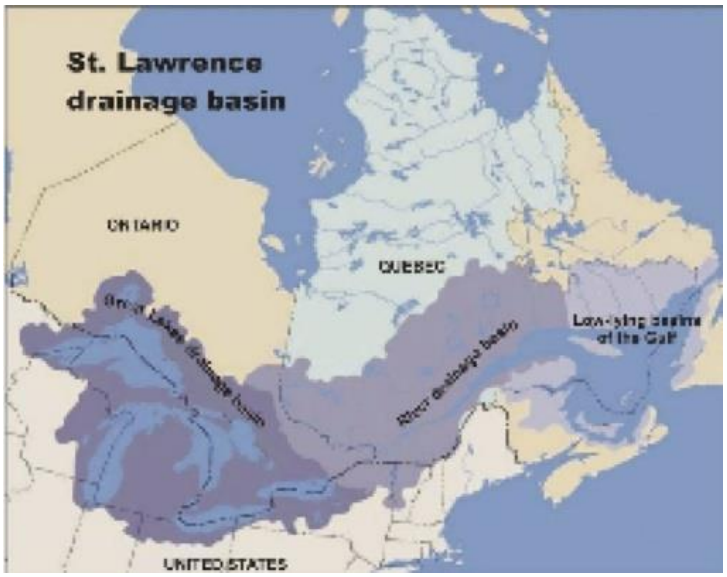
Introduction



from: https://www.ec.gc.ca/stl

The St.Lawrence River is an integral part of North American society. The river acts as an important waterway for fishing, shipping and receiving, and for the manufacturing industry situated on or near the river shoreline. It also houses agriculture and urban populations as well as indigenous populations using it for cultural traditions. It is a shared geographic border between Canada and the United States of America and there are currently 15 million and 30 million people from those countries respectively that live within the river basin. It comprises an area of more than 1,610,000 km2 and drains 25% of the world's fresh water (retrieved from https://www.ec.gc.ca/stl/default.asp?lang=En&n=49C847E2-1 November 30). The St.Lawrence also houses a bevy of flora and fauna in the aquatic and land ecosystems within the river itself and its basin. Its complex usage and dynamic ecology, as well as its sheer size result in a rather wicked problem in regards to pollution management. A term coined by Rittel and Webber in 1973, a wicked problem can be identified as "a problem that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize" (1). The issues surrounding the St. Lawrence are a wicked problem in that there are many interacting and dynamic systems at work within the basin, numerous different values placed on river usage, ever changing physical characteristics and social dependencies that lead to a measure of uncertainty and that there is no concrete, one-fits-all solution to satisfy all of these aspects at once.

Framing the Problem

Pollution in the St.Lawrence is naturally ever changing and difficult to recognize, due to the ecosystem dynamics of such a large drainage basin. This, combined with the large number of inhabitants in the surrounding area, provides plenty of material for perpetually creating new sources of problems that might not have immediate solutions.

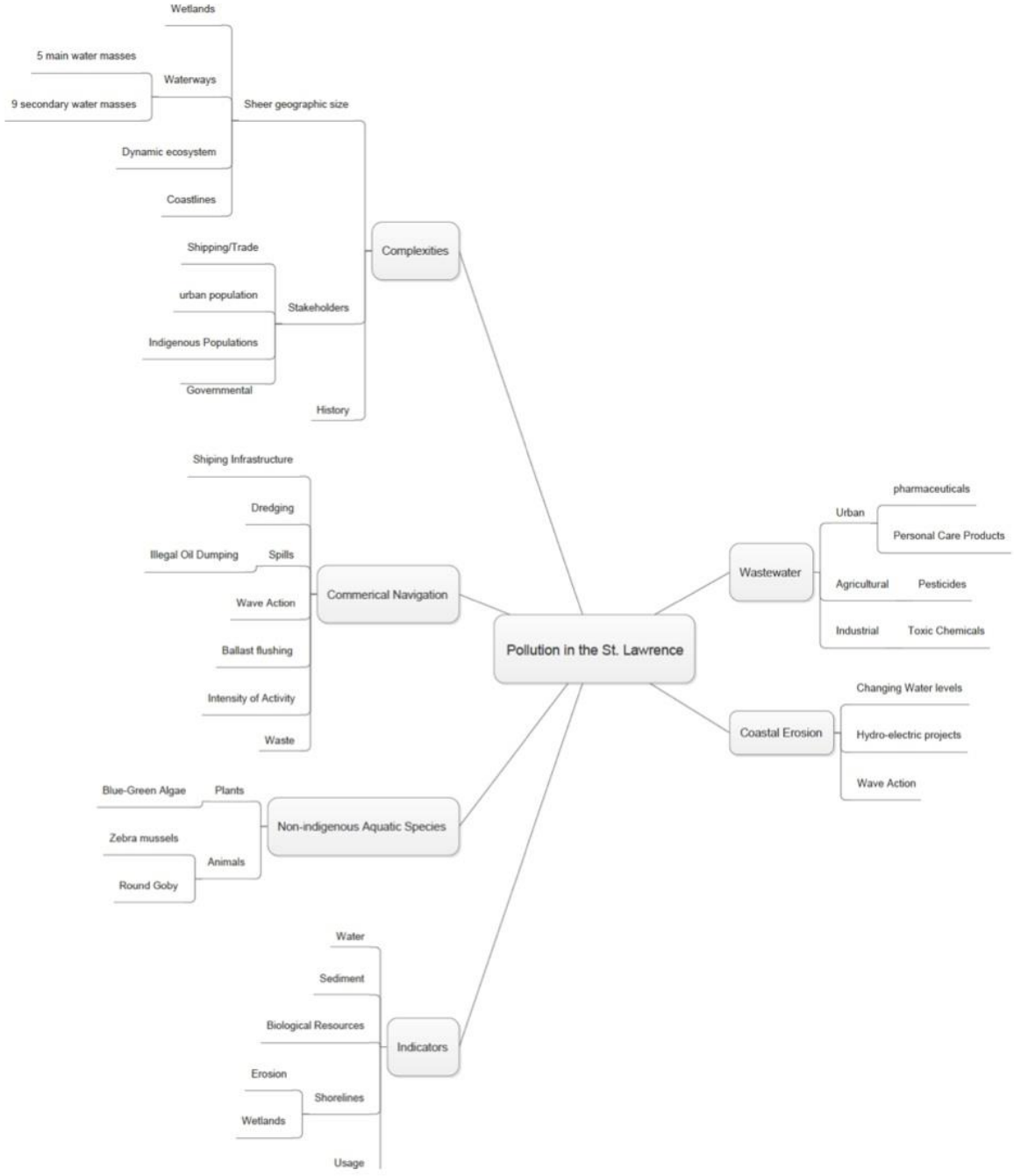
When trying to quantify and qualify interacting systems along the St.Lawrence, we should consider that the agriculture and manufacturing industry and the aquatic and land ecosystems are situated together. Since the St.Lawrence drainage basin contains manufacturing plants, agricultural operations, and urban populations, effluence is a major issue. Pollution from industry and agriculture discharge harmful chemicals such pesticides into the St. Lawrence. It is difficult to determine what takes precedence. Agriculture and manufacturing provide enormous economic benefit while monitoring the aquatic and terrestrial ecosystems can help determine the viability of those former activities which are entrenched within those ecosystems. Industry and urban populations along the rivers waterways has led to pollutants entering the waterways, from pharmaceuticals, to personal care products and Polybrominated diphenyl ethers (PBDEs). The chemicals affect wildlife and water quality, however they can be difficult to adequately assess. Fertilizer spillover from agriculture can result in algal blooms and the formation of anoxic areas called death zones, which occur where there is not sufficient oxygen for aerobic organisms to survive. This can have dramatic effects on the fish populations, which in turn has negative outcomes on the livelihoods of the inhabitants who are reliant on the endemic fish populations.

Considering the local flora and fauna that are situated in the St. Lawrence, there is also the problem of invasive species. Invasive species can affect local species if they proliferate in the area and overtake local species in favorable conditions. This can have unforeseen consequences as the change in species may cause marginal or significant change to the ecosystem. Some invasive species of note in the St. Lawrence are Purple Loosestrife and Zebra Mussels. These species were mostly brought unknowingly to the river basin. However the problem now lies in how to eradicate them or minimize their extent, all the while causing as little damage to the environment containing them. While not representative of the classic ideology of what defines “pollution”, invasive species have contributed to the extensive destruction of native habitat and decimation of indigenous species populations inhabiting the St.Lawrence drainage basin. Zebra mussels alone have caused approximately $4 billion worth of damages in the Great Lakes basin (http://www.ec.gc.ca/stl).

The St. Lawrence was also opened to major shipping and commercial marine traffic. This has caused a massive disruption the ecosystem. With marine traffic comes a whole host of problems. Infrastructure was put into place to facilitate the traffic, such as the large locks and canals in Montreal, which affected the surrounding environmentally sensitive areas. Many of the invasive species now living in the basin were introduced through ballast flushing from ships arriving from all regions of the world. Wastewater can also be a significant side effect of increased shipping traffic. Illegal oil dumping or sewage mismanagement attributed to commercial marine traffic significantly affect the surrounding environment.

With such a large geographic region, and pollutants entering the system from various industries and causes, specific solutions must be made for each individual pollutant. However, it can be difficult to know how that will affect other parts of the system. It’s an ever changing and interconnected environment and requires constant monitoring and assessing

to create viable solutions which positively impact one part of the system without negatively impacting another. Complicating the matter further, the St. Lawrence seaway is a national boundary and an important part of the Canadian and American economies. With so many stakeholders and varying value systems, proper management and decision making must take into account many differing and sometimes conflicting perspectives. All efforts in remediating this problem must be jointly tackled by the two countries in order to yield solutions that will have an impact on both shorelines.



Governance Framework

Due to its geographical position as an international boundary, governance of the St. Lawrence River Basin falls into the jurisdiction of both Canada and the United States. The Federal governments of each nation-state are key decision-makers in the management of St. Lawrence. The agencies responsible are Environment Canada and the United States Environmental Protection Agency (USEPA), respectively. Since this land feature is integral to all who use it, the International Joint Commission (IJC), a bi-national organization including Canada and the USA, was developed in 1909 and its main mission is to coordinate the efforts of Environment Canada and the USEPA in the management of the St. Lawrence River and to prevent and settle disputes pertaining to this cross-boundary waterway.

The Great Lakes Water Quality Agreement, which was amended in 2012, is an integral part in the decision making and governance process of the St. Lawrence River and is overseen by the IJC. The agreement outlines areas of concern (areas that have been heavily affected by environmental degradation as a result of anthropogenic pollution), the current lake wide management structure, chemicals of concern, invasive species, climate change impacts among other things. There are 43 Areas of Concern (AOC) listed within the agreement, which refer to some of the most polluted areas in the basin that are impairing human use. Through the agreement a specific protocol is in place in order to approach the rejuvenation of these areas in a systematic way. In accordance with the agreement, the IJC acts as an intermediary between the federal governments of Canada and the United States. Together, and through the IJC, AOCs are designated and Development and Implementation of Remedial Action Plans (DIARPs) are initiated. According to the IJC website, criteria for the DIARPs are as follows:

1. Identification of beneficial use impairments (BUIs)
2. Criteria to measure the restoration of beneficial uses
3. Specific remedial actions to be taken
4. A summary of implementation actions and the status of the beneficial use.
5. A description of monitoring activities to assess the effectiveness of remedial actions and confirm restoration of beneficial uses. Individual BUIs are removed/redesignated when the established criteria have been met. (http://ijc.org/en_/aoc/AOC_Process retrieved November 30)

As the Great Lakes flow out to the St. Lawrence, pollution management must be integrated there as well, another aspect of what makes this problem so wicked. The above criteria use an ecosystem perspective to approach the AOCs. They attempt to integrate considerations for the ecosystem as whole, including and not limited to air, water, land, and living organisms.

The IJC has also gone on to establish the International St. Lawrence River Board of Control to oversee the condition of the river itself. (Environment Canada, “Managing the St.Lawrence”, Youtube Oct.23,2014). Through this initiative, the Moses-Saunders Power Dam was constructed for commercial navigation and hydro-electric power, however it has been able to adequately manage the St. Lawrence water level as well (http://www.opg.com/generating-power/hydro/ottawa-st-lawrence/Pages/rh-saunders-station.aspx). The International St.Lawrence River Board of Control is able to constantly

monitor the river by means of incorporating air/water temperature, humidity, and precipitation into computer models. These models are important as they allow predictions of water levels and flows as well as water quality fluctuations which users of the river must adhere to. Within Canada there is also a concentrated effort within federal and provincial governments to work together in maintaining the integrity of the St. Lawrence river for all parties involved, be that civilians for recreational use and industry for economic reasons.

However, the IJC and the federal governments are not the only actors. There are a host of organizations acting on the local level. At the provincial and local legislation levels of governance, there are a number of US states (bordering the Great Lakes) as well as the Ontario Ministry of Agriculture, Food and Rural Affairs, the Ontario Ministry of the Environment and Climate Change, the Ontario Ministry of Natural Resources and Forestry, Agriculture and Agri-Food Canada, Fisheries and Oceans Canada, Health Canada, Natural Resources Canada, Parks Canada Agency, Public Works and Government Services Canada, Transport Canada, and Infrastructure Canada.

In 2005, the federal government of Canada collaborated with the provincial government of Quebec to produce the St. Lawrence Plan (SLP). It's a useful example to demonstrate how the decision making process works between intergovernmental organizations, as well as the broader academic and professional communities. The SLP focused on four main objectives: Integrated Management of the St. Lawrence, Social Commitment, Ecological Integrity, and Environmentally Responsible Economic Activities. The first of these principles sought to revamp members of the Intergovernmental Working Group on Integrated Management of the St.Lawrence (IWG-IMSL) with representatives from various governmental departments from both GQ & GC such as Environment Canada, Fisheries and Oceans Canada and Ministere des Transports du Quebec. This was done in order to provide a social consensus that incorporated information from both bio-physical and socio-economic aspects of the river. The second principle, Social Commitment, attempted to bring more awareness and share more knowledge with the communities situated along the course of the river. Ecological Rehabilitation Action Plans (ERAPs) were established for riverside communities which enabled concerned partners to seek financial, scientific and technical support. This is an involving process that allows public participation from people living along the St. Lawrence river to take action on environmental remediation projects that may occur. This principle also touches upon how government scientists and other professionals working along the St. Lawrence have an immense amount of data and knowledge regarding the state of the river. They also readily share this information online, creating a transparent overview of their findings. The third principle is in regards to Ecological Integrity. Proponents of the Plan identify that human caused pressures on the environment lead to habitat fragmentation and loss of species that hinder the ecosystem balance. The goal for this aspect of the Plan is to gain a more thorough understanding of the transformations that may occur in the St. Lawrence River. The last principle, Environmentally Responsible Economic Activities, works toward making agricultural practices and navigational activities more environmentally respectable. This means reducing agricultural pollution that runs off farmland into the river on top of enforcing better commercial and recreational navigation operations. The St.Lawrence plan seeks to involve not only the departments and agencies listed earlier with these 4 core principles but also Parks Canada, Public Works and Government Services Canada, Ministere des Ressources naturelles et de la Faunce du Quebec, and Agriculture and Agri-Food Canada.

This plan serves to highlight the complexities inherent with managing such a broad environmental area with so many sociological and economic implications. It falls under the responsibility of the federal governments of both the US and Canada to coordinate their efforts with the surrounding communities and industries. Solutions must account for varying perspectives of industries and individuals and as such can be incredibly complex and difficult to implement.

Moving Forward

A recent initiative has been put into place, the St. Lawrence Plan Action Plan 2011-2026 (https://www.ec.gc.ca/nature/default.asp?lang=En&n=A642EE65-1). Drawing upon elements from the former St.Lawrence plan will be critical in order to formulate an updated management strategy. This plan recognizes three main principles that overlap with the previous plan:

1. Biodiversity conservation
2. Improved water quality
3. Sustainable Use

At first glance, this appears to be a more minimalistic plan compared to the previous one from 2005-2010. Whether this has to do with the government in power at the time of implementation is something that requires more thorough research. However this plan still has the same integrated-management as the St. Lawrence Plan before it. This initiative has three objectives when it comes to the future of the St. Lawrence River (http://planstlaurent.qc.ca/fileadmin/site_documents/documents/Depliant_PNE_E_WEB.pdf). Firstly, this program seeks to provide more accurate and precise predictions regarding the flows of the entire St. Lawrence ecosystem. In order to make better predictions about changes in water, sediments, soil, vegetation, temperature and humidity levels, new and extensive numerical models will be implemented to simulate the physical, biological, and chemical processes in the St.Lawrence. Secondly, the plan is intended to be a decision-making platform for a holistic management approach of the St.Lawrence. Lastly, the plan hopes to foster an ever-evolving management plan that includes every level of government and also allow chief figures from the private sector to contribute to maintaining ecosystem stability and ecological considerate development. Campaigns are already under to develop models for surface data covering the watersheds, hydrological regimes, ecosystem as well as ocean ice in the St. Lawrence Estuary and the Gulf of St. Lawrence. The forecasts these models give will allow sound predictions to be made in regards to vegetation conditions, water levels and flow rates, indicators of ecosystem health, analyses of socioeconomic impacts and ice forecasts. Altogether these models will enable analysis on the impacts of climate change, support socio-economic activities and public safety actions, supply data to monitor ecosystems as well as the levels, quality and availability of water.

In order for progress to happen, signficant change needs occur at different levels of governance. Governmental implementation of procedures can be marred with red tape and take a long time. There is also always a concern of lobbying, and governments need to be completely transparent to ensure their policies are not being implemented to serve certain groups. Players at a local/non-statutory level of government hold a strong temporal advantage

in the implication of new practices – they can act much quicker and achieve results in a timely manner. The mobilization of these groups is not hindered by governmental bureaucratic inefficiencies and red tape. Non-statutory groups can rely on tactical approaches through media representation, the formation of unions and word-of-mouth to get their message out. Local non-statutory groups are also superior in transparency, as they are usually funded and run by individuals who do not benefit from any inaccuracies or misrepresentations in the situation. A coordination between the two groups is necessary to ensure major policy changes happen at the federal level, while smaller but drastic changes happen at the local level.

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