Consistency in U.S. tidal wetland soil carbon densities: spatial and downcore trends of a field-based, community-generated dataset

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Tidal wetlands produce long-term soil organic carbon (C) stocks, and thus for C accounting purposes, we need accurate and precise information on the magnitude and spatial distribution of those stocks. To address this problem, we assembled and analyzed an unprecedented soil core dataset, and tested three strategies for estimating C stocks: applying average C stock values from syntheses of soil core data, applying models fit using empirical data and applied spatially using soil, vegetation and salinity maps, and relying on independently generated soil carbon maps that intersect with mapped tidal wetlands. We found that soil C maps had significant bias in C stock predictions. Further, variation in C density was not well-predicted based on geography, climate, salinity, or vegetation class. Instead, the assembled dataset showed that C density across the conterminous U.S. was normally distributed, with a narrow range of observations. Thus, the simplest strategy tested, applying the mean C stock (27 kg C m-3) to comprehensive tidal wetland maps, results in the most accurate C stock estimation. Using that approach, we conservatively estimated that the top meter of tidal wetland soil in the conterminous U.S. contains 0.72 petagrams of C.

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