Compost doubles the number of flowers and pollinators in suburban native plant landscapes

Department of Biology

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Introduction

Pollinators are in decline globally[1]

- Declines are due to a combined stress from lack of floral resources, pesticides, and climate change.[2,3]
- Urban areas can support significant pollinator diversity by providing food resources and nesting sites for bees and other pollinators.[4]

Residential development plays a crucial role in urban land-use change, globally. Residential landscapes can support pollinator diversity if landscapes are designed and managed with pollinators in mind.



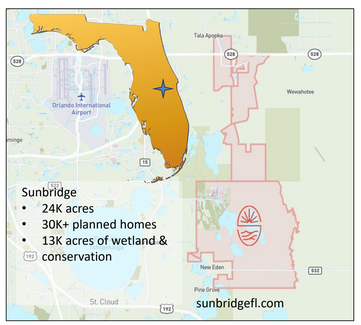
A typical residential development in Florida



An urban pollinator garden in Orlando, FL

Rationale

Sunbridge is a new residential development being built on the southeast edge of Orlando, FL. The developer is taking proactive measures to address existing and future limitation on irrigation water. One measure they are taking is to test and implement alternative landscape designs based on native plants and limited turfgrass. The photos below show two contrasting landscaping approaches at Sunbridge.





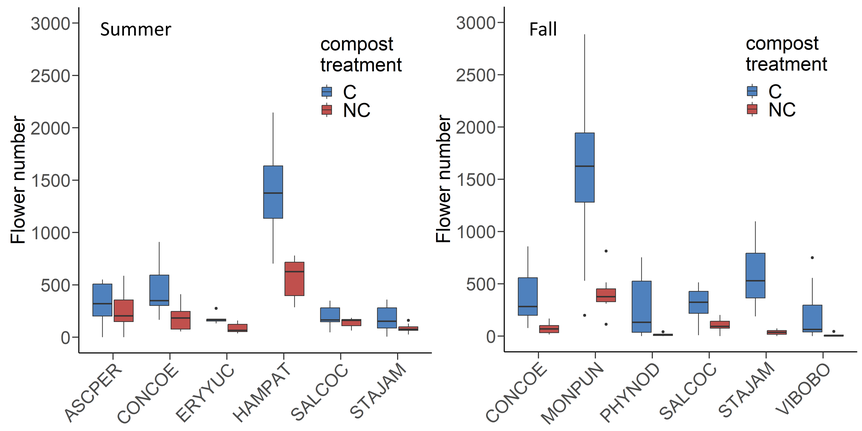
This front yard in the Weslyn Park neighborhood represents a new low-water, native species approach.



This typical front yard in the Del Webb neighborhood represents a traditional landscape approach.

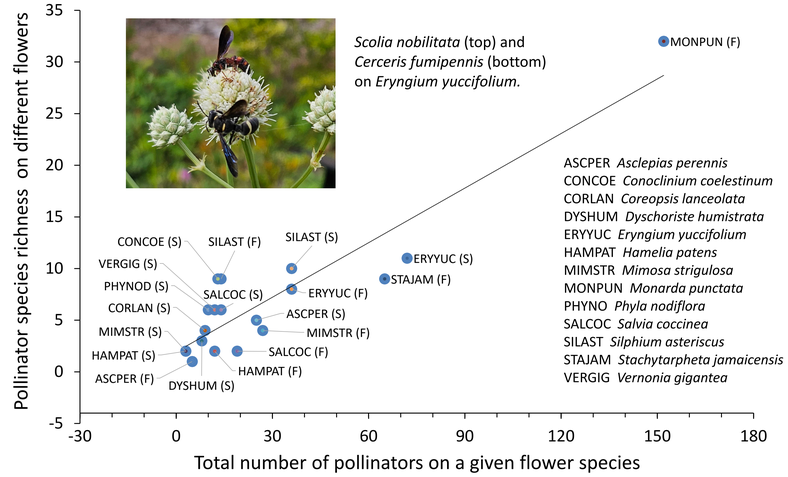
Results

Plots treated with compost (C) produced more than twice as many flowers as plots without compost (NC) in both summer (left) and fall (right) of 2022.



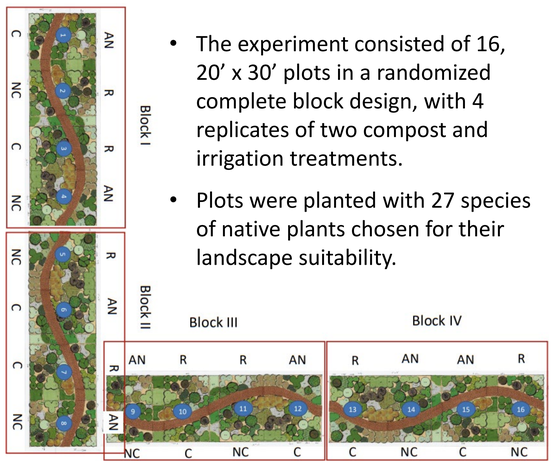
Six top flowering species in summer (left) and fall (right)

Plant species with the greatest pollinator number also had the greatest pollinator diversity in summer (S) and fall (F). There were a total of 95 pollinator species.



Objectives and Methods

Determine the interactive effects of compost addition and irrigation on flower abundance and pollinator abundance and diversity on 27 native plant species grown in suburban test plots.



- The experiment consisted of 16, 20’ x 30’ plots in a randomized complete block design, with 4 replicates of two compost and irrigation treatments.
- Plots were planted with 27 species of native plants chosen for their landscape suitability.



Apis mellifera on Silphium asteriscus



Dielis plumipes on *Mondarda punctata*

- Manually observed and counted pollinators on all flowers in each plot in summer and fall, collecting individuals when necessary to identify pollinator species.
- Counted all flowers in plots in both summer and fall, 2022--counted subsamples of flowers for plants with large numbers of flowers and estimated total number based on plant size.
- Irrigation treatments were regular (R) weekly irrigation or as needed (AN) to prevent plant loss; compost was with (C) or without (NC) 0.01 m^3 m^{-2} LifeSoils COMMAND® compost.

Discussion

- Compost increased flower number which drove increases in pollinators, but plants varied in the number and diversity of pollinators that visited them.
- We confirmed results from previous studies showing that flower number benefits both pollinator abundance and diversity; this relationship held across plant species as well—the more pollinators a species attracted the greater the diversity of its visitors.
- The lack of an irrigation effect was likely because the plots received regular rain throughout the growing season. Irrigation effects would likely only occur during drought.
- Our results show that adding compost to soil in new residential developments can greatly increase flower production by native landscape plants to the benefit of pollinators.

Acknowledgments

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References

1. Potts, Simon G.; Biesmeijer, Jacobus C.; Kremen, Claire; Neumann, Peter; Schweiger, Oliver; Kunin, William E. (June 2010). "Global pollinator declines: trends, impacts and drivers". *Trends in Ecology & Evolution*. **25** (6): 345–353.
2, Biesmeijer, J. C. (21 July 2006). "Parallel Declines in Pollinators and Insect-Pollinated Plants in Britain and the Netherlands". *Science*. **313** (5785): 351–354.
3, Goulson, D.; Nicholls, E.; Botias, C.; Rotheray, E. L. (27 March 2015). "Bee declines driven by combined stress from parasites, pesticides, and lack of flowers". *Science*. **347** (6229)
4. Baldock, K.C.R., Goddard, M.A., Hicks, D.M. *et al.* (2019). A systems approach reveals urban pollinator hotspots and conservation opportunities. *Nature Ecology and Evolution* **3**, 363–373.