Effects of Powerline Cuts and Imperviousness on Bee Abundance

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Introduction

- An estimated 35% of global food crops require animal pollination (Klein *et. al.*, 2007), and a majority is done by bees (McGregor, 1976).
- Powerline cuts and roadsides may be sanctuaries for bees due to increased sunlight, higher temperatures and abundant edges (Russell *et. al.*, 2005; Hill, 2016)
- It is unclear if the urban (more impervious) or rural (less impervious) nature of powerline cuts and roadways impact their suitability as bee habitats.
- The objective of this study was to determine if a relationship exists between bee abundance and either distance from powerline cuts or % impervious ground surface.

Study Sites

Table 1. Assessment of six study sites located in Plymouth county. Beaver Brook and Native Meadow are located at Massasoit Community College, Brockton campus.

SITE	TERRAIN	DISTANCE FROM POWERLINE CUT (m)	% IMPERVIOUS
Beaver Brook (BB)	Urban Campus	579	46.03
Christos (CH)	Urban Parking Lot	949	46.85
Dunrovin Farm (DF)	Rural Farm	0	1.93
Leland Farm (LF)	Suburban Farm	301	0.50
Native Meadow (NM)	Urban Campus	173	32.03
Sachem Rock (SR)	Suburban Park	519	7.88

Methods

- Sampling occurred from April to October of 2016 and 2017.
- Bees were caught via pan traps left in the field for 24 hours (Droege, 2015), as well as sweep netting performed by two researchers for 30 minutes each (Popic, 2013). After collection, bees were pinned and identified to genus.
- Google maps was used to determine the distance between study sites and the nearest powerline cuts.
- Geographical information system software (ArcGIS) was used to calculate % impervious ground surface for all sites within a buffer zone of 300 meters.
- Pearson correlation analysis was conducted to assess the relationships between bee abundance and distance from the nearest powerline cut, and also between bee abundance and % impervious ground surface of the study sites. Abundance data were SQRT transformed, % impervious data were ArcSin transformed.

Results

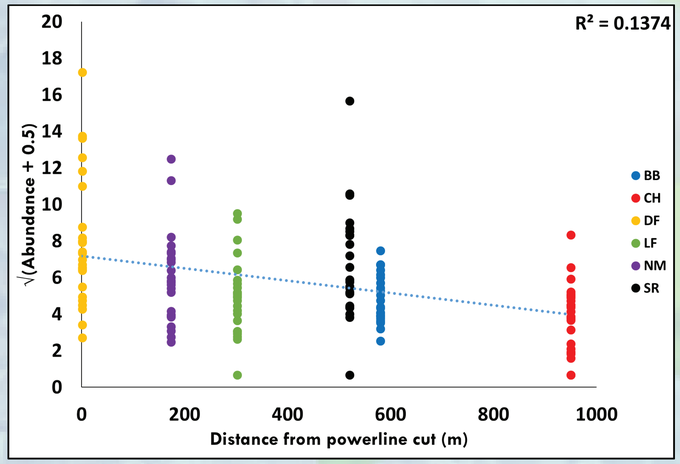

Figure 1 represents the correlation between bee abundance and distance to the nearest powerline cut for both pan trap and sweep net collection methods ($p<0.001$).

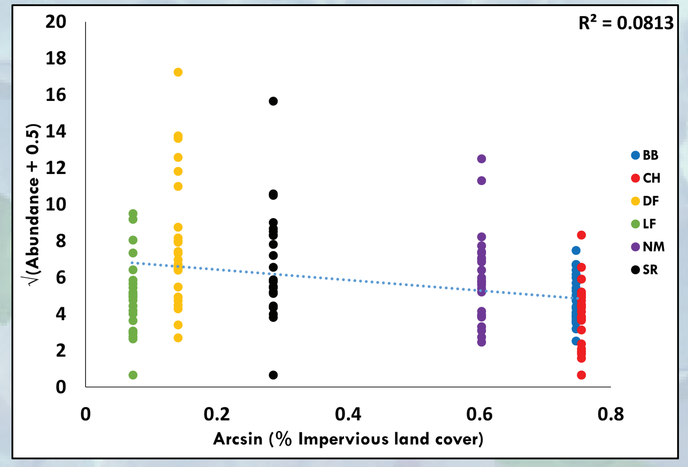

Figure 2 represents the correlation between bee abundance and % impervious for both pan trap and sweep net collection methods ($p=0.007$).

Discussion & Conclusion

- Bee abundance was weakly negatively correlated with distance from powerline cuts, consistent with the idea that powerline cuts may provide an appropriate habitat for bees.
- Adopting some of the practices used in powerline cut maintenance may lead to an increase in bee abundance, which in turn may promote a healthier ecosystem.
- The trend toward less bees in more impervious areas showed a weak but statistically significant correlation, suggesting that bees prefer rural sites to urban sites. More data are needed to better assess the strength of this relationship.
- In this study, the effects of distance from powerline cuts and % impervious on bee abundance were determined separately. However, those two variables may not be independent.
- Therefore, future multivariate analyses could include both distance from powerline cut and % impervious to assess their combined effect on bee abundance, as well as their potential interaction with other environmental variables that have been linked to bee abundance.

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