

## SHORELINE EROSION CAUSED BY BOAT WAKE:

### EROSION AND BOAT WAKE

Shoreline erosion is a process that occurs along all watercourses. There are many natural causes (wind-generated waves, water levels, ice, slope of the bank, absence of vegetation), as well as human (deforestation of shorelines, wave action from passing boats). Wake is the wave action, produced by the wash of passing ships and boats, that strikes against the banks of rivers or channels. The extent of erosion varies (Figure 1) and is closely linked to the nature of the shoreline substratum. In the most severely eroded areas among the archipelagos in the Montréal – Sorel sector, the average shoreline recession rate has been estimated at 1.65 m/year, from 1964-2002 (Lehoux, 2004, personal comm.).

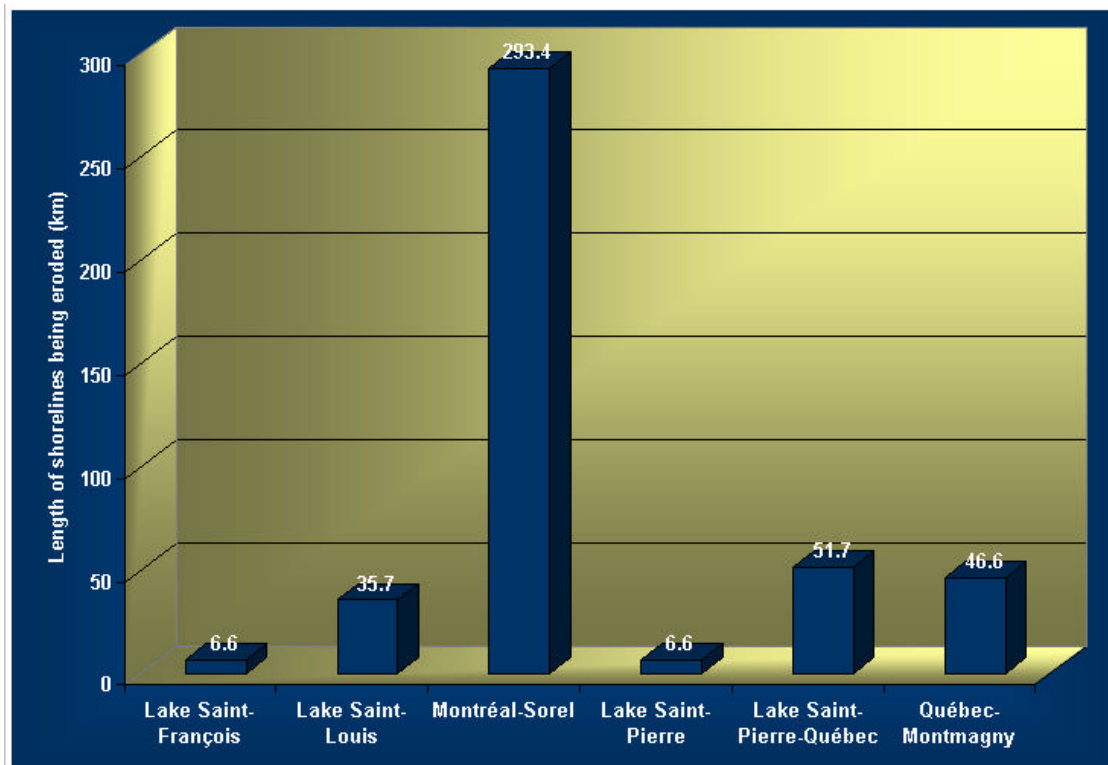


Figure 1 – Lengths of different shorelines being eroded between Cornwall and Montmagny.

### THE CONSEQUENCES OF EROSION

Shoreline erosion has many consequences on the aquatic environment, including habitat destruction, an increase in sedimentation and in turbidity of the water, and the release of nutrients (phosphorous and nitrogen) that promote algal blooms. As well, shoreline erosion can result in the loss of land and affect shoreline property values.

The significance of each factor varies and may depend, among other things, on the size of the watercourse. In larger channels, boat wakes have relatively little impact compared with streamflow, as they make up only 2% to 5% of the annual energy dissipated against the banks. The opposite is true in smaller channels where wake accounts for between 95% and 98% of the energy (Hill et al., 2002). Recreational boating in small channels, then, has a considerable impact. Where craft navigate is therefore very important. However, it is important to keep in mind that other factors may increase the impact of erosion.



The magnitude of the waves generated by a boat depends on different factors, particularly the boat's speed, its size, passenger/cargo loading, the shape of its hull, distance from shore and water depth. Wave height is one of the most important factors in shoreline erosion. Observations made by the Minnesota Department of Natural Resources have shown that a wave that is 12.5 cm high (the height of a compact disk case) does not cause significant shoreline damage. Waves of this height are created by boats operating at speeds generally under 10 km/h—a speed that is considered reasonable when operating close to sensitive shores. A wave that is 25 cm high is five times more destructive than a 12.5-cm wave; 62.5-cm high waves are 30 times more destructive. For example, a small motorboat produces a wave that is 25-cm high when at planing speed, whereas cruising yachts and other craft that do not plane can generate waves that can easily reach heights of 62.5 cm and more.

## **WHAT YOU CAN DO**

It is difficult to apply a universal rule for all boats because of their variable configuration and behaviour in the water. As such, the surest approach is to observe the wake produced by your boat.

### **Watch your speed**

By observing what happens when changing speed, boat operators can control their boat's wake. Observations made by the Oregon State Marine Board have shown the effects of three speed zones:

**Displacement speed** – This is usually the slowest speed for most motor boats. It also creates the least wake. The boat operates with the bow down in the water.



**Transition speed** – As you increase the power while attempting to get on plane, the bow rises, causing the stern to plow through the water. This speed creates the largest wake.



**Planing speed** – At planing speed, the bow drops back down and only a little of the hull contacts the water. This speed creates less wake than transition speed, but more than displacement. Many large craft are not designed to reach this speed.



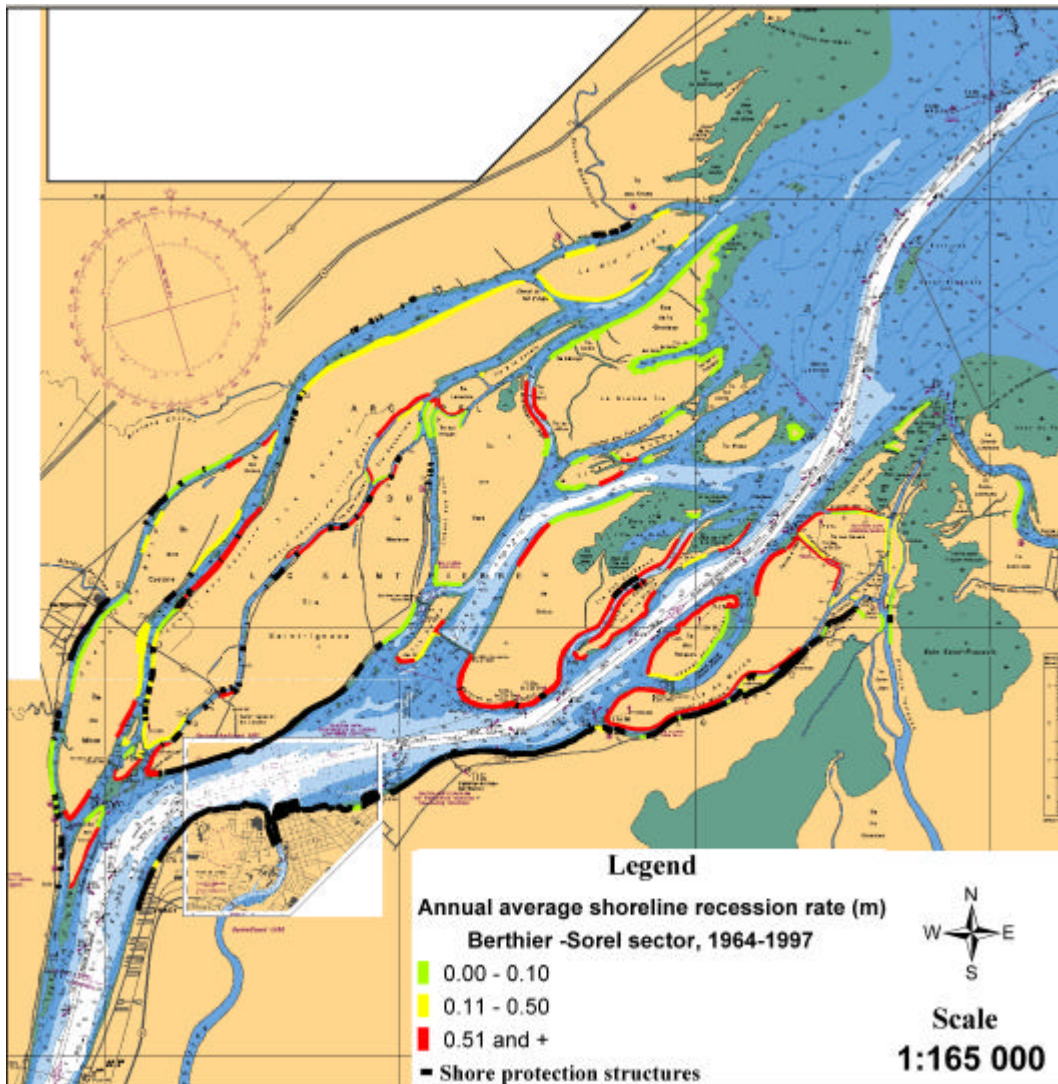
Boaters can reduce the impact of their boat's wake on sensitive shorelines by checking the wake being produced, particularly when they navigate near the shore.

### **WHY BOATERS MUST PAY ATTENTION TO THE WAKE THEY CREATE**

A Canadian Wildlife Service study (Dauphin, 2000) revealed that, in the case of the sensitive, ecologically valuable archipelagos between Montréal and Sorel, wave action from passing commercial ships might be a major factor in shoreline erosion. In the fall of 2000, the shipping industry adopted a voluntary speed reduction measure within the framework of the Navigation Committee of the St. Lawrence Vision Action Plan. The aim of the reduction in ship speed was to reduce the height of the wave produced. More than 80% of ships complied with the prescribed speeds. After three years of monitoring, it is noticed that the shoreline recession rate decreased by 45% in certain areas—results that convinced the shipping industry to maintain the speed reduction measure in the sectors identified by the Canadian Wildlife Service (press release SODES/St. Lawrence Ship Operators Association - April 2004).

Since erosion is the cumulative effect of each contributing factor, recreational boaters can also help in conserving the shorelines and sensitive areas of the St. Lawrence River by reducing the wake produced by their boats when operating near shorelines and in small channels. This voluntary action will also promote a more harmonious co-existence between shoreline property owners and other users of the river.





## References

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**Photos**

Courtesy of the Canadian Wildlife Service and of Michel Sacco.

**Map-based data**

Environment Canada, Hydrologic Service