Title: Testing Mechanisms of How Mycorrhizal Associations Affect Forest Soil Carbon and Nitrogen Cycling

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Project Abstract: Mycorrhizal fungi provide plants with nutrients in return for photosynthate, linking above and belowground processes. Forests dominated by arbuscular (AM) versus ectomycorrhizal (EcM) fungi differ in total soil carbon (C) and nitrogen (N) pools, but their effect on the distribution of C and N within mineral soils is uncertain. We measured the effects of mycorrhizal associations on the distribution of soil C and N among particulate and mineral fractions in four forests across the Eastern United States, which had gradients of EcM-associated tree basal area but differed in their dominant tree families. Within each plot, we used ITS sequencing to characterize communities of EcM fungi. We expected that the amount of C and N in mineral-associated pools would decrease as the basal area of EcM trees increased, but that pattern was only observed in half of our sites. We found that the EcM fungal communities and the dominant tree families were better predictors of mineral-associated C and N than the proportion of EcM-associated trees. Thus, not all EcM fungi have similar effects on soil biogeochemistry. We are currently investigating two hypothesized drivers for how soil C and N are affected by mycorrhizal associations: inherent differences in 1) litter quality and 2) nutrient acquisition strategies in a large scale in situ decomposition experiment with six different types of dual ^{13}C and ^{15}N-labeled litter. We have placed litter in soil mesocosms at forests in NH, IL, and GA where each have six plots differing in the abundance of EcM-associated trees and the family of the dominant EcM trees. Our initial results suggest that fungal communities are more important drivers of how soil carbon and nitrogen are stored than litter quality. We will explore the implications of these findings for soil carbon storage using a modified CORPSE model that takes into account differences in fungal community function.