# Differences in arbuscular mycorrhizal fungal community structure at residential and desert land use types within the CAP LTER

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## INTRODUCTION

Land transformation has been linked to decreases in biological diversity worldwide. Much of the blame for this decline in biodiversity can be placed on land transformation (Vitousek et al. 1997). Changes in community structure can be seen most vividly where lands that were once historically free from anthropogenic disturbances are converted to residential or urban centers. Plant community responses to anthropogenic disturbances may be critically linked to the dynamics and diversity of the arbuscular mycorrhizal (AM) fungal community (Bever et al. 2001). Allen (1991) defines mycorrhiza as "a mutualistic symbiosis between plant and fungus localized in a root or a root-like structure in which energy moves primarily from plant to fungus and inorganic resources move from fungus to plant." It is believed that roughly 90% of all higher plants have some sort of association with AM fungi (Kendrick and Berch1985).

How urbanization effects AM fungal diversity s still unclear (Cousins 2003). Preliminary results from the Survey 200 Pilot Study indicated that land use type, land use history and vegetation type may impact AM fungal community structure (Cousins 2003). Cousins (2003) showed that spore densities were found to be lower at residential sites in comparison to desert sites, but it was difficult to detect any other differences in AM fungal community structure because of the small number of sites in the Pilot Study. We are presenting the first part of an investigation comparing AM fungi at additional Survey 200 sites.

## METHODS/MATERIALS

Soil was collected from exotic plants at 10 sites classified as residential land-use and from native plants at 10 sites classified as desert land-use as part of the CAP LTER Survey 200 and used to start pot cultures in the greenhouse to obtain AM fungal spores for identification. Spores were collected by wet-sieving and decanting, followed by sucrose gradient centrifugation under a Leica dissecting microscope and mounted on slides in polyvinyl alcohol-lactic acid-glycerol (PVLG) (Koske and Tessier 1983) and PVLG mixed 1:1 (v/v) with Melzer's reagent. Identification was based on spore morphology observed using the Leitz and Nikon light microscope and compared to descriptions and voucher specimens from the International Culture Collection of Arbuscular and Vesicular-Arbuscular Mycorrhizal Fungi (INVAM) web page.

CAP LTER Survey 200 Site Map
Desert sites, Residential Sites

**Figure 1.** Total number of AM fungal species observed at each land-use type, the mean value of the number of AM fungal species found associated with each plant, and the mean value of the number or AM fungal species found at each land-use site.

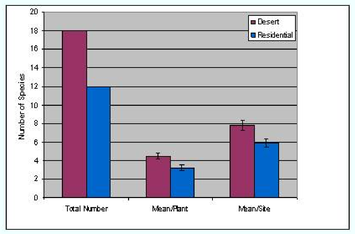



Figure 2 A. The relative frequency of each AM fungal species found. B. The number of sites each AM fungal species detected.

Figure 2 A.

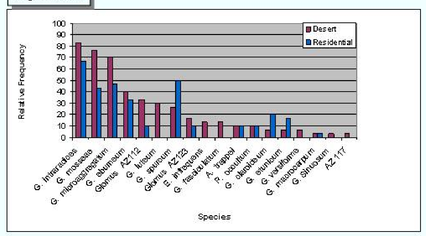



Figure 2 B.

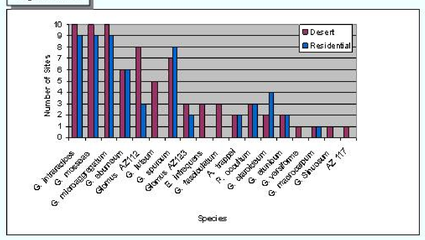
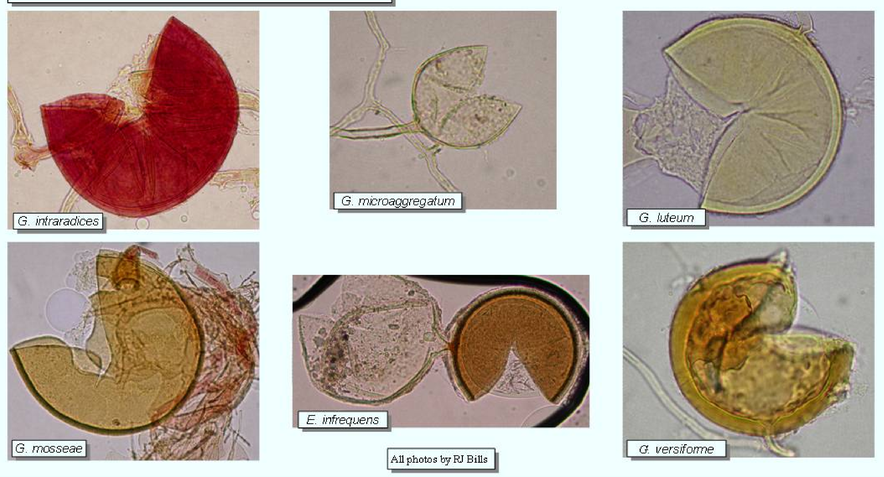



Figure 3. AM fungal species detected at sampling sites.




## RESULTS

- AM fungal species diversity was greater in deserts surrounding Phoenix in comparison to residential areas (Fig. 1). Almost twice as many AM fungal species were detected in the desert sites in comparison to residential sites. The mean number of AM fungal species per woody plant and the number of species detected at each site was greater at the desert sites in comparison to the residential sites.
- There was a significant overlap in the species composition between desert and residential sites. (Fig. 2). All species detected in the residential areas were also present at the desert sites. *Glomus intraradices*, *G. microaggregatum*, and *G. mosseae* were detected most frequently at both land-use types (Fig. 3). These 3 species and *G. eburneum* and *G. spurcum* were detected at over 60% of desert and residential sites.
- Some AM fungal species were unique to desert locations (Fig. 2). *Glomus luteum*, *Entrophospora infrequens*, *G. fasciculatum*, *G. versiforme*, *G. sinuosum*, and *G.* species AZ 117 were not detected at the residential sites. *Glomus luteum* was detected at 50% of the desert sites.

## CONCLUSION

AM fungal diversity was found to be different at the desert and residential sites. It is not known if these differences are due to urbanization or to differences between native and exotic plants. Future plans include the identification of AM fungal associations with native plants growing at residential sites.

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