ASSESSING THE "SEDIMENTATION DEFICIT" PROBLEM IN LOUISIANA'S COASTAL SALT MARSHES

Denise J. Reed[1] and Donald R. Cahoon[2]

Abstract

The imbalance between relative sea-level rise and vertical marsh accretion is frequently cited as a major factor in the problem of wetland loss in coastal Louisiana. Relative sea-level rise rates are high, compared to the rest of the Gulf coast, due to subsidence of Holocene Mississippi deltaic plain sediments, and although marsh accretion rates are also high, in comparison with other coastal areas of the United States, they are usually insufficient to maintain the relative elevation of the marsh surface. This situation is commonly referred to as a "sedimentation deficit". One of the problems with evaluating the magnitude of the "sedimentation deficit" problem in Louisiana and its spatial variation is that measurements of subsidence and marsh accretion or sedimentation are rarely made on similar time scales. Subsidence affecting the marsh surface is composed of a number of factors, including compaction of recently deposited sediments, regional downwarping, and diagenesis of underlying Pleistocene and earlier sediments. The total effect of these factors, in combination with eustatic sea-level rise, is frequently obtained form tide gauge measurements over the last 50 years or so. Subsidence is also measured by dating sedimentary horizons of unknown depth which characterize surface environments. Carbon-14 is a common tool for this type of study and subsidence is then averaged over periods of up to several thousand years.

In comparison, marsh accretion or sediment deposition can be measured over periods from several hundred years, using Lead-210 dating, to several days, using marsh surface sediment traps. The many techniques available for measuring the sedimentary status of the marsh surface can provide a variety of information concerning the processes responsible for sediment deposition and vertical accretion. Only when sedimentation measures are averaged over the same period as subsidence indicators, can a "sedimentation deficit" be established. Temporal and spatial variability in marsh surface sedimentation has been shown to be associated with proximity to sediment supply, the frequency and magnitude of storm events, local topography of the marsh surface, and vegetation type and vigor. The complexity of the process of marsh accretion will be examined, and data illustrating various aspects of the processes will be presented. The value of the "sedimentation deficit" concept will be assessed as a measure of the geologic processes contributing to wetland loss.

[1] Lousiaiana Universities Marine Consortium

[2] Louisiana Geological Survey