Creating Pollinator Habitat with Native Plant Gardens at the University of North Carolina Asheville

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Background

Density and diversity of native pollinators is declining world-wide[1], and plant-pollinator networks are particularly sensitive to urbanization[2]. Establishing communities of native plants within cities might be one way to attract and support local communities of native pollinators[3]. The inclusion of plants with different reproductive phenologies, or those with generalist pollinator syndromes, might be key to maximizing pollinator diversity[4].

Objective

In early summer 2015, we established gardens of native plants and native plant cultivars at UNC Asheville. We then monitored timing, diversity, and potential effectiveness of visiting pollinators. Our goal was to provide insight to the horticultural community about native plant selections to promote pollinator species abundance and diversity.

Methods

Garden Design

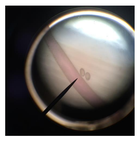
- Randy Burroughs, Landscape Architect, designed wet- and dry-adapted meadow gardens for the UNC Asheville campus, using plants native to the region or their cultivars.
- Plants (Table 1) were purchased as plugs or grown from seeds by Bethany Beliveau and Melissa Acker, then established by students (supervised by B. Believeau) in prepared sites.

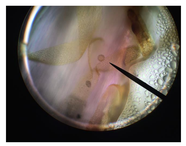
Visitor Observation

- Observations (N = 324) were made in the dry-adapted meadow garden from June to August 2015, once plants had become established.
- Individual plants were watched from 0900 – 1200 hours; visitor category and visit duration were recorded.

Pollen Deposition

- Plants in the dry meadow garden were covered with bridal veil nets before sunrise (N = 40).
- Nets were removed, and plants were observed for one visit; after the first visitor left, flowers were collected.
- Flowers were dissected to expose stigmatic surfaces, and numbers of conspecific pollen grains were counted under a compound microscope (40X magnification).





Acknowledgements

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Table 1. Species planted in dry-adapted garden. Species in green text flowered in summer 2015; they were used in visitor observation and pollen deposition studies. Poaceae have anemophilous (wind) pollination.

Family	Species	Common Name / Variety
Asclepiadaceae	*Asclepias tuberosa* L.	butterflyweed
Asteraceae	*Coreopsis verticillata* L.	tickseed / moonbeam
	Echinacea purpurea L.	purple coneflower / ruby star
	Erigeron pulchellus Michx.	robin's plantain
	Helenium flexuosum Raf.	sneezeweed / tiny dancer
	Liatris spicata L. (Willd.)	dense blazing star
	Symphyotrichum oblongifolium Nutt.	aromatic aster / October sky
Lamiaceae	*Monarda fistulosa* L.	bee balm / Claire Grace
Plantaginaceae	*Penstemon digitalis* Nutt.	foxglove beadstongue
	Penstemon smallii Schmidel	Small's penstemon
Poaceae	*Andropogon ternarius* Michx.	split bluestem
	Bouteloua curtipendula (Michx.) Torr	sideoats gramma
	Schizachyrium scoparium Michx.	little bluestem
	Schizachyrium scoparium Michx.	little bluestem / standing ovation

Results

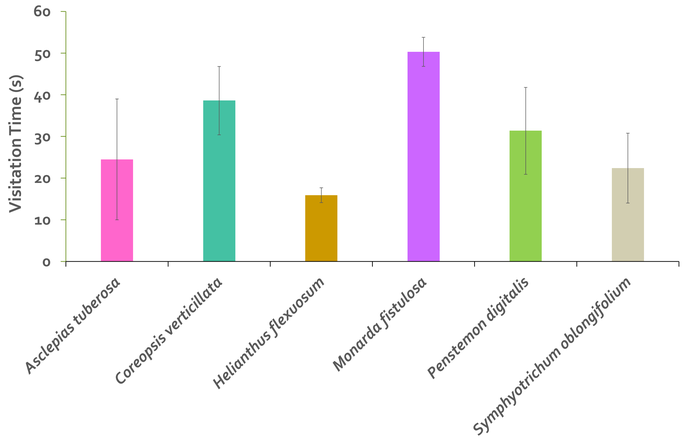

Figure 1. Mean (+/- 1 S.E.) floral visitation time varied significantly among flowering plant species (ANOVA, P = 0.0014).

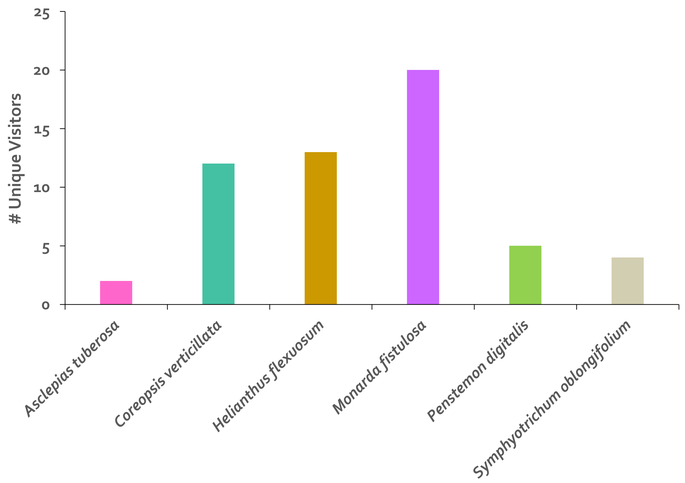

Figure 2. The number of unique floral visitor types varied among flowering plant species.

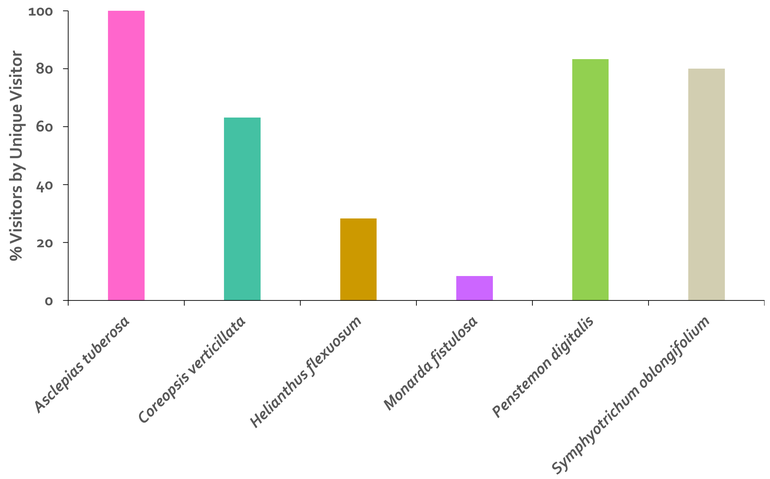

Figure 3. The percent of total floral visits made by a unique visitor type varied among flowering plant species.

Discussion

- Unique visitor categories = 27; ~108 in southern Appalachians[5].
- Visitation times highest on *Monarda fistulosa*, lowest on *Helianthus flexuosum*, consistent with published data[6].
- *M. fistulosa* attracted highest number of unique visitors.
  - not all floral visitors were pollinators: nectar, pollen robbers
  - repeat visitors led to low percent unique visitors
- Pollinator effectiveness data only analyzed for *Penstemon smallii*.
  - low (mean = 2 grains), consistent pollen deposition by all categories of visitors

Future Directions

- In summer 2015, add more hours of visitor observations.
  - trained observers; once all plants are established, flowering
- Add more pollen deposition observations (covered flowers).
- Identify all visitors and pollinators to species.
- Quantify floral neighborhood effects.
- Compare dry- and wet-adapted gardens.

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