The St. Lawrence River

Region

The St. Lawrence River flows from Lake Ontario northeast to the Atlantic Ocean and forms part of the boundary between the United States and Canada. The Great Lakes and St. Lawrence River form a single hydrologic system which contains 20% of the world’s surface fresh water. The system is vital to the Great Lakes states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin) and Canadian provinces, Ontario and Québec. The St. Lawrence Seaway is a system of canals and locks that allows ocean-going vessels to travel to and from the Great Lakes. The region is shown in Figure 1.

![Figure 1: The Great Lakes and St. Lawrence River](image)

The Seaway was a challenging engineering project due to the difference in elevation of the water surfaces in the Great Lakes and along the St. Lawrence River (water elevation of Lake Superior is 183 m above msl, Lake Ontario sits at 75 m above msl). The system of sixteen locks throughout the waterway allows boats to travel over a vertical differential of 183 meters. The Seaway also has three dams, which provide hydroelectric power, to control the portion of water that is not diverted through the locks.
The shipping industry is very important in the region. In 2005, 168 million tons of commodities were transported between US ports alone with a total value over $15 billion. The majority of the cargo is made up of bulk grain, iron ore, coal and steel.

History
Navigation in the St. Lawrence River has been of great important and interest since the colonists and explorers came to the region centuries ago. Originally, the river was only continuously navigable from the ocean to Montreal due to the rapids and falls. The first canal around the Lachine Rapids just upstream of Montreal began construction in 1680. Britain finally finished the Lachine Canal in Montreal in 1825 which extended the navigable portion through the city. Other channels were built over the next century, but the river was not completely navigable by ocean-going vessels until the St. Lawrence Seaway opened in 1959, eventually making the Lachine Canal and Erie Canal obsolete.

The United States and Canada have shared one of the more peaceful borders in the world for many years. The United States and Canada have cooperatively managed the water bodies of the border since 1909 when the Boundary Water Treaty was signed. The Treaty established the International Joint Commission (IJC) to enforce the treaty and prevent and resolve disputes over border waters. At the time of implementation, priority of water use was given to domestic and sanitary purposes, then navigation, energy production and irrigation. Of the six members of the Commission, half are appointed by the President of the United States and the other half by the Governor in Council of Canada and the Prime Minister. The Commission can authorize water uses, must approve projects that will change water levels in the River, and can set flow limitations to ensure hydropower production and navigation. The Commission manages other waters along the US-Canadian border beyond the Great Lakes.

In 1963, a water level regulation plan for the Seaway was adopted, Plan 1958-D. The plan specifies outflows of Lake Ontario based on water level and inflows. Commonly noted shortcomings of this plan include lack of consideration for riparian users, lack of environmental protection, required deviation from set allocated flows due to changes in water supply, and overall, that the plan is outdated. IJC has attempted to revise it; the latest attempt was a five-year study conducted by the Lake Ontario- St. Lawrence River Study Board to develop a new water level regulation plan. The current draft is called Plan 2007, which is more flexible than 1985-D but has also been rejected by environmental groups.

In 1972, the Great Lakes Water Quality Agreement was signed by the United States and Canada. The Agreement outlines objectives and guidelines for restoring the ecosystem of the river basin.

The Great Lakes Charter of 1985 was an agreement between the Governors of the Great Lakes states and the Premiers of Ontario and Québec to cooperatively manage the water resources of the Great Lakes. The Charter established the Council of Great Lake Governors to assist the Governors and Premiers. The mission of the Council is “to
encourage and facilitate environmentally responsible economic growth through a cooperative effort”

In 2001, the Great Lakes Charter Annex was signed to update the water management system and ensure protection of the waters. The Annex was inspired by a proposal in 1998 to export bulk quantities of water from Lake Superior to the Far East. The Annex establishes clear procedures for deciding whether to approve proposed withdrawals from the Great Lakes.

In 2005, the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement was signed by the Great Lakes Governors and Premiers. The Agreement provides even greater protection of the Great Lakes-St. Lawrence River Basin.

Current Issues
The greatest issue facing the St. Lawrence River today is environmental. The environmental degradation of the St. Lawrence has occurred over the last few centuries. The production capacity of the river basin has grown drastically since the opening of the seaway. This growth caused a decline in water quality due to a lack of environmental regulations. The peak of pollution seemingly occurred in the early seventies. Pesticides were high in the water, and contaminants including mercury, PCB and other heavy metals were found in the river’s sediment and fish. Since the Great Lakes Water Quality Agreement of 1972, regulations and conservation have lead to significant improvements in the region, including a 50% reduction of Mercury concentrations and overall improvement in water quality.

Invasive species have been a problem since the Seaway was opened. The species are brought to the river in the ballast water of ships from the Atlantic Ocean. The notorious zebra mussels have prospered in the river and spread to waterways around the United States where they damage harbors, boats, power plants and water treatment plants. The economic losses and control efforts of the US are estimated to be $5 billion each year. While the filter-function of the mussels is beneficial to water quality, the invasive species can cause biological changes in the ecosystem to an unknown extent.

Native fish species in the River are suffering from over-fishing, and bird populations are currently recovering from a sharp decline in the seventies.

Another issue with the Seaway is the shipping limitation. The channel depths and lock sizes limit the vessels that can use the seaway. To use the Seaway west of Montreal, the ships must draw less than 26 feet which is currently only about 10% of all ocean-going vessels. The U.S Army Corps of Engineers is considering reengineering the Seaway possibly through blasting and dredging to accommodate larger ships. According to the environmental group “Save the River”, impacts could include the following: destruction of wetlands and fish populations, increased toxin levels from resuspended sediments, and increased risk of spills due to the increase in cargo size.
Discussion

1. Population and energy demand increases can put a great amount of strain on the environment. Can the conflicting interests of the water users be fulfilled while maintaining cooperative management?

2. What effects would a decline in the relationship between the US and Canada have on the management of the water resources in the River?

References

Required reading/skimming:

The IJC and the 21st Century. International Joint Commission Website:

Additional resources:


“St. Lawrence River history… a summary and links”
http://www.vsr.cape.com/~powens/riverhistory.htm

Council of Great Lakes Governors Website: