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Can plantations develop understory biological and physical attributes of naturally regenerated forests?

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ABSTRACT

With an increasing proportion of natural forests being replaced by plantations, there is a need to determine their potential to fulfill ecological purposes other than wood production. This study evaluated the extent to which deciduous and coniferous plantations develop understory attributes comparable to those of naturally regenerated stands. A functional group approach was used to synthesise species responses in terms of their ecological traits. Multivariate analyses of ecological traits revealed 16 emergent groups that shared common traits associated with a similar life history strategy. Responses of these groups, understory structure, and understory environmental conditions to plantation types and stand stages were analyzed and compared to naturally regenerated stands. Clear associations of trait responses to stand developmental stages and plantation types emerged. Light-demanding and wind-dispersed species groups were associated with early-successional stages, while woody groups, ferns and ant-dispersed spring-flowering herbs were associated with late-successional stages. Analyses also revealed an indicator group associated with old naturally regenerated forest. The understory functional groups and environmental conditions of deciduous plantations converged toward those of old naturally regenerated forests. However, understory structure in deciduous plantations remained poorly developed and richness of the indicator group was low compared to unplanted stands. Conifer plantations, currently the most common plantation type in the northern hardwood biome, showed a completely different pathway of understory development. Modifications to current plantation management practices are proposed to help recreate or maintain natural understory biological and physical attributes.

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1. Introduction

Around 60,000 km² of primary forest are lost or modified annually by human interventions around the globe (FAO, 2007). In many regions, this marked loss of natural forests has been offset by the rapid increase in forested lands allocated to plantations (FAO, 2007). While plantations

provide tree cover and forest wood products, little is known about their potential to fulfill other ecological services typical of the ecosystems that they are replacing, such as the maintenance of biodiversity. The question has arisen therefore whether plantations can develop ecological attributes similar to naturally regenerated forest ecosystems over time.

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