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**Beach mining, nearshore dredging,  
coastal erosion, and sedimentation in the  
McNabs Island area of Nova Scotia**

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The McNabs Island area, situated at the eastern side of the entrance to Halifax Harbour, consists of several drumlins formed in the Wisconsinan-age Lawrencetown and Hartlen tills. Bluffs in these drumlins exposed to the open Atlantic Ocean are actively eroding at rates up to 6 m/a, supplying sand and gravel sediment which builds local beaches. Beach growth is supplemented by sediment transported landwards by storm wave action under the effects of long-term sea-level rise.

This area has been subject to significant anthropogenic disturbance with the commercial, defensive and urban development of Halifax. The earliest known written record of exploitation of coastal geologic resources suggests mining for shipping ballast occurred *circa* 1849. Other beach mining and dredging activities were conducted to build and maintain military infrastructure on McNabs Island between the late 1800s and 1950s and at

CFB Shearwater beginning in 1918, to rebuild parts of Halifax destroyed in the 1917 Halifax Explosion, and for the construction of the Halifax Container Terminal completed in 1970. Also, near-shore anti-submarine defences consisting of single rows of closely spaced wooden pilings with interstrung cables were constructed at two shallow harbour entrances (Eastern Passage and Drake's Gut) in the area during the Second World War.

Coastal change resulting from these disturbances (and from the natural forcing of change by storms and continuing sea-level rise) are documented using a combination of historical charts dating from 1759, aerial photography since 1935, Canadian Hydrographic Service (CHS) field sheets and other single-beam echosounding surveys since 1959, and precision single-beam and sweep multibeam echosoundings collected in 1998 and 1999.

Analyses of these sources reveal that beach mining caused the overwash and destruction of Barrie Beach, Noonan's Beach, and Doyle Beach, and acceleration of coastal erosion in adjacent areas. Sediment liberated from the beach deposits by overwash was transported landward and deposited at the anti-submarine defences forming new beach deposits. These were later exploited by nearshore dredging with little impact on coastal stability, likely because of continuing landward transport of sediment.

These results demonstrate the reasons for change of some beaches in the McNabs Island area and allow quantitative estimates of nearshore sediment mobility. In a broader context, these analyses may also, with continued monitoring, provide insight into the relative contributions of eroding bluffs versus overwashing barriers in contributing beach-forming sediment to the local sediment budget.