# Capitalizing on the Mycorrhizal Relationships of Tree Seedlings to Enhance Restoration Success in Changing Climates

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Ambitious reforestation targets to combat climate change will require expansion and optimization of the reforestation pipeline. Successful transplantation of nursery grown seedlings is a key bottleneck in this pipeline. While the impact of seed sourcing is well documented, less is known about how the nursery environment itself can prepare seedlings for success or failure in particular conditions after transplanting. Nursery conditions may increase transplanted success by recruitment of locally adapted microbial associations, especially root symbiotic fungi. Mycorrhizal fungi are key mediators of tree tolerance to abiotic conditions, such as nutrient or drought stress. Mycorrhizal associations developed during nursery production may have unintentional effects on restoration success. While underexplored, nursery seedlings are known to develop diverse fungal associations, which can have consequences for out planting success. Here we assess the effect of nursery management and location on rhizosphere microbial communities on bare-root seedling stock for a diversity of species. To assess whether bare-root seedlings bring different fungal communities to planting sites, we obtained seedlings from four public bare root nurseries (one each in IA, MO, IL, and WI), as well as a private nursery in northern IL. We obtained 2-5 species from each nursery, including a mix of softwood and hardwood species, and species that associate with both arbuscular and ectomycorrhizal fungi. We characterized the fungal communities on seedling roots using the ITS2 gene. The sequences were clustered into exact sequence variations and identified to species level. We used the FungalTraits database to assign fungal species to ecological guilds (Arbuscular Mycorrhiza and Ectomycorrhiza). A permutation MANOVA tested whether fungal community composition differed by nursery, while controlling for seedling genus. Soil fungal communities differed strongly between softwood (conifers) versus hardwoods (Angiosperms), but within these tree groups nursery location had the strongest control over fungal communities. There were fungal differences at ecological guilds within nurseries. We are currently assessing survival and growth of transplanted seedlings in ambient and droughted conditions in a central Illinois old growth forest. Documenting fungal associates of bare root seedlings of nurseries across the Midwest leads to assessment of tree-fungal interactions in nursery management practices that may lead to improved transplant success in restoration practices.

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