

Infestations of hemlock woolly adelgid are associated with changes in eastern hemlock ectomycorrhizal fungal communities and soil conditions

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In the northeastern United States, populations of eastern hemlock (*Tsuga canadensis*) are declining due to defoliation by the introduced invasive insect, the hemlock woolly adelgid (*Adelges tsugae*). Ectomycorrhizal fungal communities, soil chemistry, and soil nutrient cycling associated with eastern hemlock may be affected by adelgid-induced defoliation. To make predictions for changes in eastern US forests after eastern hemlocks die, it is important to understand how the ectomycorrhizal fungal communities and soil conditions that are associated with healthy hemlock stands are changing as a result of infestation of hemlock woolly adelgid. In Black Rock Forest of southern New York, ectomycorrhizal fungal communities and soil chemistry variables were compared between eastern hemlock stands that were infested with hemlock woolly adelgid with those that were relatively healthy. Results of this study showed that hemlock defoliation associated with hemlock woolly adelgid infestations results in lower ectomycorrhizal fungal richness and root tip density. Results of Sørensen's quantitative index suggest that the decline in ectomycorrhizal fungal richness and root tip density does not result in a very different ectomycorrhizal fungal community composition, but that all morphotypes decline in number, though some of the rarest species are eliminated. Hemlock woolly adelgid infestation also results in higher soil C/N, higher soil NO₃⁻ concentrations, higher soil NH₄⁺ concentrations, and faster net nitrification. Changes in ectomycorrhizal fungal communities and soil chemistry show that the decline of the eastern hemlock could have a large impact on the soil ecology of eastern forests.