

Dissertation Defense

Plant Migration Along Freeways In and Around an Arid Urban Area: Phoenix, Arizona

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General ecological thought pertaining to plant biology, conservation, and urban areas has rested on two potentially contradictory underlying assumptions. The first is that non-native plants can spread easily from human developments to "pristine" areas. The second is that native plants cannot disperse through developed areas. Both assume anthropogenic changes to ecosystems create conditions that favor non-native plants and hinder native species. However, it is just as likely that anthropogenic alterations of habitats will favor certain groups of plant species with similar functional traits, whether native or not.

Migration of plants can be divided into the following stages: dispersal, germination, establishment, reproduction and spread. Functional traits of species determine which are most successful at each of the stages of invasion or range enlargement. I studied the traits that allow both native and non-native plant species to disperse into freeway corridors, germinate, establish, reproduce, and then disperse along those corridors in Phoenix, Arizona. Field methods included seed bank sample collection and germination, vegetation surveys, and seed trapping. I also evaluated concentrations of plant-available nitrate as a result of localized nitrogen deposition. While many plant species found on the roadsides are either landscape varieties or typical weedy species, some uncommon native species and unexpected non-native species were also encountered. Maintenance regimes greatly influence the amount of vegetative cover and species composition along roadsides. Understanding which traits permit success at various stages of the invasion process indicates whether it is native, non-native, or species with particular traits that are likely to move through the city and establish in the desert.

In a related case study conducted in Victoria, Australia, transportation professionals and ecologists were surveyed regarding preferences for roadside landscape design. Roadside design and maintenance projects are typically influenced by different groups of transportation professionals at various stages in a linear project cycle. Landscape architects and design professionals have distinct preferences and priorities compared to other transportation professionals and trained ecologists. The case study reveals the need for collaboration throughout the stages of design, construction and maintenance in order to efficiently manage roadsides for multiple priorities.