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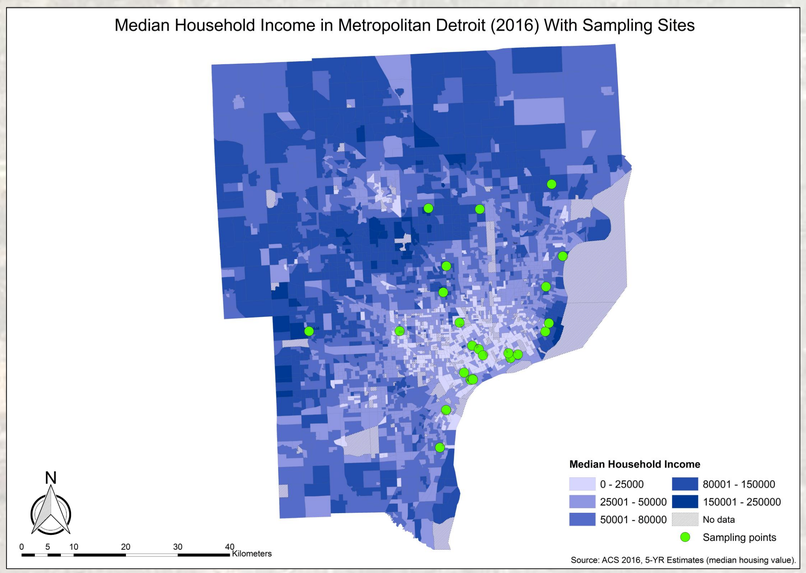
THE NATIVE BEES OF METROPOLITAN DETROIT

HOW DEMOGRAPHICS RELATE TO BEE DIVERSITY

INTRODUCTION Insect pollinators, important for ecological functioning, are seeing declines due to habitat loss, agricultural intensification, pesticides, and pathogens. The community structure of bees and other pollinators in urban areas is under-studied but important for understanding pollinators and their crucial ecosystem services in an increasingly urbanized world. Evidence points to the importance of cities as havens for bees (Baldock et al., 2015). Further, demographic trends across cities have been shown to affect weed coverage, which in turn affects bee abundance (Iuliano, Markiewicz, and Glaum, 2017). Cultural norms, municipal codes, lawncare, and aesthetic preferences which influence pesticide usage and the diversity of plants change with a range of socioeconomic trends. Specifically, those with more valuable homes tend to use more bee-harming pesticides (Robbins, Polderman, and Birkenholtz, 2001). In this study, I compare income and race data from the U.S. Census American Community Survey (ACS) with native bee genus diversity from samples I collected in 2016 throughout Metropolitan Detroit. *My research question is how do socioeconomic variables affect native bee genus diversity?*

METHODOLOGY

- Used pan traps and netting to sample native bees in 24 sampling sites in residential lawns throughout Metropolitan Detroit (Wayne, Macomb, and Oakland Counties) during the summer of 2016.
- Identified the specimens and calculated the Shannon's Diversity Index (H) at the genus level from the bee samples.
- Used ArcMap to create a 1 km buffer around each sampling site (native bees typically forage within 1 km) and calculated weighted demographic data based on the proportions of census blocks within each buffer area.

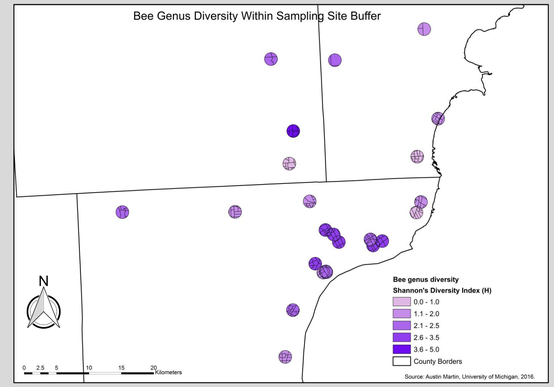


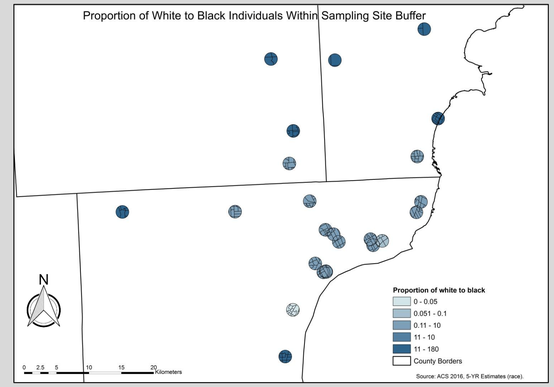
RESULTS

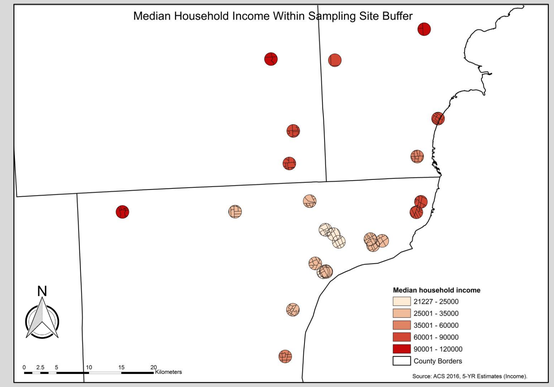
Within the 1 km buffer around each sampling site, the Shannon's Diversity Index (H) of bee genera varies in conjunction with both the proportion of white to black individuals and median household income. Sampling buffers within the City of Detroit tend to have a lower white to black ratio and a lower median household income, but they also have a higher H. A few notable exceptions exist wealthier suburban areas, however: these outliers have a high H, a high white to black ratio, and a high median household income.

CONCLUSION

This spatial analysis shows that whiter, wealthier areas in Metropolitan Detroit tend to have lower native bee diversity. The likely mechanism here is lawn care: Robbins, Polderman, and Birkenholtz (2001) argue the ecological impact of lawns is underestimated and comparable to that of intensive agriculture. Their findings show that, among other indicators, income is a positive predictor of lawn pesticide use. Considering that many lawn chemicals (e.g. Imidacloprid) cause harm to insect pollinators, lawncare practices are the likely mechanism behind these links between bee diversity and human demographics. With Detroit's history of racial segregation and racially exclusive zoning laws, suburban communities with more turfgrass lawns tend to be whiter and wealthier. The number of suburban exceptions in this spatial analysis with a high H likely stem from the presence higher local floral diversity in those lawns along with lower pesticide use. This indicates the need to investigate local floral conditions and lawncare practices as more immediate predictors of bee diversity.







REFERENCES

- Baldock et al. 2015. "Where is the UK's pollinator diversity? The importance of urban areas for flower-visiting insects." *Proc Biol Sci*. 22;282(1803):20142849.
- Iuliano, Benjamin, Alexandra Markiewicz, and Paul Glaum. 2017. "Socio-economic Drivers of Community Garden Location and Quality in Urban Settings and Potential Effects on Native Pollinators." *Michigan Journal of Sustainability.* Vol. 5:1.
- Robbin, Paul, Annemarie Polderman, and Trevor Birkenholtz. 2001. "Lawns and Toxins: An Ecology of the City." *Cities,* Vol. 18:6, 369-380.

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