

Life is (next to) a Highway: Examining the effect of native roadside plantings on honeybee abundance



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Background

- The European Honeybee (*Apis mellifera*) is the world's most important single species of pollinator¹
 - In the US alone, it is estimated that honeybees provide \$15 billion to the economy by pollinating dozens of crop species²
- There is a well-documented global pollinator decline, with studies suggesting losses up to 76% in the past 30 years³
- Roadsides are incredibly valuable to pollinators in highly modified landscapes, supporting robust plant communities and acting as corridors connecting habitat fragments⁴
- One way that organizations such as the Minnesota Department of Transportation (MnDOT) try to help pollinators is by planting native seed mixes along roadsides; however, these plantings have not been evaluated to see whether they are cost-effective.

Methods

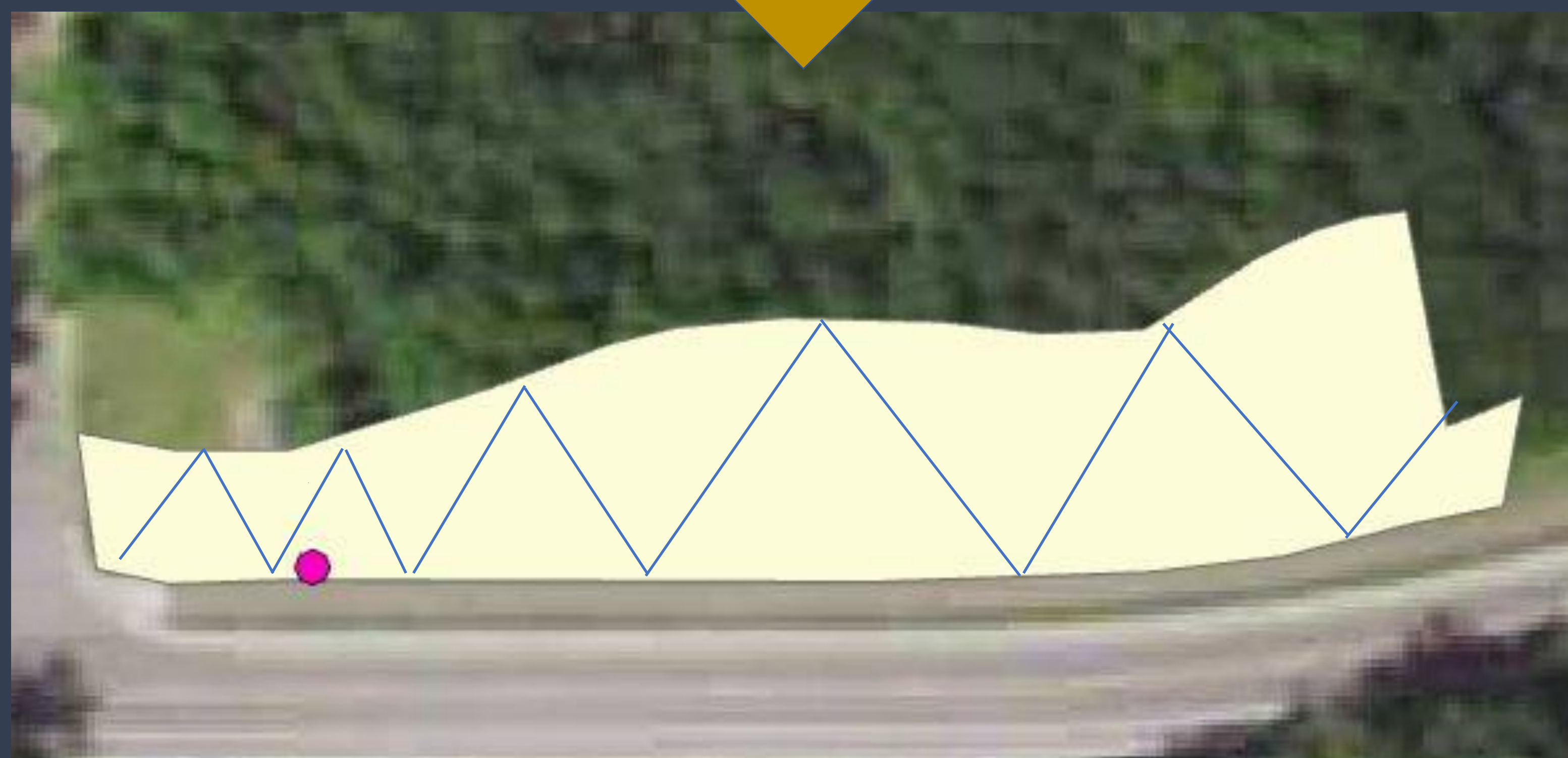
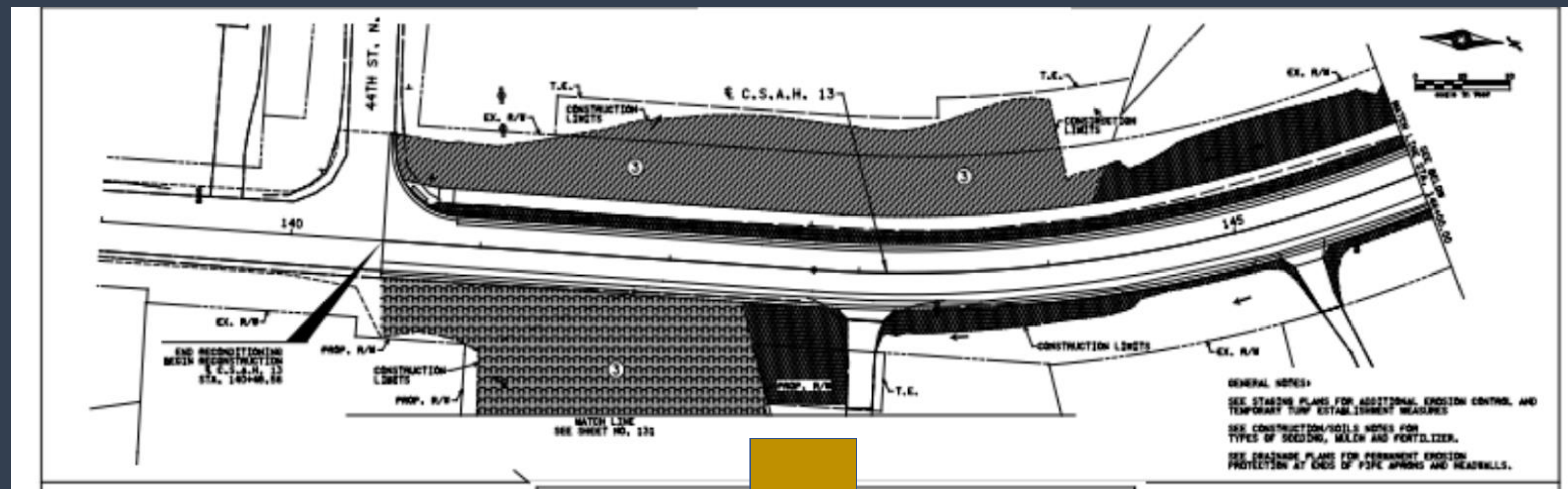


Figure 1: Construction plan and ArcGIS polygon for project site 14non, showing an approximate transect

For this project, 20 survey sites were selected using construction plans obtained from the Minnesota Department of Transportation (MnDOT). Using these plans, I found areas where nonnative and native mixes were planted. Each construction plan was then overlaid onto 2019 satellite imagery using ArcGIS, which allowed me to create polygons corresponding to real-world GPS coordinates. This enabled me to know exactly where each seed mix was planted, ensuring that I was surveying in the correct area.

For each survey, I meandered through the site in a zig-zag path (Fig 1), stopping once I reached the end of the site or once 15 minutes had passed. Every bee I observed was recorded, as well as the flower it was feeding upon.

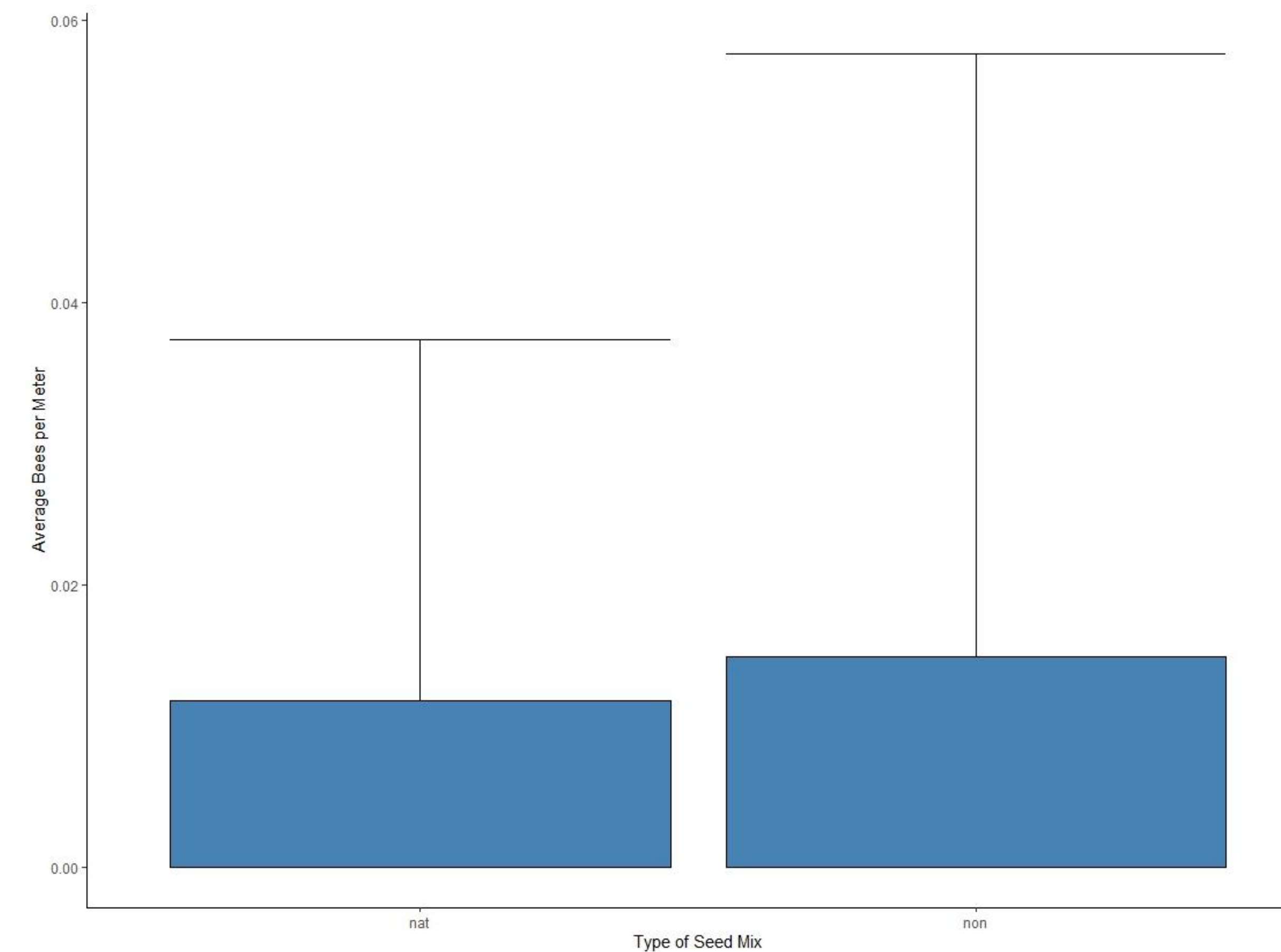


Fig. 2: Average number of bees per meter for Native and Nonnative sites

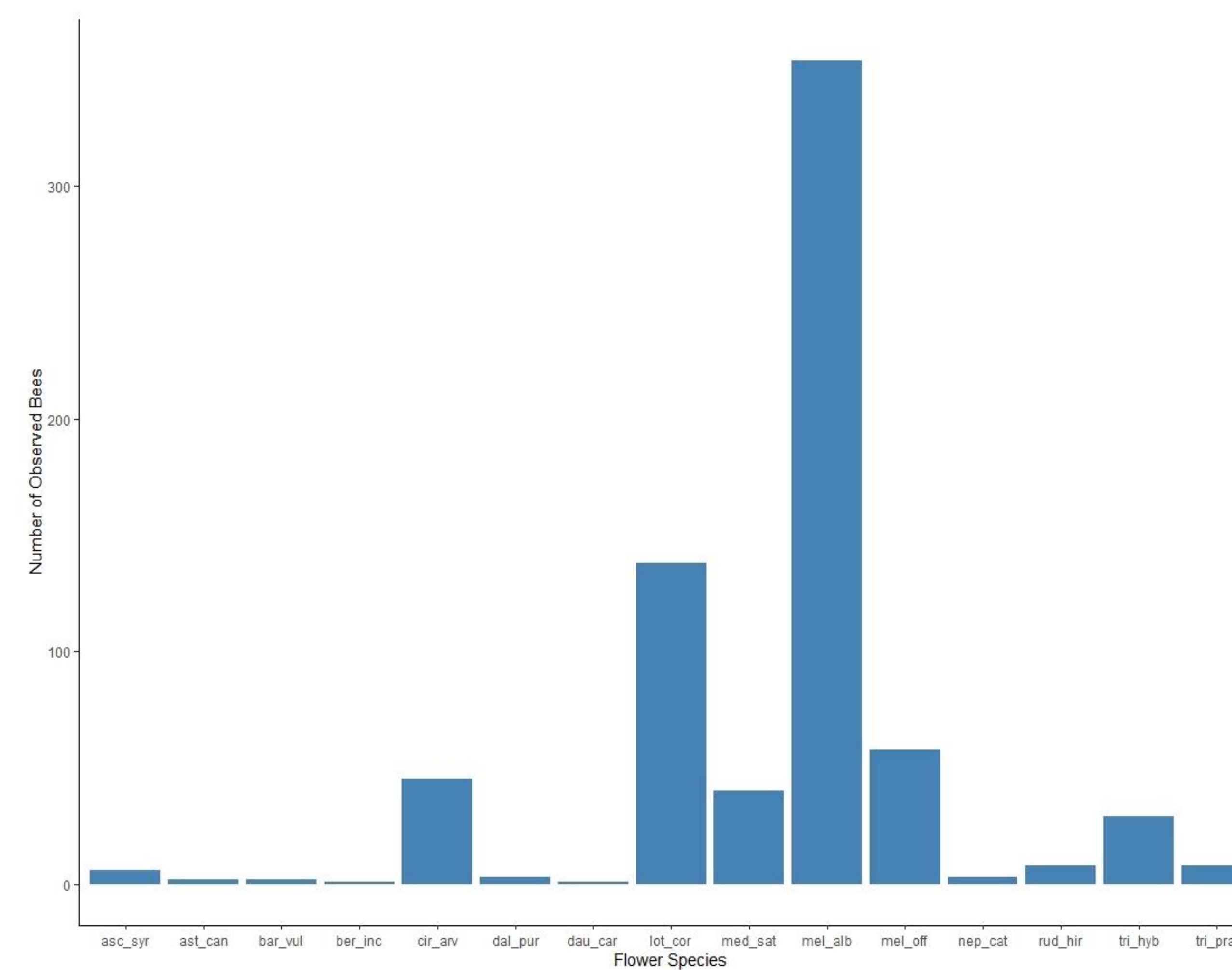


Fig 3: Total number of observed bees for each flower species

Research Questions:

- Is there a difference in honeybee abundance between sites planted with native and nonnative seed mixes?
- What flowers are honeybees feeding on in MN roadsides?

Results and Conclusions

- There was no significant difference in average number of bees per meter between native and nonnative sites.
 - For all 20 projects, the difference in bees per meter was insignificant (Table 1)
- Over 400 honeybees were observed on white sweet clover (*Melilotus alba*), a nonnative plant. In fact, the 6 plants with the greatest abundances of honeybees were all nonnative, including white sweet clover, bird's foot trefoil (*Lotus corniculatus*), yellow sweet clover (*Melilotus officinalis*), and alfalfa (*Medicago sativa*).

These findings suggest that there is not a correlation between native seed mixes and honeybee abundance. However, they do suggest a relationship between honeybees and nonnative plants. The vast majority of honeybees were seen on nonnative plants, indicating that these species are important food sources for MN's honeybees

Future Directions

- Examine the effect of native and nonnative seed mixes on native bumblebee and butterflies
 - Native plantings may have a greater effect on native pollinator species than nonnative pollinators such as honeybees.
- Examine the correlation between nonnative plants and honeybees
 - One limitation of this study is that simple surveys are not sufficient for making meaningful conclusions about floral preference. Future studies might examine factors such as competition, flower abundance, and phenology
- Look at native ranges of *A. mellifera* and compare it to nonnative plants in Fig 2.
 - Do honeybees most frequently forage on plants native to their natural range?

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Acknowledgements: I would like to thank my fellow members of "Team Ditch" : Tim Mitchell, Ashely Darst, and Cate Patterson. I also would like to thank Emilie Snell-Rood and the rest of the Snell-Rood lab for providing help and supporting this project. I'd like to thank Elaine Evans and Zach Woods for helping me learn bee ID skills. Finally, I'd like to thank Mike Verhoeven for giving me a much-needed tutorial in ArcGIS.
All research was funded through a URS from the University of Minnesota.