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# Patterns and drivers of nutrient trends in flood-impacted surface waters: Insights from Bayesian modeling approaches

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Extreme events, including regional floods caused by hurricanes, have the potential to mobilize and transport nutrients across the landscape, creating public and environmental health concerns. Several studies have characterized the contaminants in floodwaters, but few studies offer insights into which watershed characteristics explain flood water quality signatures. To address lack of understanding on flood water quality descriptors, we aimed to explain floodwater nutrient concentrations as a function of different environmental variables. Specifically, we quantified nitrogen and phosphorus concentrations in floodwaters across the Atlantic Coastal Plain of North Carolina (USA) after Hurricane Florence, a major tropical storm that delivered up to 700 mm of rainfall to the region during September 2018. We also constructed a multivariate, spatial Bayesian model to explain nutrient responses as a function of different hydroclimatic factors, land use classifications, and nearby pollution point sources. Nutrient samples were collected at 51 different sites at four different time points spanning a year after Hurricane Florence impact: during major flood conditions and after floodwaters had receded. Samples were assessed for total Kjeldahl nitrogen, total ammonia nitrogen, nitrate and nitrites, total phosphorus, and orthophosphate. Results from this analysis show that nutrient concentrations were very low in floodwaters, with the exception of several sites that exhibited excessively high total Kjeldahl nitrogen, total phosphorus, and orthophosphate concentrations. Furthermore, modeling results indicate that swine production facilities (concentrated animal feeding operations; CAFOs), wastewater treatment plant (WWTP) proximity, and precipitation variables were important in explaining nutrient concentrations in floodwaters. This research suggests that swine CAFOs and WWTPs were likely sources of nutrient exports associated with Hurricane Florence, with rainfall amount being a primary driver.