## Evaluation of the nutrient dynamics of an Atlantic coast beach, Nova Scotia

Linda Roberge[1], Philip R. Hill[1] and Kenneth Lee[2]
[1]*Groupe de recherche en environnement côtier, Université du Québec à Rimouski, 310 allée des Ursulines, Rimouski, Québec G5L 3A1, Canada*
[2]*Maurice-Lamontagne Institute, 850 route de la mer, Mont-Joli, Québec G5H 3Z4, Canada*

In the last two decades, there have been several major oil spill incidents in different parts of the world, some of them affecting Canadian coastlines. As a consequence, research has been focused on the development of oil spill countermeasures for coastal systems. Of the new technologies, bioremediation (based on the addition of substances to accelerate natural biodegradative processes) has been proven to be effective. Previous field trials on low-energy coastal environments including salt marshes and sand beaches, as well as on cobble beaches following the Exxon Valdez oil spill incident, have conclusively demonstrated that the optimal biodegradation rates of oil may be limited by the availability of nutrients (N and P). The addition of nutrients, accelerated both the natural rate and the extent of oil degradation.

A total of forty six field trials are now being conducted to develop operational guidelines for bioremediation. However, highly variable rates of natural oil degradation have been observed following nutrient enrichment, both between and within the same study sites. Possible explanations include both the physical loss of the added nutrients or the presence of natural nutrient sources. As part of a baseline study prior to future field trials, geological expertise is being applied to define the hydrogeological and stratigraphical parameters influencing nutrient concentrations at two low-energy beach sites on the eastern shore of Nova Scotia.

The first site is a pocket beach limited by rocky headlands and has a stepped intertidal profile. The second site is morphologically similar to the first except for the presence of a tidal channel and a flatter profile. Both sites are backed by low dunes which separate standing water bodies from the beach. At the first site, the dunes completely isolate a freshwater lagoon whereas, at the second site, the tidal channel allows saltwater to intrude at high tide so that the lagoon water has a salinity close to or higher than that of the ambient seawater. These water bodies generate a positive hydraulic gradient which results in ground water flow through the beach at low tide.

The preliminary results of the chemical analysis show that the nutrient concentrations in seawater and freshwater from the lagoon at the first site are both relatively low compared to concentrations found in pore water from the beach. The pattern of along-profile nutrient concentrations in the beach porewater was found to be coherent between tidal cycles, but difficult to explain in detail. The presence of high nutrient concentrations in the beach pore water suggests the presence of one or more sources of these nutrients within the beach sediments. A possible source could be nutrient regeneration from the degradation of buried organic matter (e.g., seaweed); however, the results could be influenced by other factors such as rainfall and evaporation.