

How urbanization alters the top-down influence of herbivores on plant communities

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Introduction:

- Desert ecosystems are amongst the fastest urbanizing areas on the planet, causing desert plant communities to shift due to the influence urbanization has on plant productivity and community composition.
- Urbanization can increase the abundance and species richness of herbivores within the city, due to the concentration of food resources.
- Despite this assumption, previous research at the CAP-LTER has shown that herbivory at Sonoran Desert sites within and outside the city has led to equally reduced biomass.
- It is unclear whether this lack of difference in herbivory is the result of unaltered herbivore populations or altered activity levels that counteract the differences in population densities.
- We are quantitatively surveying small rodent populations at four sites inside and four sites outside of the city core during the fall and spring in order to determine whether abundances and diversity differ significantly between urban and rural sites.
- We hypothesize that there will be higher small rodent abundances inside the city, but greater diversity outside.



Methods:

- Small rodent surveys were conducted at eight Central Arizona-Phoenix Long-Term Ecological Research project (CAPLTER) sites (Figure 1).
 - Four sites inside of the city were paired with four sites outside of the city.
- Mice, squirrels, and rats were quantified using the live capture-release method:
 - 100 Sherman traps and 8 larger wire traps were baited and set for two consecutive nights. Rodents were identified the following mornings.
 - On each of four weekends, one set of paired sites were surveyed, with a total of 216 traps set per trapping event.
 - In order to target diurnal rodents, traps at each site were allotted 2-3 hrs of extra daylight before collection while data was being obtained from its pair.
 - Traps were placed in key habitat types, such as under Bursage, Palo Verde, etc.
 - Traps were scattered within a 20,000 square meters area at each site.
- Sites were surveyed in fall (September-October) and will be surveyed in the spring (March-May) in order to account for the fluctuation of populations with the seasons.

Results:

- Differences in small rodent abundances inside and outside of the city were found to be insignificant ($P = 0.11$) as seen in Graph 1.
- Graph 2 illustrates that the differences between small rodent species diversity inside and outside the city were also found to be insignificant ($P = 0.36$).
 - This may be due to the fact that the South Mountain sites had relatively high diversity when compared to the other urban sites.
- However, when comparing genus diversity inside and outside of the city, a significant difference was observed ($P = 0.04$), as illustrated in Graph 3.
- Trapping events so far also suggest that certain species can only be found in parks outside of the city as opposed to inside, and vice versa.
 - Merriam's Kangaroo Rat and Grasshopper Mice for example, were only identified at rural sites, and are absent from all four urban sites. In addition, Deermice were only identified at sites within the city.
- The data also suggests that the small rodents varied in size, with the rodents inside the city weighing in at a site-scale average of 25.27 g, and the rodents outside of the city weighing in at a site-scale average of 38.69 g.

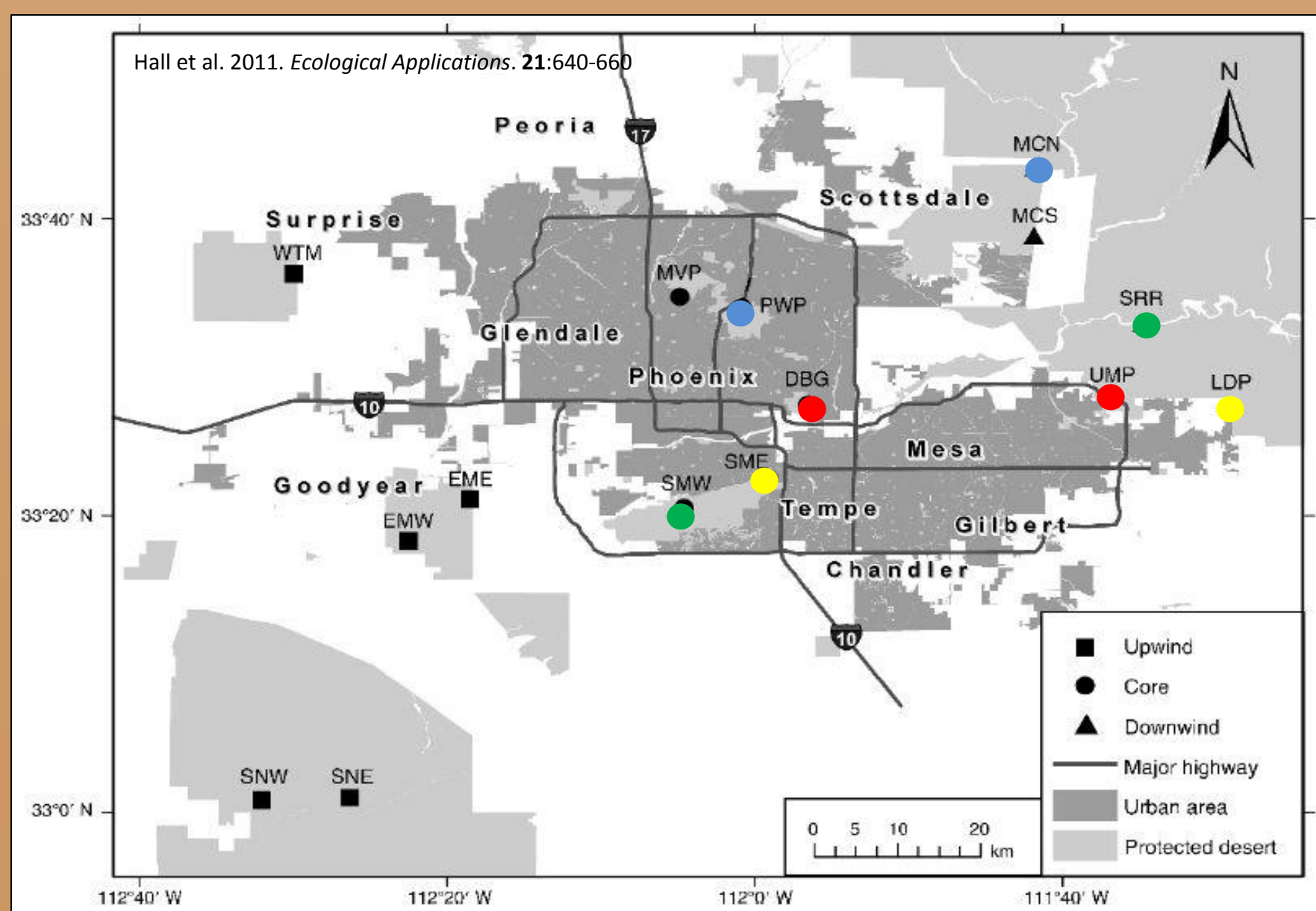
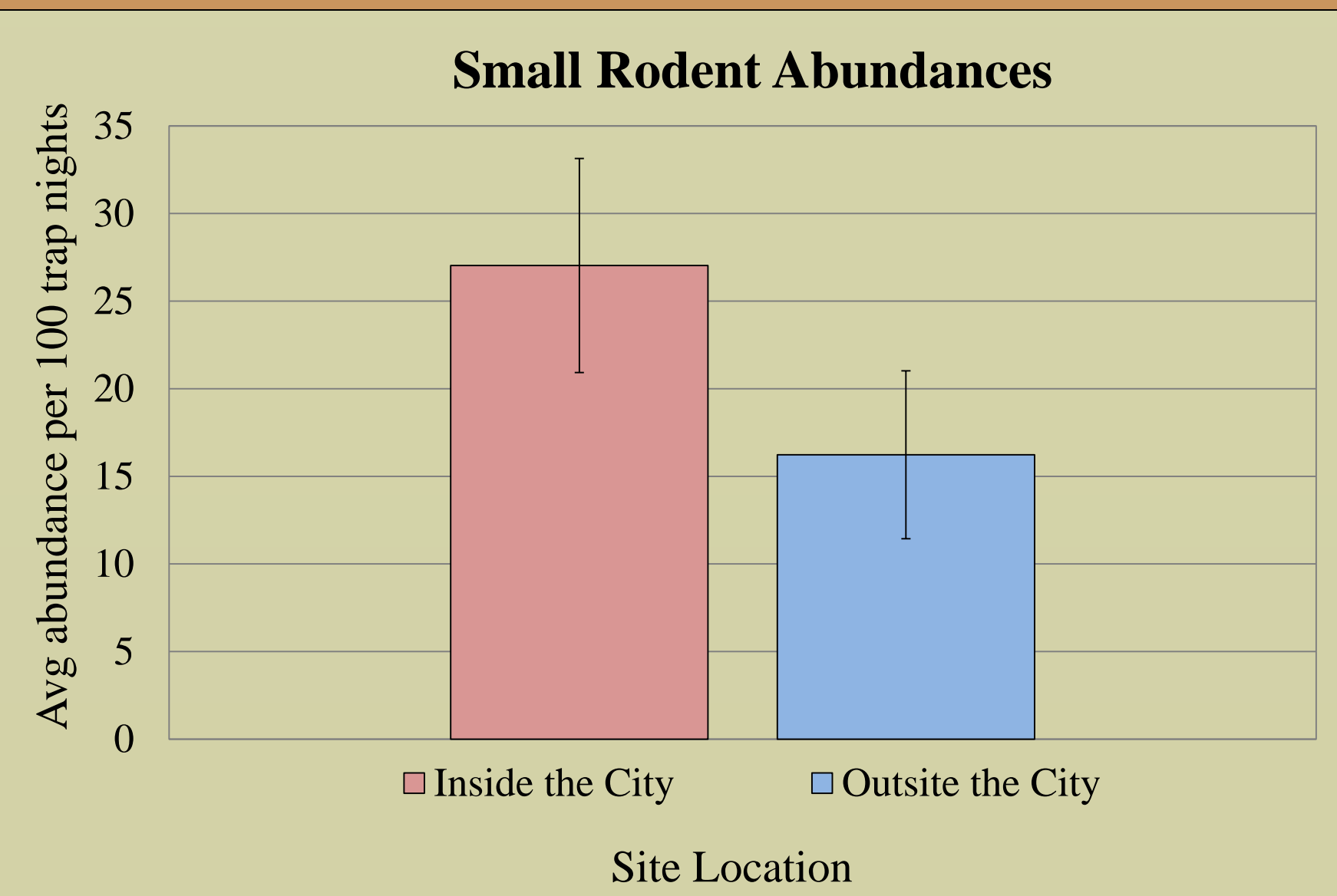


Figure 1: Depicted above are the ten sites of herbivory study; eight of which are currently being sampled in pairs.

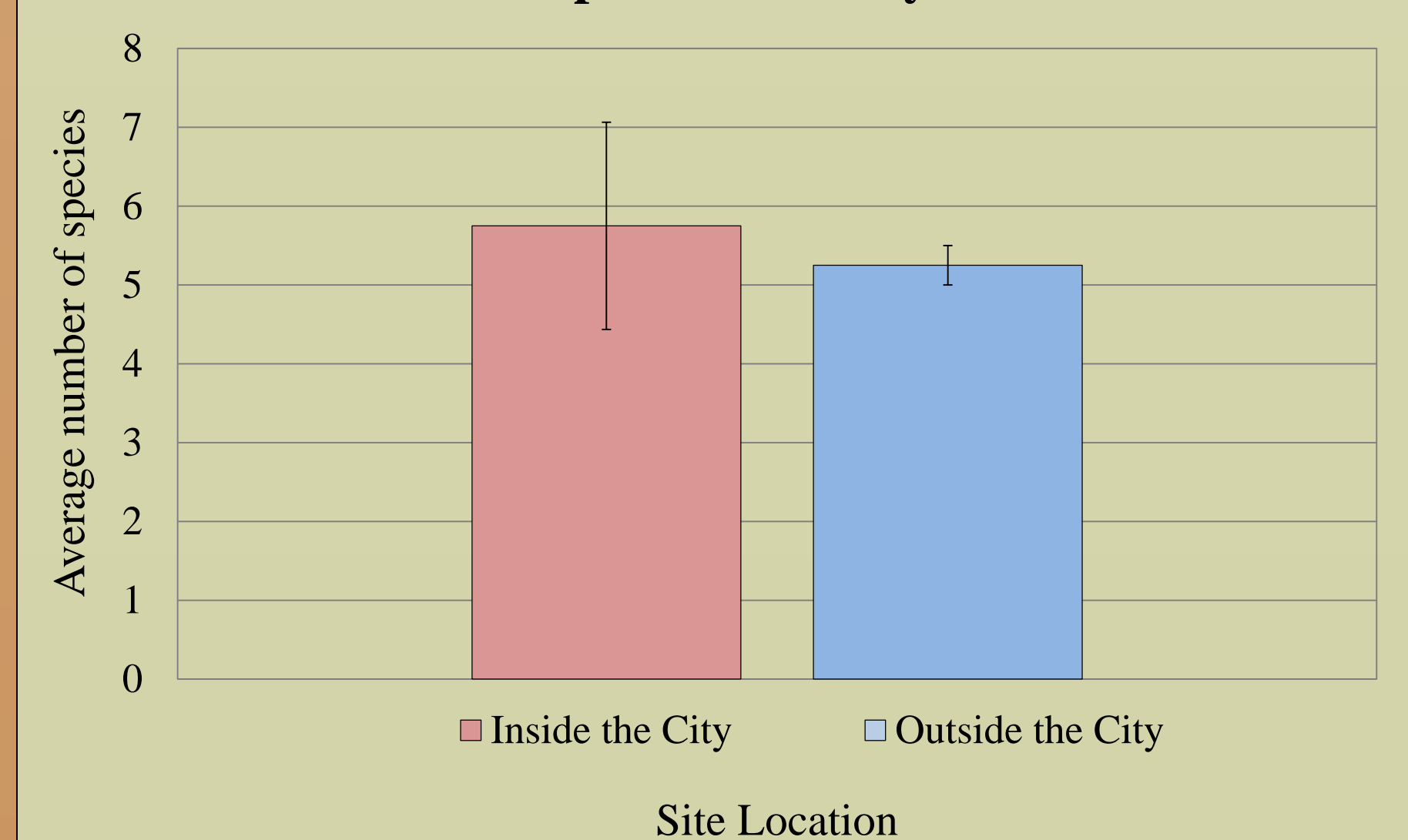


Graph 1: Small rodent average abundances (individuals captured out of 100 traps per night) for rural and urban sites.

Conclusion:

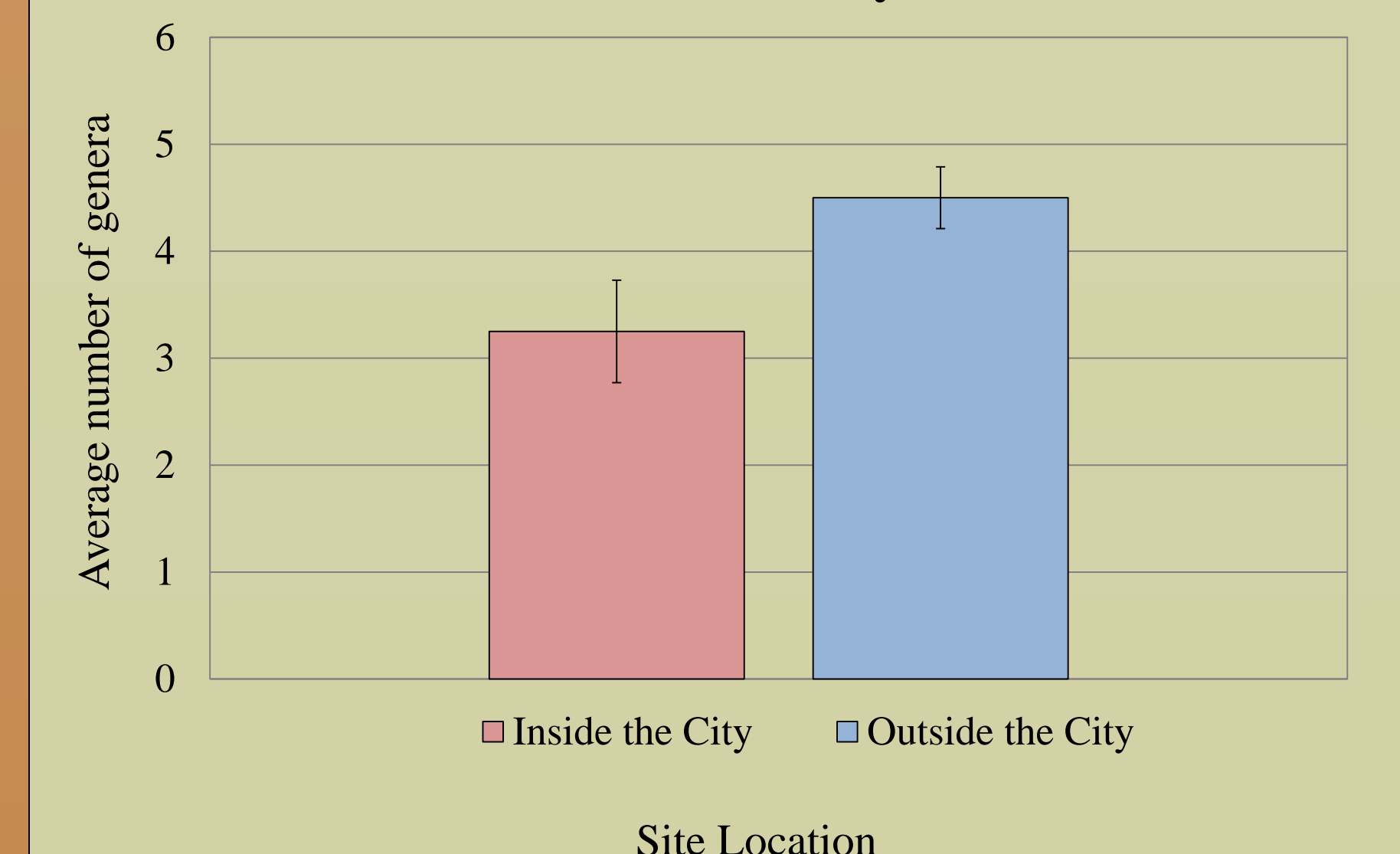
- According to the data, the commonly assumed difference in abundance does not seem to apply to small rodent herbivore populations in a desert city when manicured environments are excluded.
 - The equal consumptions of plant biomass inside and outside of the city may simply be due to the insignificant differences in small rodent abundances.
- Differences between the small rodent species observed at rural and urban sites were also found to be insignificant.
 - The relatively high species diversity observed at the South Mountain sites may be because the park is bigger than the others, and may therefore be able to support higher diversity.
- The significant difference between small rodent genus diversity observed highlights the fact that genera of small rodents may dominate urban sites.
- Though overall abundance and species diversity are the same between the urban and rural locations, the sites have different community composition.
- The data collected in this project will serve as preliminary results to lay the foundation for a future Barrett Thesis. We will publish one of the first reports quantitatively describing small mammal herbivore population densities in this region.

Species Diversity



Graph 2: Average number of small rodent species identified at rural and urban sites.

Genus Diversity



Graph 3: Average number of small rodent genera identified at rural and urban sites.

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