

PROVIDENCE COLLEGE

Background

Pollinator populations are in decline, due in part to habitat fragmentation via urbanization (Wagnner 2020). While urban environments can support pollinator populations, habitat fragmentation can prevent pollinators from gathering proper nutrients (Baldock et al., 2019). Connectivity between gardens is important in urban environments where spaces are separated by impervious surfaces.

My research has built upon prior Bonoan Lab research on plant and pollinator richness/abundance and the unequal distribution of flowering plants, i.e., nutrients, through the seasons in on-campus rainwater retention gardens (bioswales). Data collected will display if bees on campus can move among gardens to balance nutritional intake. I expect that the larger bumble bees (Fig. 5) will be able to travel between gardens ,while the green metallic sweat bee (Fig. 6) will not be able to move between gardens.

Methods

Capture-Mark-Recapture:

- The 5 bioswales were each surveyed for 20 minutes, all bees captured were placed in a cooler (Fig 1a).
- Bees were uniquely marked with 3 paint dots on their thorax (Fig 1b, 1c, 1d).
- After being marked, the bees were released in the garden they were caught in.
- The protocol was repeated as time and weather allowed



Fig. 1 (a) bees chilling in cooler (b) painting the bees (c) marker being used on bee with bee squeezer (d) painted bee

Determining Foraging Distances in a Fragmented Urban Landscape

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Results



Fig.2 The garden had a significant impact on the abundance of bees in each garden for Bombus griseocollis (Poisson Distribution, X2= 103.11, df=4, p<0.001). The day of year also had a significant impact on the abundance of bees in each garden for Bombus griseocollis (Poisson Distribution, X2= 659.11, df=1, p<0.001).



Fig.3 The garden did not have a significant impact on the abundance of bees in each garden for Agapostemon virescens (Poisson Distribution, X2= 16.81, df=4, p<0.002). The day of year had a significant impact on the abundance of bees in each garden for Agapostemon virescens (Poisson Distribution, X2= 8.657, df=1, p<0.003).

	Distance = 0	Distance > 300	Distance >500
Agapostemon virescens	1	0	0
Bombus griseocollis	36	2	1
Total	37	2	1

 Table 1. Distances moved by recaptured bees

Conclusions

The data suggests that majority of bees on campus stay in the same garden. Having this data will allow campus, as well as urban areas, to create gardens suitable to support the pollinator populations throughout the year. Future research will continue collecting data into the fall, as the composition of the gardens change with the seasons. This will look at how the number of bees in a garden correlates with floral abundance and/or nectar-plant switching behavior.



Fig. 4 Map of gardens on campus





Fig. 5 Bombus griseocollis can reach a length of about 21 mm, while workers are typically between 10-15 mm (Hoffman et al., 2020)



POPAN in RMark, Phi~time, p~garden, pent~time, N~1

Fig. 6 (a) Agapostemon spp. are about 7-14 mm (Hoffman et al., 2020)

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References

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