How does the texture of added sediment affect carbon sequestration of restored coastal salt marshes?

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Salt marshes and their capacity to sequester carbon are threatened by coastal development and accelerated sea level rise (SLR); these threats are particularly acute in the northeastern US where coastlines are heavily populated and SLR is 3-4 times the global mean, effectively "squeezing" salt marshes. To abate the salt marsh squeeze, adding sediment to the surface of marshes is an increasingly prescribed restoration technique that aims to increase coastal resiliency by reducing the frequency of inundation, but it is unclear how sediment texture affects greenhouse gas (GHG; CO_2, CH_4, N_2O) emissions and net primary productivity (NPP). Using a full-factorial blocked field experiment established in 2021 (3 sites, 2 habitats (low, high marsh), and 3 sediment texture treatments (control, silt-loam dredge, sandy cobble)), we investigated how NPP and GHG emissions respond to different textures of added sediment across a tidal range gradient in coastal Connecticut. The sediment treatments represent textures available to managers in southern New England. In 2022, two years after sediment addition, we observed an interaction between sediment texture, site, and habitats, with higher NPP in silt-loam dredge treatments at some locations. Dredge plots also had higher fiddler crab burrowing activity and increased sediment nitrogen, which may contribute to elevated NPP. Overall, there were no detectable effects of sediment texture on soil GHG emissions. CH_4 emissions were negatively correlated to aboveground biomass production and crab burrowing activity, both factors that increase oxygen in the rhizosphere; CO_2 emissions were positively correlated with percent inundation frequency and time since low tide, indicating that more soil oxygenation and tidal pressure might increase emissions. Together, our research will further scientific understanding of how sediment addition alters vegetation recovery and carbon sequestration, as well as help inform restoration decisions for New England salt marshes.