

# Patch specific composition and activity of soil microbial populations in a semi-arid urban ecosystem

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## Abstract:

As the majority of people begin to live in cities, we become more and more dependent on the provision of ecosystem services by these urban ecosystems. The nature of the urban environment, specifically, direct and indirect effects of urban land use on soil properties can greatly alter soil processes within these ecosystems. Understanding the responsiveness of microbes to the urban environment, the quality of urban soils, and the ability to mitigate urban soil conditions will improve our ability to manage urban soils to provide ecosystem services. In the spring of 2009, we began a survey of urban soils in Tucson, Arizona, USA to investigate how soil microbial communities and biogeochemical functioning varies across the urban landscape. This survey includes analyses of the soils of green infrastructure modifications such as rain gardens to see if urban soil conditions can be ameliorated with such interventions. Here we present the results of a microcosm experiment where solutions reflecting urban chemical modifications (added C, N deposition, metal contamination) were added to soils to gauge the responsiveness of microbial communities to these chemical stressors. We additionally were interested in assessing whether microbial communities show any local adaptations to the urban environment. We compare soils from urban patches (rain gardens, parks, native remnant, and industrial sites) with non-urban soils. Urban rain gardens were found to have the highest labile soil C and also contained the highest functional diversity of soil microbial communities, indicating that urban conditions can be improved with small-scale interventions. Additionally, urban microbial communities showed more activity when heavy metals were added to soil microcosms, indicating that they may be adapted or acclimated to urban soil conditions. The preliminary results of this study suggest that microbial communities in some habitats within urban ecosystems may show some acclimation to the conditions of the urban environment, and that interventions to mitigate soils can ameliorate urban soils to support the functioning of microbial communities.

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