Title: How does mercury methylation respond to intensive forest management and the creation of anoxia in floodplain soils?

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Project Abstract:
It is well known that silvicultural practices such as clear-cutting and thinning would alter productivity and hydrology of forest watersheds, which may also mediate a mercury (Hg) cycling response involving methylmercury (MeHg) production. In this study, we are conducting a field study with three transects covering the upland, midland riparian, and wetlands within thinned, clearcut and uncut control areas within a first-order watershed in the lower Atlantic coastal plain on the Santee Experimental Forest in South Carolina, USA. Each transect is instrumented to monitor soil moisture, temperature, redox, water table depth, and insolation. Commencing July 2021, we collected monthly composite soil samples (0-10 cm) at each site. From the initial data in July and August 2021, we found that the soil organic matter content increased significantly from upland (7.46 %) and midland (9.37 %) to lowland (18.55 %) ($p<0.05$). Due to the intimate association of Hg with soil organic matter, total Hg content followed this trend, i.e., upland (35.00 ng/g) and midland (48.49 ng/g), to lowland (75.14 ng/g) ($p<0.05$). We also observed a similar spatial trend of toxic MeHg, i.e., upland (0.34 ng/g) and midland (0.35 ng/g), to lowland (0.50 ng/g) ($p<0.05$). When we compared MeHg levels across treatments at the same spatial position of the transect, we found that soils had much significantly higher MeHg in both harvest (0.75-0.77 ng/g) and thinning (0.66-0.70 ng/g) treatments in both upland and midland than the control upland and midland (0.34-0.37 ng/g) ($p<0.05$), but we found the opposite results for the lowland wetland site (i.e., 1.59 ng/g for control, 0.79 ng/g for harvest, and 1.32 ng/g for thinning). Additional field sampling through September 2022 will help affirm these spatial differences, if any