

The effects of local filtering processes on the structure and functioning of native plant communities in experimental urban habitats

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Abstract

Despite a growing literature-base devoted to documenting biodiversity patterns in cities, little is known about the processes that influence these patterns, and whether they are consistent over time. In particular, numerous studies have identified the capacity of cities to host a rich diversity of plant species. This trend, however, is driven primarily by introduced species, which comprise a large proportion of the urban species pool relative to natives. Using an experimental common garden study, we assessed the relative influence of local assembly processes (i.e., soil environmental filtering and competition from spontaneous urban species) on the taxonomic and functional diversity of native plant communities sampled over four seasons in 2016-2018. Taxonomic and functional diversity exhibited different responses to local processes, supporting the general conclusion that species- and trait-based measures of biodiversity offer distinct insights into community assembly dynamics. Additionally, we found that neither soil nor competition from spontaneous urban species influenced taxonomic or functional composition of native species. Functional composition, however, did shift strongly over time and was driven by community-weighted mean differences in both measured traits (maximum height, Hmax; specific leaf area, SLA; leaf chlorophyll a fluorescence, chl a) and the relative proportions of different functional groups (legumes, annual and biennial-perennial species, C4 grasses, and forbs). In contrast, taxonomic composition only diverged between early and late seasons. Overall, our results indicate that native species are not only capable of establishing and persisting in vacant urban habitats, they can functionally respond to local filtering pressures over time. This suggests that regional dispersal limitation may be a primary factor limiting native species in urban environments. Thus, future greening and management plans should focus on enhancing the dispersal potential of native plant species in urban environments, in order to achieve set goals for increasing native species diversity and associated ecosystem services in cities.

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