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Environmental history of the St. Marys River

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ABSTRACT

This paper provides a brief history of the navigational and industrial activities that led to the St. Marys River being declared a Great Lakes Area of Concern in 1985 and serves to give context to the special issue of the Journal of Great Lakes Research devoted to the St. Marys River. Although much of the river contains important fish and wildlife habitat including mostly intact coastal wetlands, the urban areas of the upper St. Marys River have been impacted over the past 100+ years by industrial and navigational development. One of the more severe impacts was the near-total destruction of the once-prolific St. Marys Rapids. Large volumes of pollution were discharged into the river including up to 10,000 kg/day of oil and grease. The invasion of sea lamprey severely reduced lake trout and other fisheries. Water quality monitoring and other studies from the 1970s to 1980s documented these problems. Enforcement of environmental regulations enacted in Canada and the United States, investments in pollution control technology by industry and the municipalities, and improved fisheries management for invasive species have resulted in improved environmental conditions, however legacy impacts remain. The on-going Remedial Action Plan (RAP) process provides a framework for continued environmental improvements.

Introduction

To date, much of our understanding of the St. Marys River ecosystem is based on U.S. and Canadian government assessments, surveys and studies completed late in the 20th century. At the time of the studies, severe human impacts on the river ecosystem had been going on for nearly 100 years, beginning in the late 19th and early 20th century. For example, by 1918, the crucial rapids habitat in the St. Marys River was already significantly altered. By the 1970s the river had become severely polluted. More recently, water quality has improved significantly, due to environmental regulation and other management activities. This paper reviews the human and environmental history of the river to provide context to the research presented in this special issue of the Journal.

Geologic and geographic context of the St. Marys Area

The St. Marys River is the connecting channel between Lake Superior and Lake Huron. Water from Whitefish Bay in Eastern Lake Superior flows over rapids that separate the twin cities of Sault Ste. Marie, Michigan and Sault Ste. Marie, Ontario and continues for about 112 km until draining into Lake Huron through channels between Detour, Michigan, Drummond Island, Michigan and St. Joseph Island, Ontario (Fig. 1). The valley is bounded on the northeast by the Canadian shield, a region of Precambrian (>2 billion year-old) rocks of granitic and volcanic origin, but the river, the lakes and many of the landforms are young geologically — the products of glaciers which receded only 11,000 years ago (Duffy et al., 1987). During the period of glaciation, lake levels fluctuated considerably. The soils in the St. Marys River valley are mainly lacustrine clays, silts and sand deposited when the valley was part of a larger lake. A ledge of sandstone at Sault Ste. Marie maintains the water level of Lake Superior about 7 m above the level of Lake Huron. About 6 m of the resultant drop from Lake Superior to Lake Huron occurred in what was once the St. Marys Rapids at Sault Ste. Marie but has now been mainly diverted for hydroelectric generation.

The long-term average flow rate of the river is about 2144 m^3/s (Duffy et al., 1987). This large volume of cold, oligotrophic water from Lake Superior flows in strong currents between numerous islands which also shelter shallow embayments such as Lake George and Munuscong Lake. These embayments are ringed by large, productive, emergent wetlands. The combination of high-energy rapids and fringing wetland areas has resulted in a highly diverse and productive fishery and wildlife population in most parts of the river. However impacts from over 100 years of industrialization, navigational construction and loss of habitat in the urbanized areas of the river have led to environmental degradation and listing of the river as an Area of Concern or AOC (RAP, 1992).

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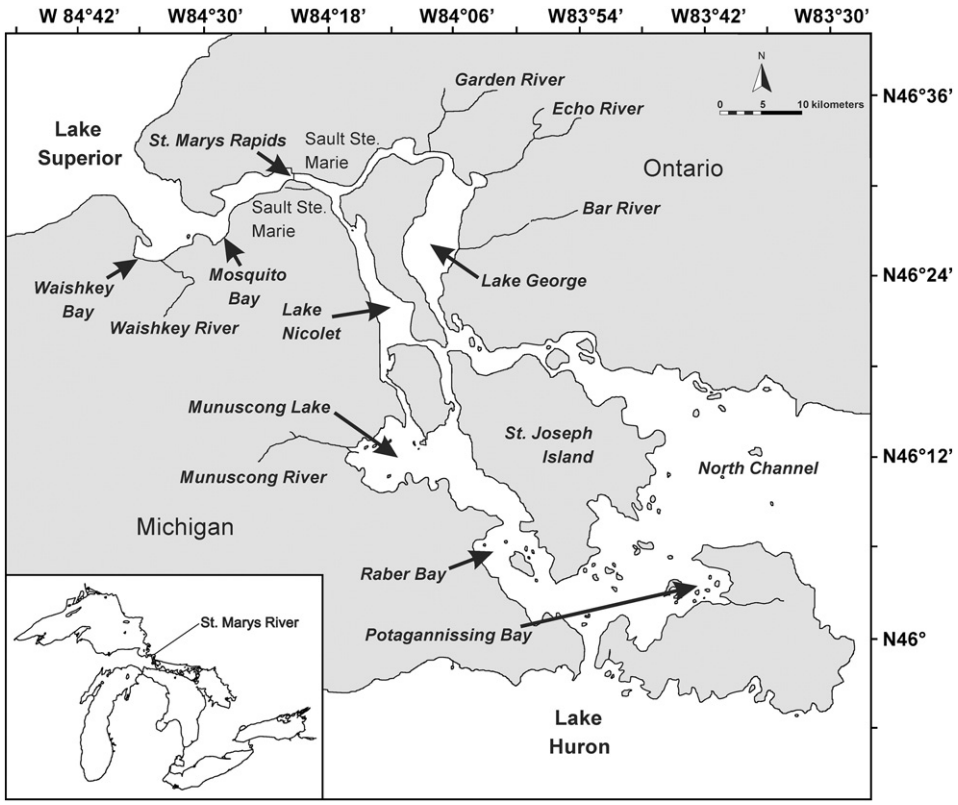

Fig. 1. Map of St. Marys River showing major embayments and tributaries.

Early human history

It is likely that humans have hunted and fished along the river for thousands of years. Archeological evidence indicates that the St. Marys Rapids have been occupied for at least 2000 years (Conway, 1977). The rapids supported a remarkably productive fishery composed mainly of lake whitefish (*Coregonus clupeaformis*) which sustained permanent and seasonal settlements. The original people call themselves Anishinaabe, a name that encompasses the subgroups of Ojibwa (also referred to as Chippewa), Odawa (also referred to as Ottawa) and Potawatomie. The Anishinaabe were living along the St. Marys River for many years before European explorers arrived. The first local contact between Anishinaabe and Europeans occurred in 1620 when the young Frenchman, Etienne Brule, visited briefly.

Until the early nineteenth century, interactions with Europeans and Anishinaabe of the St. Marys River revolved around the fur trade. There are accounts of depletion of furbearing animals as early as the end of the eighteenth century however environmental impacts such as habitat destruction and industrial pollution didn't become widespread in the river until the second half of the nineteenth century and escalated in the first half of the twentieth century (Duffy et al., 1987).

St. Marys Rapids seen as an obstacle

The most significant physical impact to the St. Marys River over the past 200 years has been the near-total destruction of the once-productive St. Marys Rapids due to modification for navigation and hydropower production. The rapids at Sault Ste. Marie had long made river traffic to and from Lake Superior an arduous task. In 1797 the Northwest Fur Company succeeded in building a small canal and lock for canoes on the British (Canadian) side of the river. This lock could raise or lower canoes about 3 m, or just less than half of the difference between the Lake Superior level and the Lake Huron level. The lock was destroyed by American troops in 1814 near the end of the War of 1812 (Arbic, 2003).

In 1822, American troops established Fort Brady at the foot of the rapids on the U.S. side of the river. Reports of vast timber and mineral wealth in the Lake Superior region were already spreading through the region, however the rapids were a very real barrier for access to those riches. The St. Marys River, for much of the nineteenth century, was the only transportation access to Lake Superior as no roads existed and railroad service didn't connect to the rest of the country until 1888 (Arbic, 2003).

Commercial copper mining in the western Upper Peninsula of Michigan began in 1845. Ore bound for the eastern United States was shipped in barrels to Sault Ste. Marie, where it was off-loaded, carted around the rapids, and loaded onto other ships to continue on its way. When Michigan became a state in 1837, the new Governor proposed the construction of a shipping canal and lock to by-pass the rapids; the project was finally started in 1853 and was completed in 1855. Ship traffic increased rapidly following completion of these locks, which prompted more navigational improvements such as dredging of channels to accommodate more and larger ships. Table 1 shows a timeline of hydrological changes to the river.

The St. Marys River had long been viewed by newcomers as a source of power. Industrialists envisioned that any number of factories could be built using cheap electricity generated by hydropower at Sault Ste. Marie, with Lake Superior acting as "the largest millpond in the world." The first major facility was completed in 1896 in Sault Ste. Marie, Ontario, and the same entrepreneurs completed a power canal and hydroelectric generation plant in Sault Ste. Marie, Michigan in 1902 (Arbic, 2003).

To increase hydroelectric power and make the flows more predictable, compensating gates were also constructed in stages at the head of the rapids between 1902 and 1918, resulting in the destruction of all but a remnant of the former St. Marys Rapids (RAP, 1992) The compensating gates result in an ability to control the flow of water through the St. Marys River. The International Joint Commission