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Water quality impacts from tidal flooding in the northeast coast of the U.S.

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Little is known about the chemical and biological effects of tidal flooding on adjacent aquatic environments. Terrestrial systems accumulate various types of organic and inorganic matter that can be dissolved or carried into adjacent water bodies as floodwaters recede. In the northeast coast of the United States, the incidence and duration of coastal flooding has increased due to the high relative rates of sea level rise in the region. Much of this flooding is tidal, occurring in the absence of rainfall during spring tides and/or when wind-induced Ekman transport is onshore. While there are estimates of stormwater inputs into coastal systems, material (e.g., sediment, nutrients and contaminating bacteria) transported into the water bodies as tidal floodwaters recede have not been measured. Here, we will report estimates of nutrient loads transported in receding floodwaters during tidal flooding associated with perigean spring tides in 2017, 2018, and 2019. During each of the three years, at the highest point of the tide trained, citizen scientists were deployed to areas known to routinely flood in the Lafayette River watershed, a sub-tributary of the lower Chesapeake Bay, located in Norfolk, Virginia (USA). More than 100 samples were collected during each year as the flood waters retreated. Particulate carbon and nitrogen, total dissolved nitrogen, ammonium, nitrite, nitrate, urea, and phosphate were analyzed using standard colorimetric methods. Additionally, samples were analyzed for Enterococcus abundance each year. Results suggest that dissolved inorganic nitrogen loading during a single tidal flooding event exceeds the total annual load allocated for runoff in this sub-estuary. Because tidal flooding is projected to increase in the future as sea level continues to rise, further research should proceed to better constraint the amounts and characteristics of loadings associated to tidal flooding events. Furthermore, these results suggest that managers should consider nutrient inputs via coastal flooding when setting restoration goals and targets.