

# Restoration age affects microbial-herbaceous plant interactions in an oak woodland

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## Abstract

In degraded ecosystems, soil microbial communities (SMCs) may influence the outcomes of ecological restoration. Restoration practices can affect SMCs, though it is unclear how variation in the onset of restoration activities in woodlands affects SMCs, how those SMCs influence the performance of hard-to-establish woodland forbs, and how different woodland forbs shape SMCs. In this study, we quantified soil properties and species abundances in an oak woodland restoration chronosequence (young, intermediate, and old restorations). We measured growth of three woodland forb species when inoculated with live whole-soil from young, intermediate, or old restorations. We used DNA metabarcoding to characterize SMCs of each inoculum treatment and the soil after conditioning by each plant species. Our goals were to: 1) understand how time since onset of restoration affected soil abiotic properties, plant communities, and SMCs in a restoration chronosequence, 2) test growth-responses of three forb species to whole-soil inoculum from restoration sites, and 3) characterize changes in SMCs before and after conditioning by each forb species. Younger restored woodlands had greater fire-sensitive tree species and lower concentrations of soil phosphorus than intermediate or older restored woodlands. Bacterial and fungal soil communities varied significantly among sites. Forbs exhibited greater growth in soil from the young restoration. Each forb species developed unique soil microbial community. Our results highlight how restoration practices affect SMCs, which can in turn affect growth of hard-to-establish forb species. Our results also highlight that the choice of forb species can have major effects on SMCs, with long-term potential consequences for restoration success.

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