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This study examines the incorporation of vegetation into sedimentary organic matter on the modern marsh surface as it pertains to the stratigraphic record preserved at Sprague River salt marsh in order to investigate how changes in relative sea-level impact the structure of the marsh through time. Downcore isotopic trends largely reflect the dominant overlying vegetation because sedimentary organic matter in salt marshes is dominated by roots and rhizomes (Good et al., 1982). Few have attempted to connect the modern to the paleo-record to interpret stratigraphic changes downcore. The study focuses on the use of stable carbon isotopes to reconstruct changes in salt marsh structure.

Quadrats (2m x 2m) were set up along three east-west transects across the northern end of the marsh. From each quadrat, elevation was determined, percent cover of vegetation by species was estimated and surface sediments were collected for carbon isotope analysis and soil salinity determinations. *Juncus gerardii*, a C_3 plant with variable isotopic values, was sampled from each of the quadrats where it grew and analyzed for carbon isotopes to evaluate the influence of soil surface salinity on carbon isotope fractionation. Additionally, downcore isotopic analyses, characterization of rhizomes and stratigraphic description were performed on two vibracores from the northern end of Sprague Marsh.

At Sprague Marsh, the C_3/C_4 distribution is well represented in the isotopic composition of the surface soil in all sites except at low elevation, regularly flooded areas, in which the effects of allochthonous input and tidal removal of leaf litter artificially depress isotope values. Surface soil salinity across the marsh increased with distance from tidal influence; however they bore no relationship to trends observed in the isotopic variability of *Juncus gerardii*. Correlation of the two vibracores most notably identified a basal freshwater peat, two periods dominated by sediment deposition, one of which was likely the result of a slight local increase in sea level rise, two failed attempts at salt marsh plant colonization from the boundaries of the marsh, the establishment of the modern marsh and a large storm event. Isotopic analysis was determined to be of crucial significance in the assignment of peat units to a particular marsh zone, when qualitative rhizome characterization was insufficient.