

POLLINATORS ON GREEN ROOFS LARIMER COUNTY

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PROJECT INTRODUCTION

On the Nutrien Agricultural Science Building Green Roof, we study the effects of a green roof system on floral phenology and nectar resources, and how these changes may support pollinator diversity and abundance in urban ecosystems.

Green roof systems can benefit urban areas through storm water mitigation and reduction of the urban heat island effect.

The ecological benefits of green roofs have not been extensively studied.



In 2022, we observed green roof plants blooming earlier in the season and producing higher sugar concentrations when compared to analogs at-grade.

We suspect that the unique qualities of a green roof system could provide early season foraging opportunities for pollinators, with high sugar content, while bridging growing phenological gaps between plants and pollinators.

The decline of bee and other pollinator populations is posing threats to food security and biodiversity at a global level. It is imperative that urban communities understand the importance of pollinators and applicable conservation methods.

INTERNSHIP GOALS

- Collect data as flowers bloom to quantify green roof effects on floral phenology.
- Evaluate nectar volume and sugar concentrations.
- Measure the diversity and foraging behavior of bumble bees on green roofs and our analog at-grade garden.
- Work with CSU extension to educate public audiences about supporting native pollinators, and green architecture projects, such as green roofs, in urban areas.

HOW DOES THIS APPLY TO YOUR EDUCATION

As an integrative organismal biology major, this internship was an incredible opportunity to study plant-insect interactions, while challenging me to cultivate a deeper understanding of many biological concepts through applied research.

I refined my scientific communication skills by speaking with the public during extension outreach events such as "Second Saturday" at CSU Spur and the "Big Day of Bugs" at the Denver Botanic Garden.

WHAT YOU DID



FLORAL PHENOLOGY:

We conducted weekly counts of floral blooms at both sites.

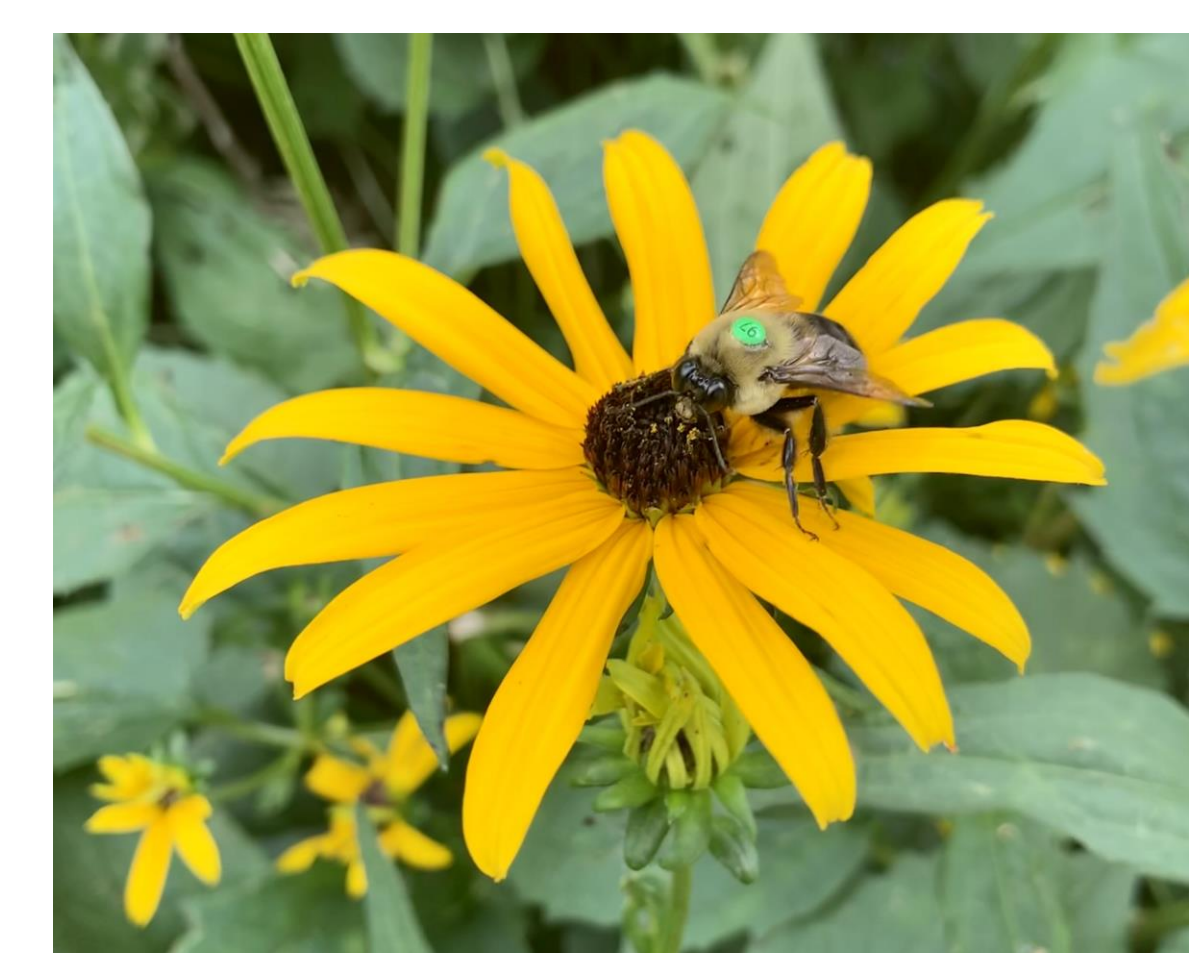
With this data, we can determine the timing of first bloom, peak bloom, and the senescence of each research species.

NECTAR SUGAR ANALYSES:

We collected nectar samples from blooming flowers to compare nectar volume and concentrations between the two sites.

We collected the nectar with calibrated pipets and tested the nectar using a refractometer to determine the sucrose concentration.

We placed mesh bags over our samples 24 hours prior to collection to prevent pollinators from interfering in our nectar volume measurements.



MARK AND RECAPTURE OF BUMBLE BEES:

We conducted timed sampling sweeps where we captured, identified, and tagged bees while we monitored for returning bees.

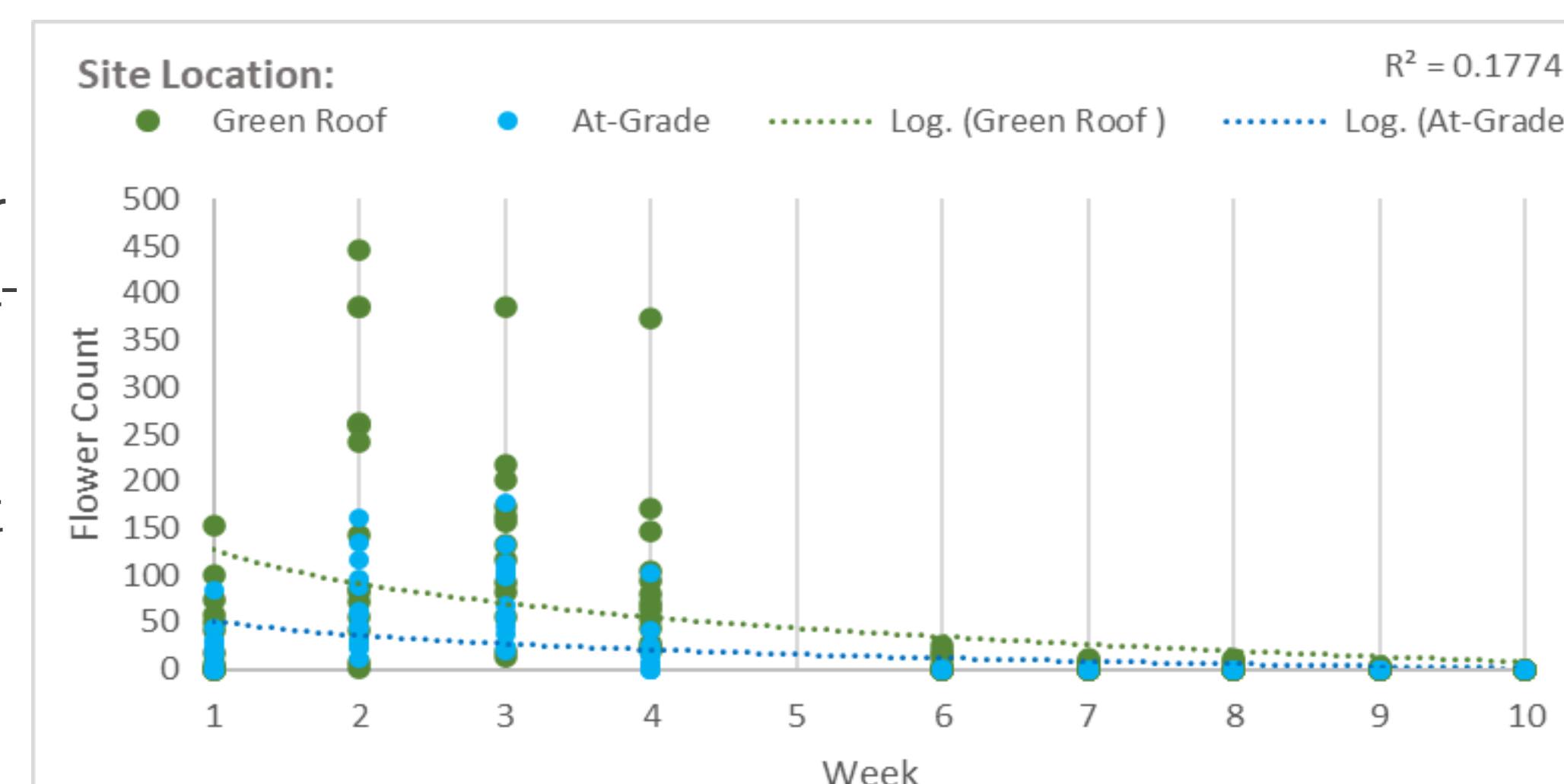
Each tag has a unique number and a color. We can then use the data to compare site foraging patterns and biodiversity at both plots.

Figure 1. Comparing Blooming Periods of Native Penstemon Flowers on the Green Roof and At-grade:

The peak bloom on the green roof occurred a week prior to the peak bloom at-grade

Average flower count during peak bloom:

- Green roof: 160
- At-grade: 72



WHAT YOU LEARNED

I learned about the complexity of applied research and the importance of communicating and applying our findings in ways that are beneficial to our communities.

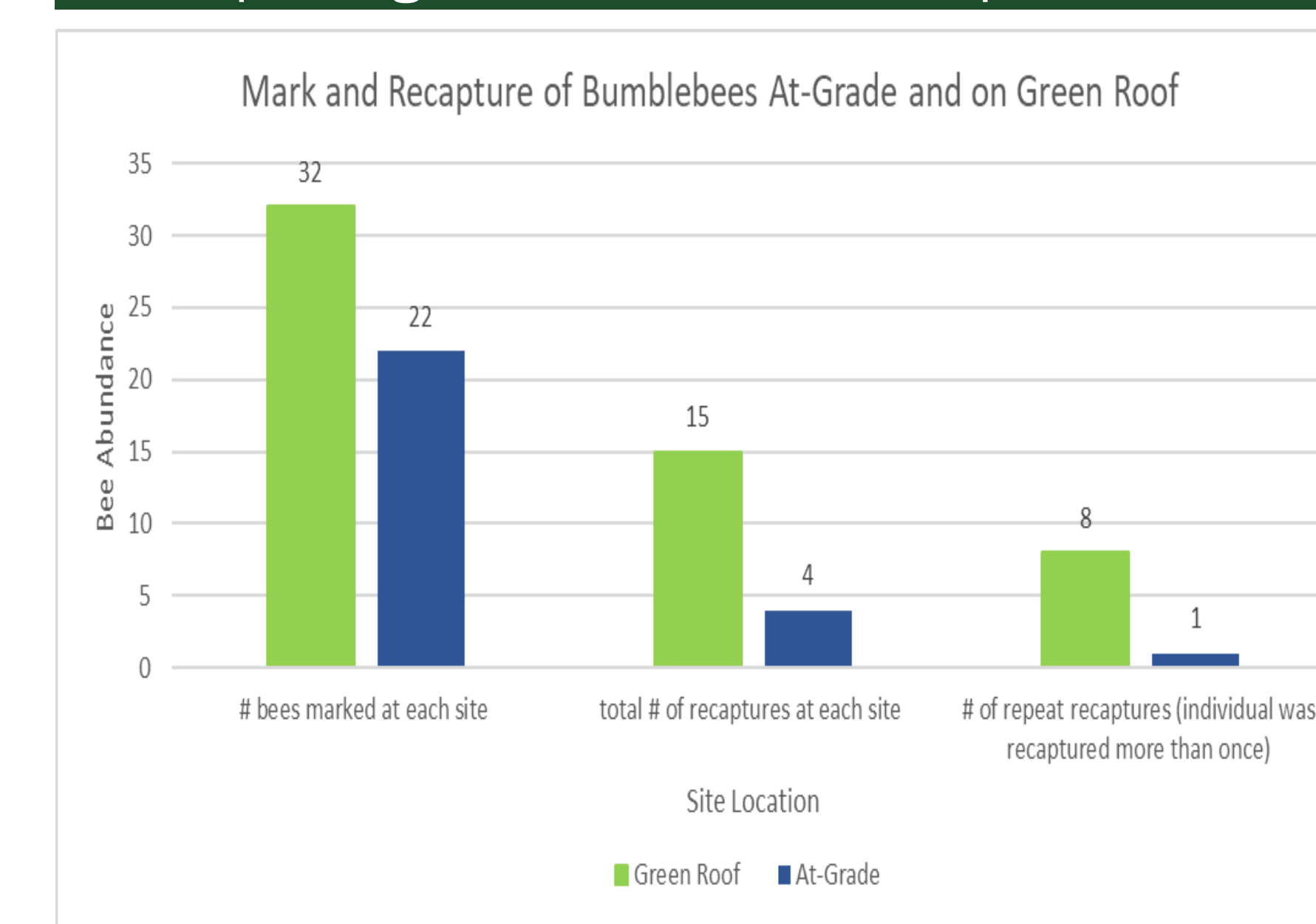
I learned how to engage with a variety of audiences and discuss the importance of pollinators, conservation, and our research objectives.

I connected with professionals involved in horticulture, landscape architecture, entomology, and restoration ecology. This introduced me to a variety of applied research topics important to human and environmental health.



Through my work, I improved my ability to identify native plants and pollinators.

Table 1. Comparing Bumble Bee Recapture on the Green Roof and At-Grade:



BUMBLE BEE DIVERSITY:

We observed four species this season:

B. griseocollis and *B. huntii* were captured at both plots and were our most commonly observed species.

We observed one *B. pensylvanicus* individual on the roof, and one *B. rufocinctus* individual at-grade.

NEXT STEPS

In the future, trialing additional plant species and sampling a greater diversity of bees would widen the scope of this research.

Future research on multiple green roof systems in different areas should be conducted to look at big-picture patterns of altered phenology and foraging resources.

Continue to participate in public outreach to educate the public on the importance of pollinators and conservation methods such as green roofs.