# Emergent Properties of Deadwood in Canopy Openings: A Response of the Wood Inhabiting Fungal Community to Manipulation of Forest Structure

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Wind disturbance in northern hardwood forests creates heterogeneously distributed structural attributes such as downed woody debris (DWD) across temporal and spatial scales. Wood inhabiting fungi (WIF) contribute to ecosystem carbon (C) dynamics through their role in deadwood turnover and long-term C storage. Deadwood reductions linked to forest management may alter WIF richness and composition, thus indirectly influencing the persistence of deadwood and its contribution to C and nutrient cycling. Forest structural complexity was manipulated via canopy gap creation and DWD addition that mimic natural disturbance by windfall within a deciduous northern hardwood forest (Wisconsin, United States) to examine its effect on deadwood-associated biodiversity and function. Experimental sugar maple (*Acer saccharum*) logs were resampled 10 years after placement and profiled using high throughput sequencing techniques to determine the assembly of fungal community composition and its relationship to wood decay rates. We built on previous studies at the experimental site that reported enhanced fungal abundance and richness in response to increased structural complexity (i.e., gaps plus CWD), and a negative relationship between DWD respiration and fungal richness 4 and 5 years after treatment. Canopy gap creation was more important in shaping overall fungal community composition than was DWD addition, but overall structural complexity was not a significant predictor of fungal operational taxonomic units (OTU) richness. The WIF community possibly responded to gap disturbance by favoring species able to persist under more extreme microclimates caused by gaps. The species assemblage in the DWD treatment was unique to other treatments, where consistent microclimatic conditions and the abundance of DWD substrates may have favored host specialists. Fungal-OTU richness was significantly and inversely related to DWD decay rates, likely due to competition for resources. In contrast, fungal-OTU composition was not significantly related to DWD decay rates, canopy openness or DWD-addition amounts. Our study site represents a diverse fungal community in which complex interactions among wood inhabiting organisms and abiotic factors are likely to slow DWD decomposition, indicating an opportunity to enhance C storage capacity within northern hardwood forests by maintaining a biodiverse and microsite-rich ecosystem.

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