Erosion in Jamaica Bay: Causes, Questions and Sea Level Rise

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Field studies and remote-sensing analysis reveal that large sections of Jamaica Bay salt marshes are rapidly eroding. This degradation has significantly increased, in spite of protection of Jamaica Bay since the establishment of Gateway National Park in 1972. The deterioration may be caused by a variety of processes, some of which may have been initiated prior to the establishment of the park and which may act synergistically. These possible factors include reduced sediment input, an altered pattern of sedimentation, plant die-off, dredging of navigation channels, boat traffic, autocompaction of sediments, dewatering of sediments and relative sea level rise.

A variety of remote sensing, field and lab techniques were used to investigate the effects of these factors on Jamaica Bay marshes. It is particularly important to rule out factors that could not be affecting the marshes. A survey of 15 island marshes reveals a 61% area reduction between 1900 and 1999. Productivity is typical of this region (700-1450 g m^{-2} yr^{-1}) but patchy. Large bare spots are now common. This pattern of growth is more consistent with an unfavorable geological environment, and not a toxic environment in which sublethal stunting should occur. Geomorphological investigations reveal many mechanisms of erosion, including slumping around marsh edges, widening of tidal channels, and ponding within marsh interiors (Allen 2000).

Projections of marsh loss were made using outputs from several global climate models (GCMs) coupled with data from local tide gauges and known local accretion rates. Local accretion rates typically range between 2-8 mm yr^{-1}, with 5 mm yr^{-1} as an average. Slow SLR scenarios suggest marshes will keep pace during the 2000s and 2010s (3.5-4.1 mm yr^{-1}), effects will be moderate during the 2040s and (2.2-5.4mm yr^{-1}), and more significant by the 2080s (6.2-6.9 mm yr^{-1}). Fast SLR scenarios predict significant flooding during the 2000s (6.4-6.9 mm yr^{-1}), and very damaging during the 2040s (11.4-13.3 mm yr^{-1}) and catastrophic flooding during the 2080s (SLR: 19.0-22.0 mm yr^{-1})(Hartig et al. 2001). Comparison of Jamaica Bay to other Long Island salt marshes reveals that the most stressed salt marshes are the most vulnerable to sea level rise.

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