



# Neighborhood Effects on Arthropod Diversity and Food Webs

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## Abstract

Recent studies in the CAP-LTER region using the native Sonoran desert plant, brittlebush (*Encelia farinosa*) have indicated that desert remnants behave more like urban mesic yards than the outlying desert and urban habitats exhibit a reduction in species diversity and altered species composition. Consequently, urbanization results in changing the food web structure and dynamics in urban areas. Here, we investigate whether local neighborhood landscaping affects biodiversity and food web structure and function of arthropod communities. North Desert Village (NDV) has four residential landscape types including mesic, native, xeric and oasis. Each of these neighborhoods have been supplemented with 6 brittlebush plants. Plant productivity, arthropod diversity, abundance and biomass will be assessed monthly. In addition, herbivory damage will be assessed monthly by randomly selecting branches and quantifying leaf damage. Species diversity and abundance of the trophic guilds will then be compared across landscape types. Food web structure and dynamics at this local scale will be compared to brittlebush in outlying desert areas and desert remnants from complimentary studies of brittlebush. This study will be one of the first to investigate human impacts on trophic structure and dynamics at the spatial scale of entire neighborhoods in a human manipulated landscape.

## Introduction

Previous investigations within the larger CAP-LTER region show that food web structure and dynamics are radically altered in urban mesic and urban desert remnants relative to outlying deserts (Faeth et al, 2005). These studies involved a native Sonoran desert plant, brittlebush, where avian predators (top-down) and water resources (bottom-up) factors were manipulated. The results showed that 1) species diversity is reduced and species composition is altered in urban habitats, 2) desert remnants behave, in terms of seasonality and arthropod abundances, and response to top-down and bottom-up forces, more like mesic yards than their outlying desert counterparts, 3) predation becomes a more important force in urban habitats, presumably because of higher and more stable abundances of avian predators throughout the year. In short, these experiments, the first of their kind in urban environments, indicate that urbanization dramatically alters the structure and dynamics of food webs. Because all species interact within food webs, understanding these changes is critical to management of habitats, species diversity, and invasive species in rapidly expanding urban areas.

NDV presents a unique opportunity to expand these studies at a different spatial scale – that of the neighborhood within a given locality, as opposed to our previous and ongoing studies at the regional scale. Our basic question is: **do local neighborhood landscaping practices alter biodiversity and food web structure and function of arthropod communities?** To address this question, we will use the common and native brittlebush plant as the focal resource base for arthropod communities.



North Desert Village Study Area



From top clockwise: Mesic, Native, Xeric and Oasis neighborhoods. North Desert Village Study Area

## Methods

A common resource plant, *E. farinosa* has been established at NDV with 6 plants in each treatment. We will continue monitoring established plantings of brittlebush at NDV in the mesic, native, xeric and oasis landscapes. Monthly arthropod sampling of brittlebush will be performed using sweep nets or a vacuum sampler. Herbivory damage will be assessed by randomly selecting branches and quantifying leaf damage. Arthropod samples will be sorted, counted and identified to family and feeding guild (eg. herbivore, predator, parasite etc). In addition, length and width measurements of the specimens will be utilized to estimate biomass. Measurements of plant volume will be included to generate an estimate of plant biomass. Species diversity and abundance of the trophic guilds will then be compared across landscape types. Food web structure and dynamics at this local scale can then be compared to brittlebush in outlying desert areas and desert remnants as brittlebush studies continue in the Faeth lab.



Arthropod vacuum sampler



## Reference

Faeth, S.H., P.S. Warren, E. Shochat and W.A. Marussich. 2005. Urban trophic dynamics. *BioScience* 55(5):399-407.

