Understanding Global Environmental Trends in Local Wetland Settings

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Throughout the 20th century, human activity and climate variability interacted with
local geomorphology to produce a range of depositional environments salt marshes in Long
Island, NY. In a set of physically diverse marshes, accretion rates were determined using the
naturally occurring radioisotope, ²¹⁰Pb. By assuming a constant rate of supply of the isotope to
the marsh surface and limited mixing, it was possible to construct detailed accretion rate
chronologies that could be compared to climate proxies. The tidal gauge record and indices of
global climatic oscillations proved particularly useful. Accretion rates in a high tidal range,
fetch- limited environment typically tracked changes in the long term position of annual mean
sea level. In contrast, in marshes situated in exposed embayments with lower tidal ranges,
accretion rates frequently correlated with short-term changes in mean sea level that are likely
forced by meteorological processes. Ironically, rates of salt marsh loss are apparently
decoupled from accretion rates, suggesting that accelerated sea level rise is not the principle
driver of marsh loss in these Long Island salt marshes. Instead, marsh loss rates closely track
patterns of anthropogenic influences. This marsh loss may be driven by eutrophication and
organic matter loading, which perturb the salt marsh sulfur cycle and lead to plant die-offs and
the deterioration of marsh peat. These findings suggests that the coastal environments that are
most impacted by human activities will be those that are most vulnerable to climate change.
Wetland restoration is possible, but should address the underlying causes of wetland loss to be
most successful.

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