Land-use type changes the belowground food-web in an arid, urban ecosystem.

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1. Introduction

• Arid, urban ecosystems experience high rates of land-use change including the installation of managed xeriscapes and irrigated turfgrass lawns in residential and commercial areas[1].

• Regular use of water and fertilizers in mesic, turfgrass lawns modifies soil microbial community structure, distribution, and function, which can alter N cycling pathways in arid cities[1,2].

• **It is unclear how land-use modifications affect belowground microflora and fauna in urban areas.**

2. Research Question and Hypothesis

• Who are the major groups of soil flora and fauna in an urban belowground ecosystem and how do populations change during the dry and monsoon seasons and across landscape type?

• **We hypothesize that increased resources (water and fertilizer) in mesic lawns will lead to an increase in soil food web biomass and functional groups relative to arid systems.**

3. Methods

• In the summer of 2011, we collected 48 soils at 10cm depth from 4 different land-use types **(Fig. 1)** within the Phoenix Metropolitan Area during dry and monsoon seasons[3].

• Soils were extracted for biomass counts of the major belowground feeding groups and were analyzed using a proc GLM in SAS for seasonal and site differences[3].

Fig. 1

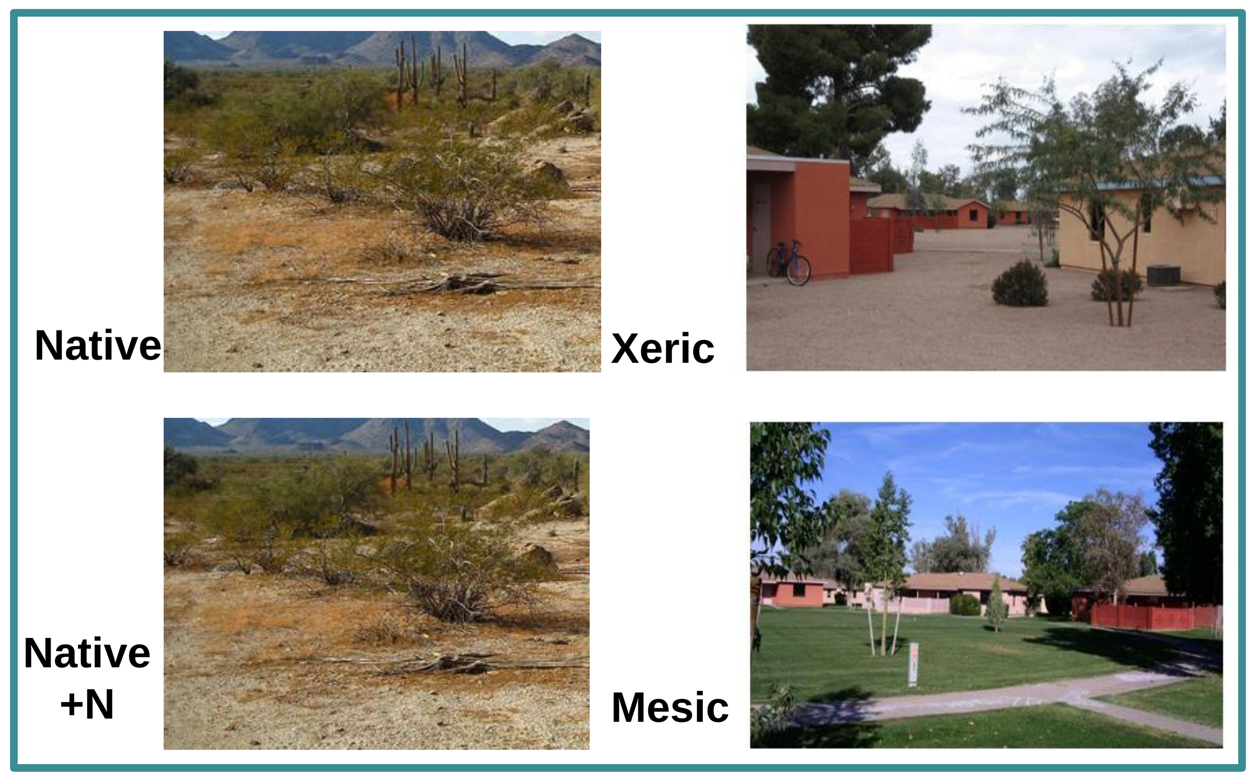


Fig. 2A-D – Brackets indicate significant seasonal difference within a site. Letters indicate a significant difference between sites for each season (p<0.05).

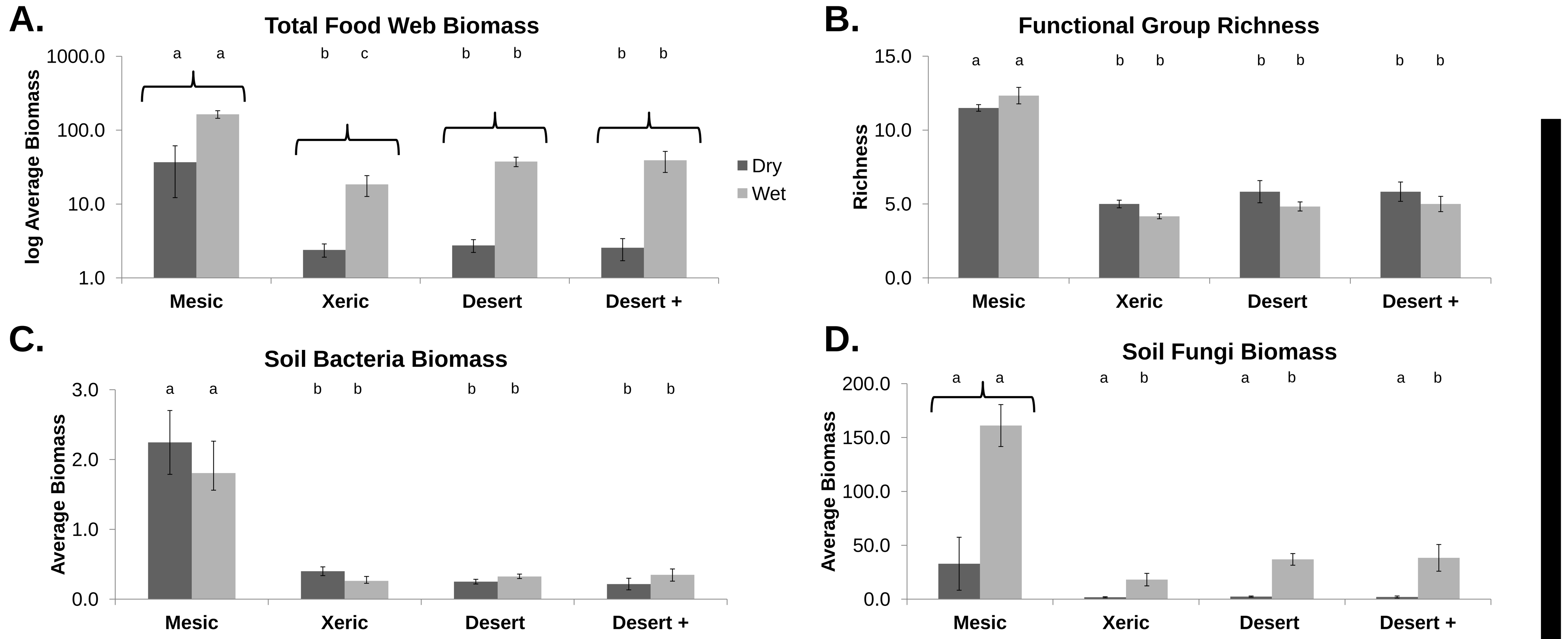


Fig. 3 – Visual depiction of food webs.

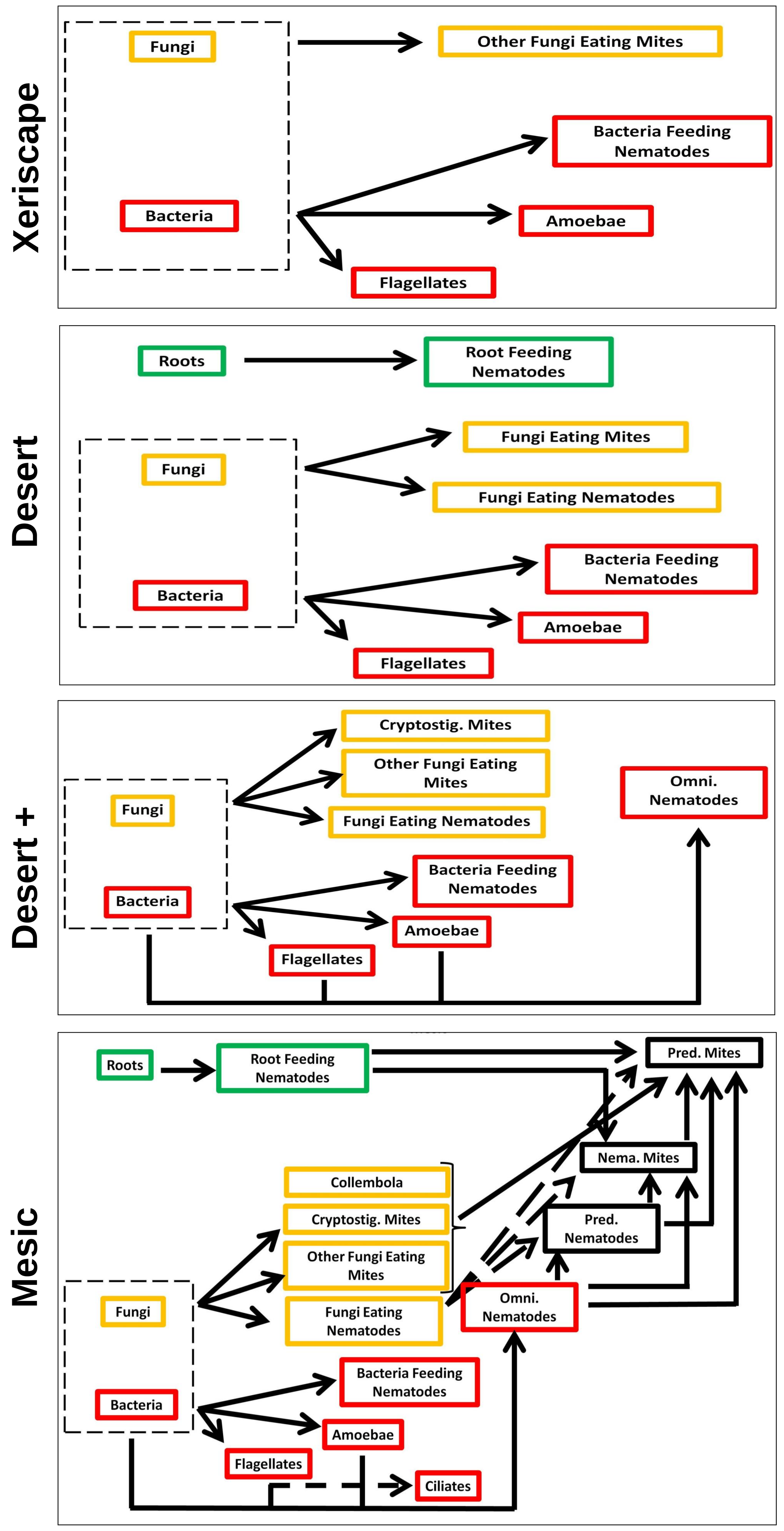


Fig. 4A-B – Biomasses of microarthropods and nematodes during the wet season.

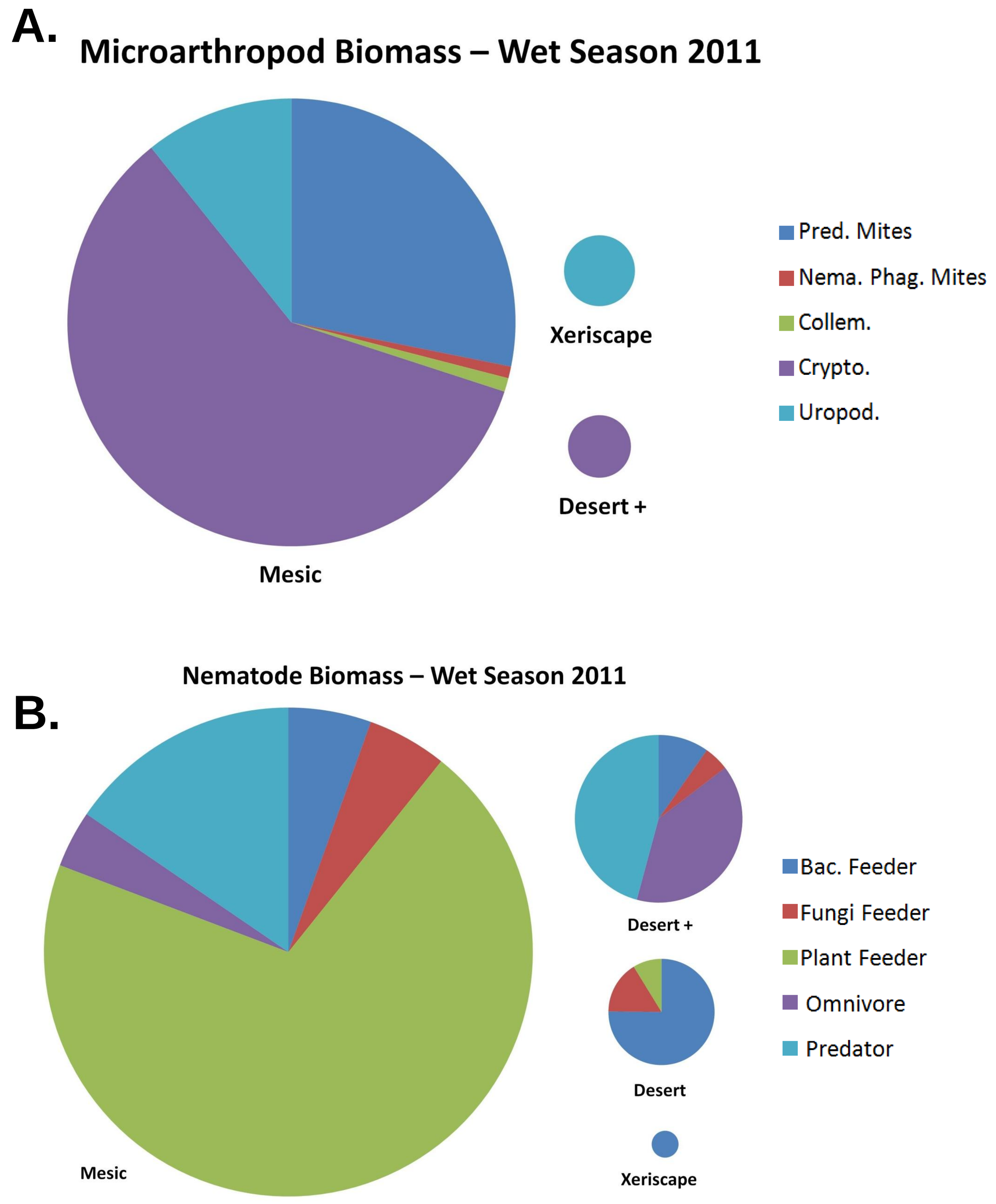
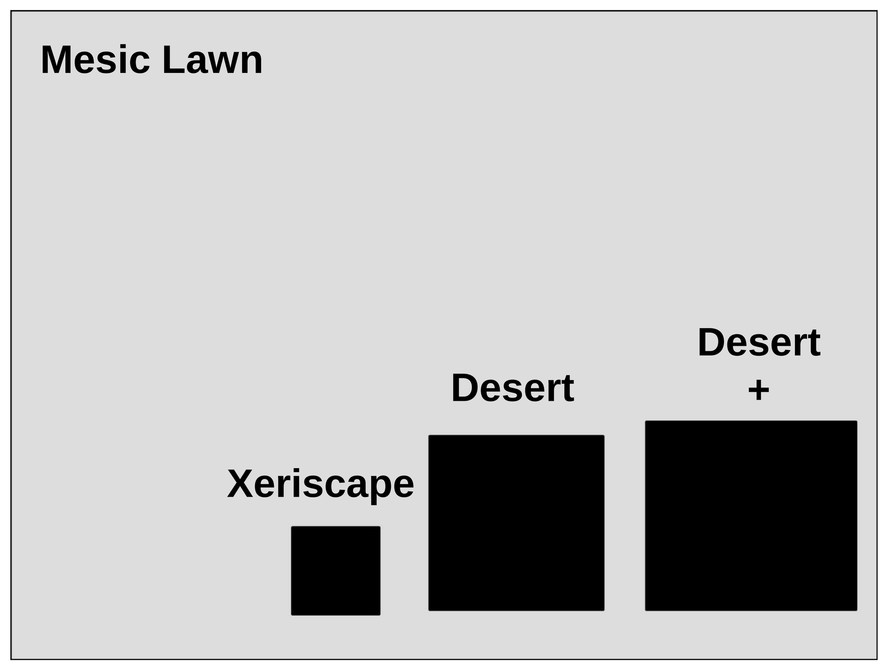


Fig. 5 – Relative sizes of each food web for the wet season.



4. Results

• **Fig. 2A –** There was a significant seasonal increase in food web biomass across all sites (**p<0.05**).

•**Fig. 2B –** The number of trophic groups were higher in the mesic sites, across both seasons, relative to the arid sites (**p<0.05**).

•**Fig. 2C –** Soil bacteria biomass deceased in mesic samples but increased in arid sites over the dry and wet seasons.

•**Fig. 2D -** Soil fungi biomass increased in all sites over the dry and wet seasons.

•**Fig 3 –** Visual depictions of soil food webs at each site show that mesic food webs are more complex than their arid counterparts.

•**Fig 4A –** Microarthropod biomass and feeding group richness was significantly greater in mesic samples than arid sites (**p<0.05**). Graphs are scaled to represent total biomass.

•**Fig 4B -** Nematode biomass and feeding group richness was significantly greater in mesic samples than arid sites. Graphs are scaled to represent total biomass (**p<0.05**).

5. Conclusions

• Mesic, turfgrass lawns are interesting ecosystems that have a food web similar to native grasslands[3].

• ~ Double the number of trophic levels and ~4-8x more belowground biomass than arid systems (**Fig. 5**)

• NPP of Turfgrass Lawns – 1,020 g m^{-2} yr^{-1}[4]; NPP of Sonoran Desert – 150 g m^{-2} yr^{-1}[5]

• Lawns represent an 'alien' landscape that supports a unique soil food web compared to arid, urban soils.

6. Next steps

• Aggregate and model data collected in 2011 and 2012 to help complete our understanding of the interactions between soil properties, soil food webs, microorganisms, and N cycling.

References

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