
Drivers of riparian plant community restoration after tree planting: role of plant succession and time-versus-space dispersal

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Abstract

The restoration of plant communities requires not only suitable ecological niches, but also efficient sources of propagules. This study aims to identify the contribution of time versus space dispersal as well as local abiotic drivers to the species turnover induced by tree planting on riparian plant communities.

Fifty-one riparian zones planted with trees along a 17-yr chronosequence and fourteen riparian forests were sampled among two agricultural watersheds of southern Québec, and characterized by botanical surveys and environmental measurements (17 variables). Soil seed banks were additionally studied for five riparian forests, five tree-planted and five (unplanted) herbaceous riparian zones.

Principal Response Curves revealed that the composition of riparian plant communities remained stable during the 12 years after tree planting, but then abruptly shifted and became similar to riparian forest 17 years after planting. This two-step species turnover was synchronized with light availability: once canopy cover reached 40%, species typical of riparian forests recovered. While species assembly in riparian communities was poorly related to soil seed banks (as shown by nMDS), it was largely conditioned by down-river spatial processes (modelled by Asymmetric Eigenvectors Maps) which contributed for 16.46% to species

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composition (once the effect -22%- of environmental variables partialled out). According to RDA-RegTree, plant species primarily responded to upstream-downstream gradients based on their seed traits.

Tree planting efficiently re-established forest plant communities in riparian zones by restoring suitable ecological niches and inducing a plant succession driven by light availability. Hydrochorous dispersal along rivers rather than soil seed banks promotes this re-establishment.

Keywords: plant community, riparian zones, spatial processes, threshold dynamics, vegetation recovery