Freshwater input structures soil properties, vertical accretion, and nutrient accumulation of Georgia and U.S tidal marshes

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ABSTRACT: To identify relationships between freshwater input and marsh soil properties, measurements of bulk density, nutrients (carbon [C], nitrogen [N], phosphorus [P]), accretion, and accumulation were compared in tidal marshes of three estuaries of Georgia that varied in delivery of freshwater. Soil organic C and N (0-30 cm) were two times greater in marshes of the freshwater-dominated Altamaha River than in the salt marshes of Doboy Sound and Sapelo River. ^{137}Cs accretion and accumulation of organic C and N were three to five times greater in freshwaterdominated marshes than in salt marshes. The patterns observed in Georgia marshes were geographically general; data for tidal freshwater and brackish marsh soils compiled from 61 studies in the conterminous United States showed lower bulk density and higher percent organic C and N than salt marshes, regardless of geographic region. Salinity, a proxy for freshwater input, was inversely correlated with percent soil organic C and N and with vertical accretion in Georgia marshes and in marshes elsewhere in the conterminous United States. There was no relationship between above- or belowground emergent plant production and salinity of Georgia marshes but the rate of root decomposition was positively related to salinity, and decomposition rate was negatively related to percent soil organic C and C accumulation. In Georgia tidal marshes and elsewhere, soil organic matter content and accumulation are mediated by freshwater through its effects on decomposition.