

The Saint Lawrence River (Canada-USA): the Need for An Ecosystem-Level Understanding of Large Rivers*

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Throughout the course of civilization, large rivers have played a major role in transport, water supply and human waste disposal. The pressure on these resources has greatly intensified over this century, but our ecological understanding of this most important class of freshwater environments remains poorly developed. In part this is because aquatic ecologists have been traditionally oriented towards lakes and have considered large rivers to be highly variable and thus difficult to study. It is also because large rivers have often been considered more in engineering terms, as conduits for water and waste, rather than in terms of their true character as living systems. To meet the increasing demand for high quality water next century will require a more sophisticated ecosystem-level understanding of large river environments.

The Saint Lawrence River is one of North America most important flowing water systems in terms of discharge as well as economic importance. In the 400 km section of the river that flows through southern Québec it supplies 3.2 million people of the province (46 % of the population) with drinking water, provides a major transport artery into the interior of the continent, and is a key water source for much of the industry and agriculture of the province. Although the St. Lawrence River has been the focus of a large research effort over the last two decades (St. Lawrence Centre, 1996) we understand very little about the fluvial parts of this environment as a living system. Food web relationships are still poorly defined, little information is available regarding seasonal dynamics, and microbial biodiversity and food web processes in the river are largely unexplored. Linkages and coupling between different sections need to be much better defined in this and other large river environments to understand the implications of specific management options for the entire river ecosystem including its estuarine environment.

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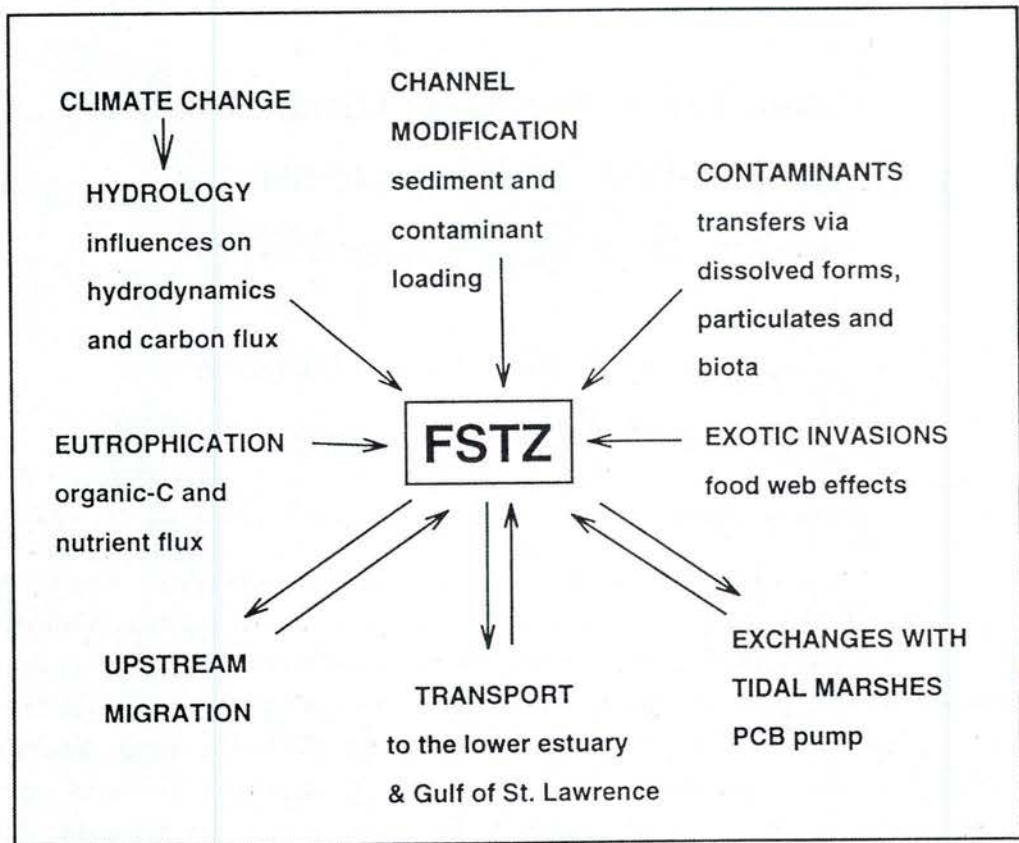


Fig.1 The freshwater-saltwater transition zone (FSTZ) as a critical interface for large river ecosystems.

In the present paper we focus on key ecological processes and linkages in the St. Lawrence River ecosystem that have previously received little attention. In particular, we present evidence that a specific downstream section, the freshwater-saltwater transition zone (FSTZ), is a critical reach for the entire river system (Fig. 1). It is a region with sharp gradients in biological properties and food web structure (Vincent, *et al.*, 1996; Frenette, *et al.*, 1995) and is a nursery site for upstream as well as downstream fish populations (Dauvin, *et al.*, 1990; Laprise, *et al.*, 1990). This reach is sensitive to upstream human activities such as contaminant discharge, hydraulic modification and dredging; it is also the interface across which energy, materials and biota pass to the marine environment. Global climate change and the introduction of exotic species (e.g., the zebra mussel invasion of the St. Lawrence River ecosystem) are likely to have a major impact on community structure and processes in this reach. The FSTZ is an ecotone with a unique combination of upstream and downstream properties, and is a key integrative site for monitoring the health of the river-plus-estuary in the St. Lawrence, and in large river ecosystems

elsewhere.

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