Nutrient enrichment effects on roots, rhizomes, and peat in a system dominated by sediment depositional processes

We examined belowground structure in coastal marshes of the North Inlet Winyah Bay system, a National Estuarine Research Reserve (NERR) in South Carolina, USA. In this observational study we included the Debidue Creek (located approximately 1 km south of a 40 year old residential development) and Goat Island (a site with an ongoing longterm fertilization experiment) to examine belowground structure of roots, rhizomes, and peat using CT imaging. We observed a significant increase in coarse roots, rhizomes, and peat associated with 12 years of fertilization (nitrogen and phosphorus) at Goat Island. The upper Debidue Creek station was located adjacent to an oyster reef that had been receiving residential wastewater effluent since the 1970s. This station had significantly fewer coarse roots and rhizomes compared to the belowground structure of the marshes at the mouth of the Debidue Creek. Although there were fewer rhizomes in the upper Debidue Creek, the diameter of the rhizomes was significantly greater in the upper Debidue than at the mouth, and twice the magnitude of the rhizomes observed at the 12 year fertilized Goat Island marsh. The peat at the upper Debidue had a significantly greater particle density and appeared more waterlogged with lower accumulation of organic matter than observed at the Debidue mouth. Our observations at the upper Debidue Creek are similar to CT images from disappearing Jamaica Bay marshes (NY), which also have received long-term effluent exposure (over seven decades). Twelve years of fertilization (i.e., at Goat Island) resulted in a buildup of coarse roots, rhizomes and peat in these minerogenic marshes, but long term (over 3 decades) effluent inputs may alter the below ground organic

matter accumulation, resulting in fewer roots and rhizomes and more waterlogged peat (i.e., at upper Debidue creek).

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