Sustainable Landscaping Solutions for Florida

UF IFAS UNIVERSITY of FLORIDA

SCHOOL OF FOREST, FISHERIES, AND GEOMATICS SCIENCES

UCF Department of Biology
UNIVERSITY OF CENTRAL FLORIDA

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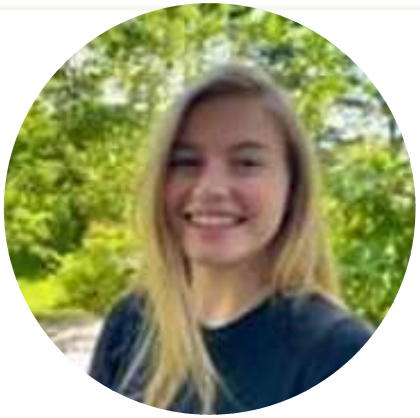


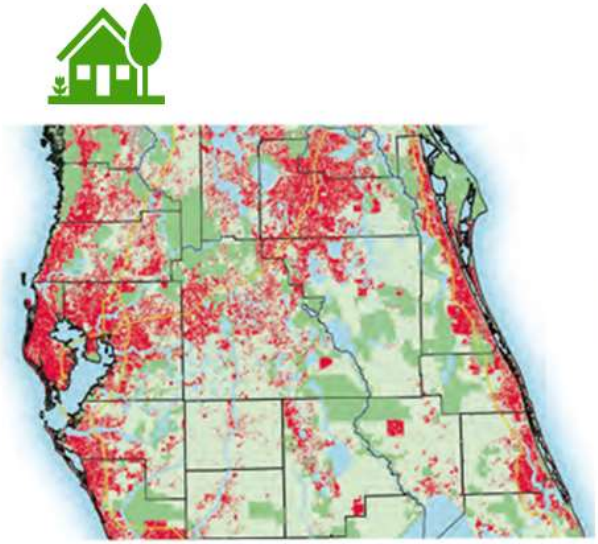
Victoria Cope
MS student, UF

Brooke Moffis
PhD student, UF

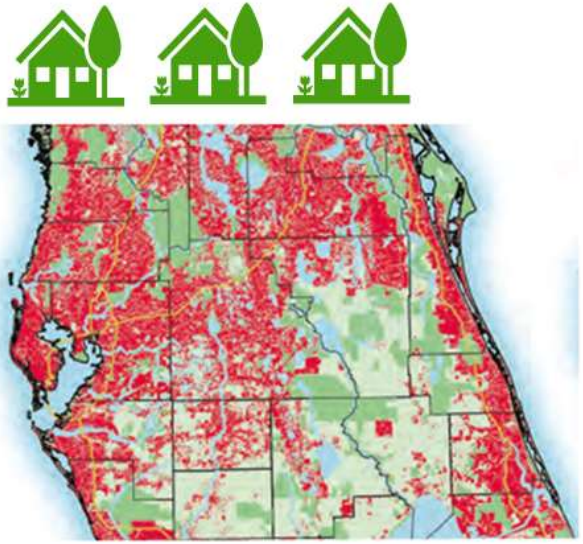
Basil Iannone
Associate Professor, UF

Patrick Bohlen
Professor, UCF

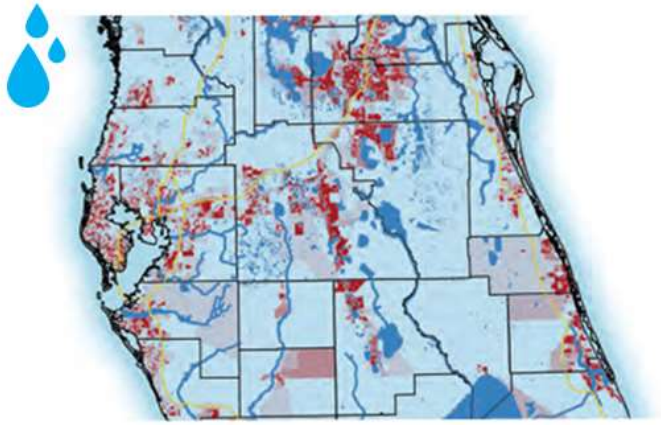
Increased development and water demand in Florida



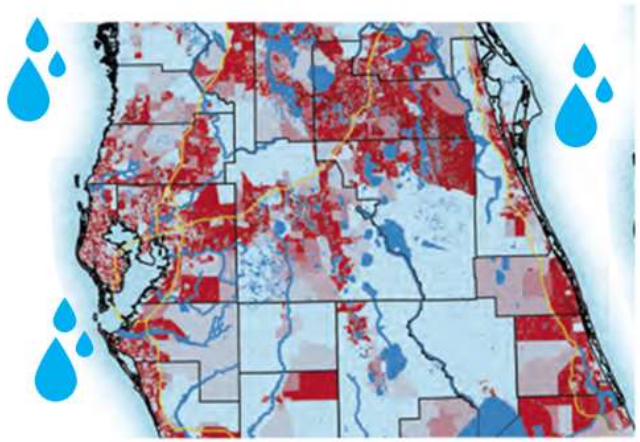
Central 2010 Baseline



Central 2070 Trend



Central 2010 Baseline



Central 2070 Trend

Challenges of Urban Soils

- Compacted soil
- Loss of topsoil
- Construction debris
- Nutrient deficiencies
- Altered pH

Brooke Moffis
PhD student, UF

Challenges of Irrigation

- 60% of all water use
- Supplies becoming limited
- Excess use in dry season
- Plants become dependent
- Disease and pest problems

Florida
Turf issues

St. Augustine Turf

Made in the shade
with little irrigation

Shady St. Augustine

No herbicide
No pesticide
Infrequent irrigation

To water or not to water?

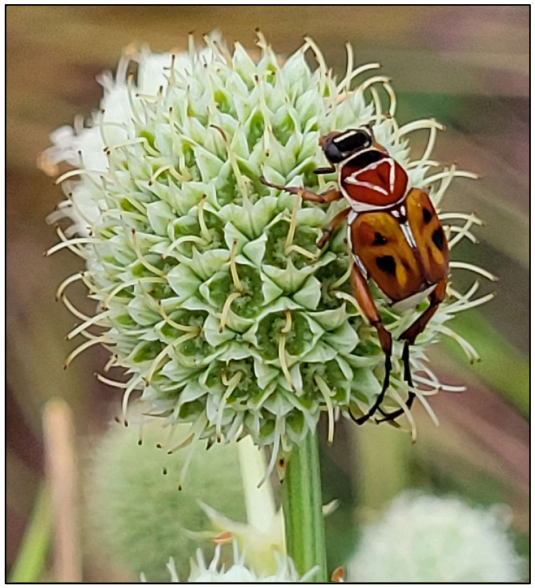
Too much
Too little
Just right

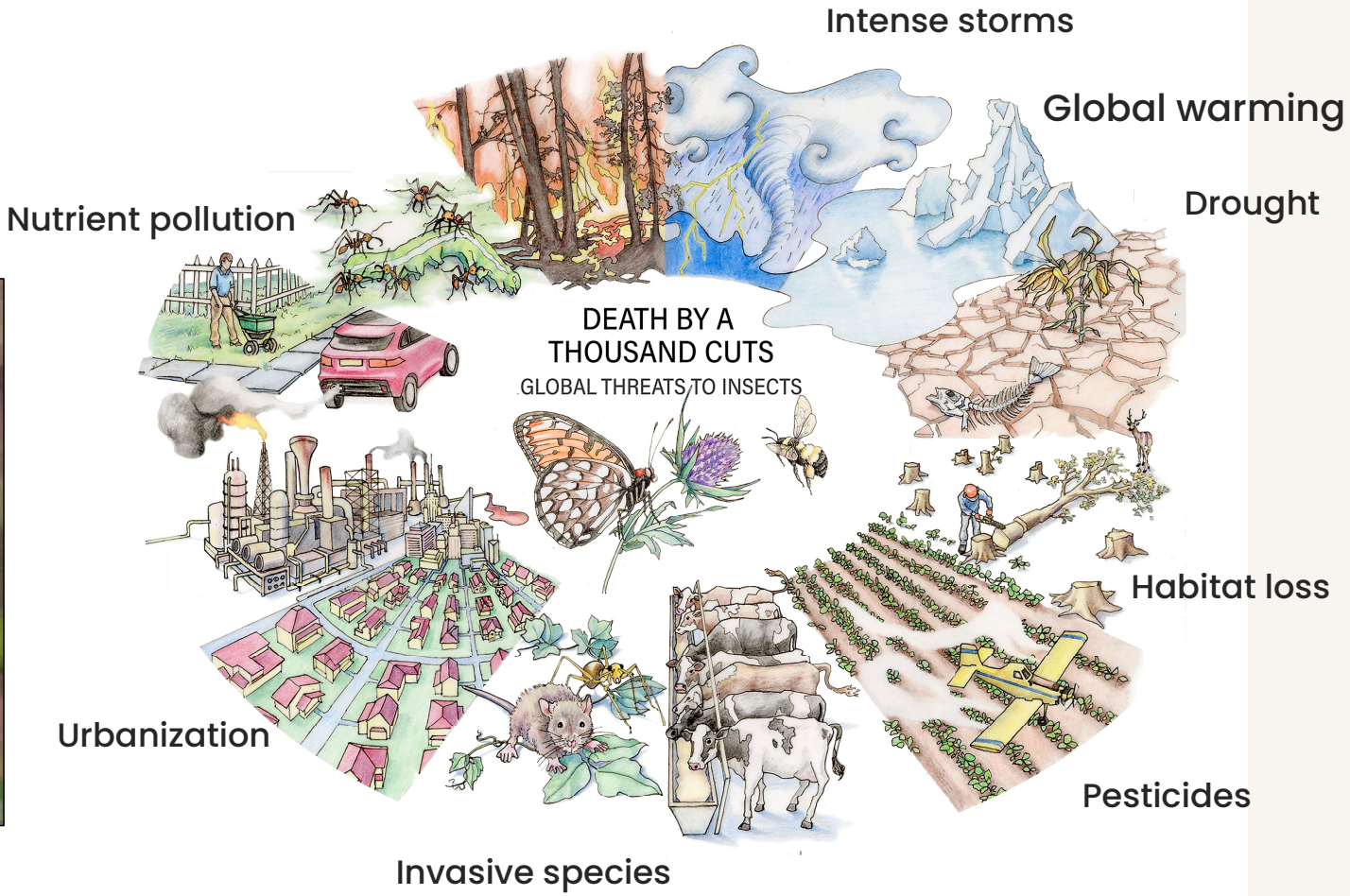
Thick St. Augustine

Water dependent
Prone to pests & disease
Easily drought-stressed

Florida Landscapes

Challenges of Biodiversity





How do we build less resource intensive, more diverse landscapes that provide multiple benefits to humans an nature?






Sustainable Landscape Collaborative

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SUSTAINABLE LANDSCAPE COLLABORATIVE

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UNIVERSITY of FLORIDA

SCHOOL OF FOREST, FISHERIES, AND GEOMATICS SCIENCES

CLUE | CENTER FOR LAND USE EFFICIENCY

LAKE COUNTY, FL
REAL FLORIDA • REAL CLOSE

cherrylake

The Nature Conservancy

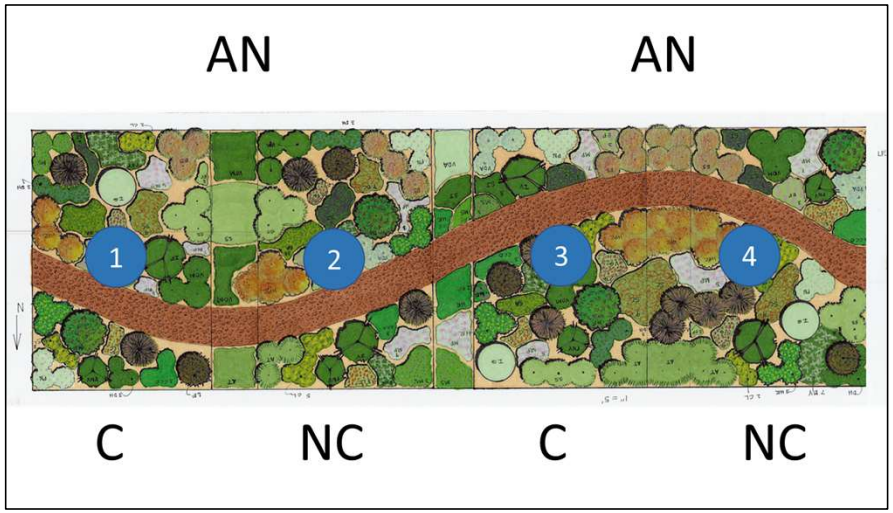
SUNBRIDGE

UCF | Department of Biology

LIFE SOILS

Our research at Sunbridge

Experimental plots at Base Camp



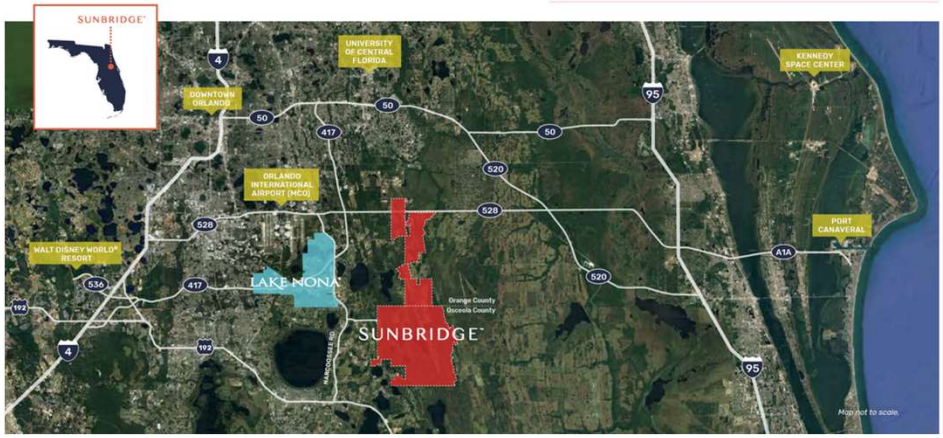
Comparing neighborhoods

Weslyn Park

Del Webb

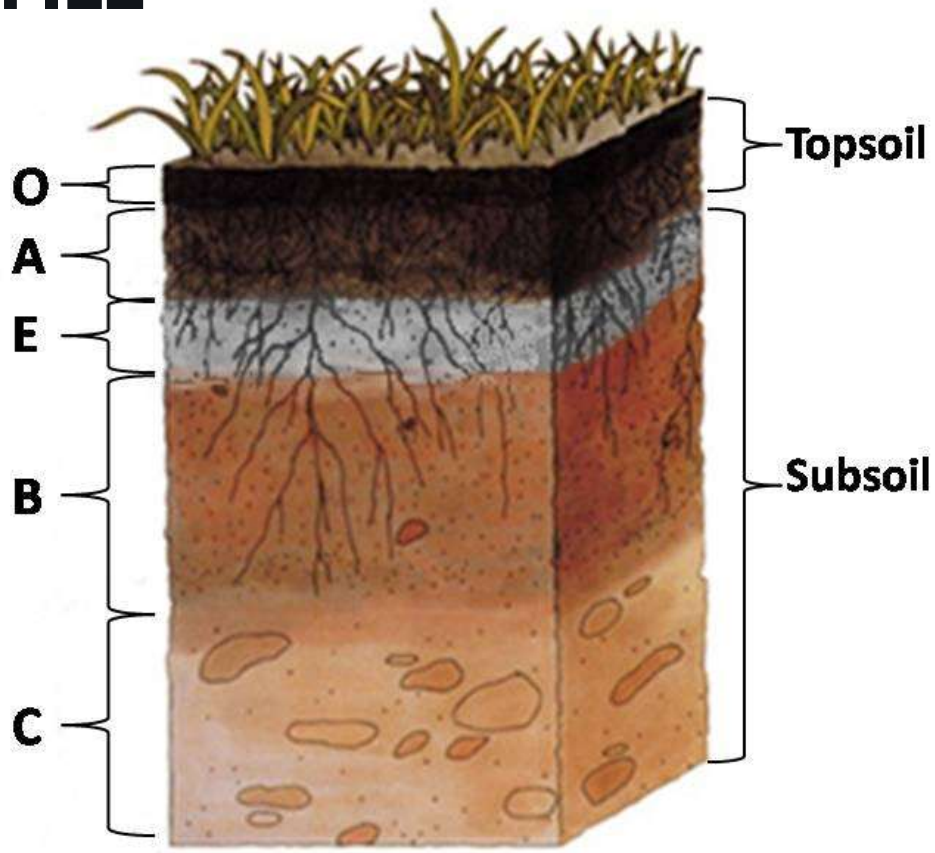
Enhancing Native Plant Establishment in Urban Soils

Brooke Moffis
Commercial Horticulture/FFL
UF/IFAS Extension Lake County



URBAN SOILS DEVELOPMENT PROCESS

THE SOIL PROFILE



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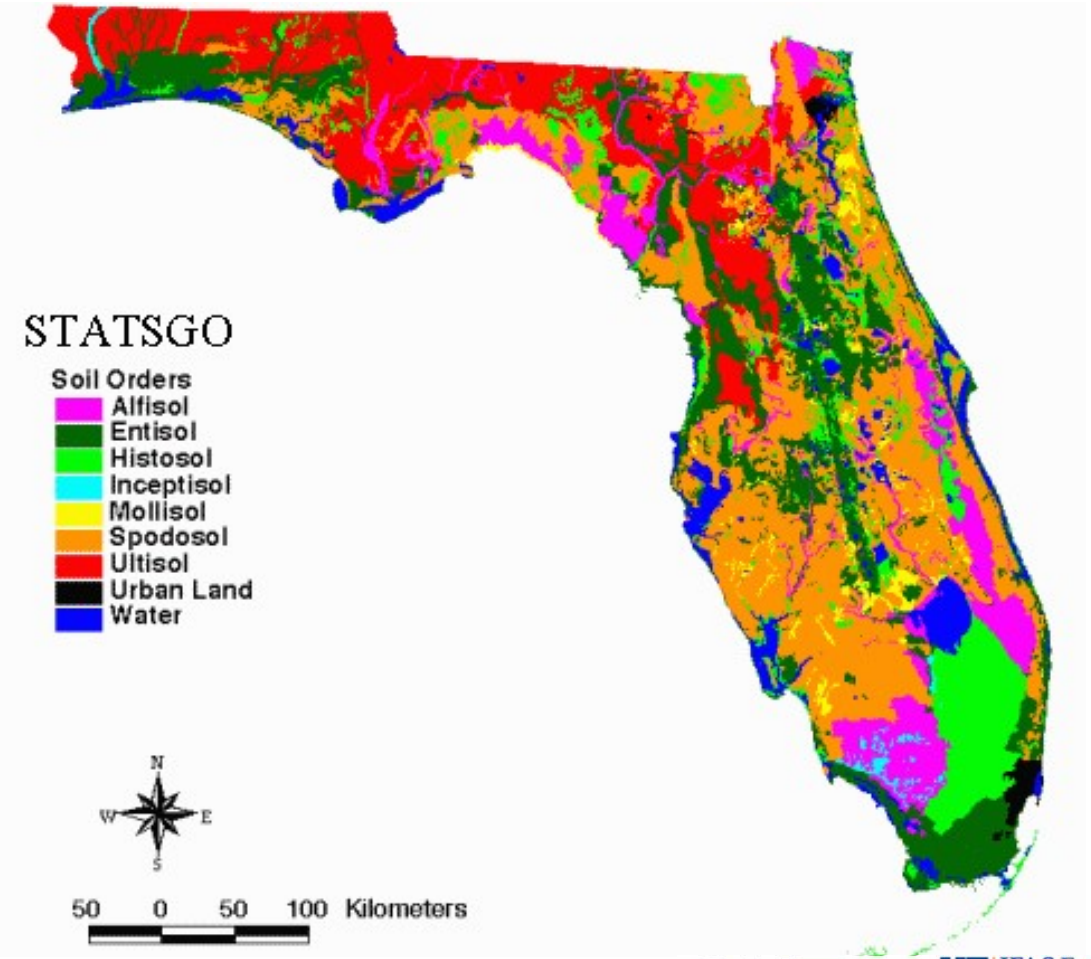
FLORIDA SOILS

Spodosol



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URBAN SOIL

- “A soil material having a non-agricultural, manmade surface layer >20 in thick…produced by mixing, filling or contamination..”

Maechling et al., 1974

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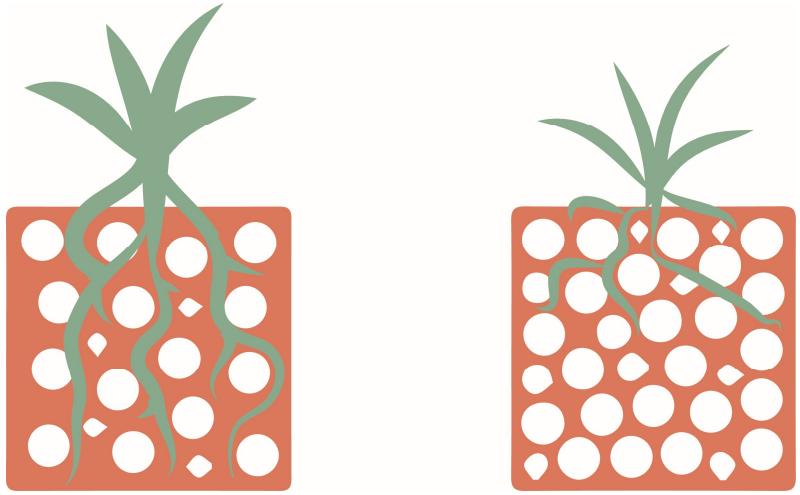
SOIL COMPACTION

- Reduced pore space leads to poor drainage and aeration
- High bulk density and soil strength impacts root penetration



Natural Soil

Compacted Soil

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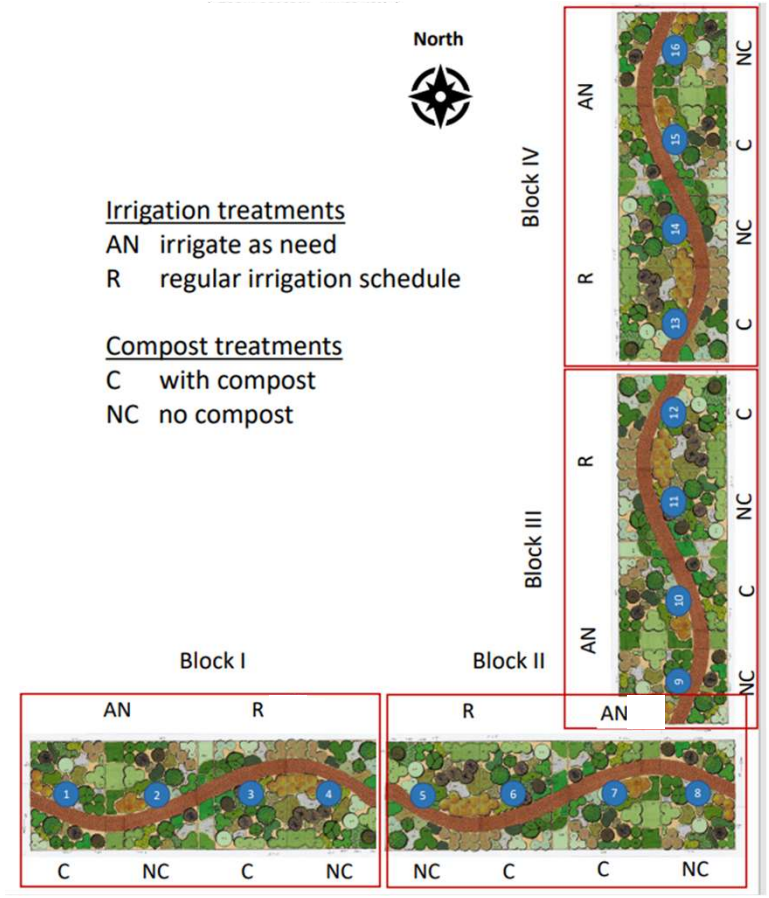
DESIGN


North
Irrigation treatments
AN irrigate as need
R regular irrigation schedule
Compost treatments
C with compost
NC no compost
Block I
Block II
Block III
Block IV
AN
R
C
NC
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16

PROJECT PLANT LIST

Trees				
Symbol	**Plan Qty**	**Botanical Name**	**Common Name**	**Size**
IV	8	Ilex vomitoria	Yaupon Holly	15 gallon.
IVP	8	Ilex vomitoria pendula	Weeping Yaupon Holly	15 gallon.
MF	16	Myrcianthes fragrans	Simpson's Stopper	15 gallon.

Shrubs & Groundcover				
Symbol	**Plan Qty**	**Botanical Name**	**Common Name**	**Size**
HPC	48	Hamelia patens 'Calusa'	Firebush 'Calusa'	3 gallon.
HR	48	Hypericum fasiculatum	St. Johns Wort	1 gallon.
IG	16	Ilex glabra 'Galberry'	Gallberry	3 gallon.
LF	16	Lyonia ferruginea 'Rusty Staggerbush'	Rusty Staggerbush	3 gallon.
SRC	16	Serenoa repens 'Cinerea'	Silver Saw Palmetto	3 gallon.
VDA	48	Vaccinium darrowii 'Darrow's Blueberry'	Darrow's Blueberry	3 gallon.
VOM	48	Viburnum obovatum 'Mrs. Schiller's Delight'	Mrs. Schiller's Delight Viburnum	3 gallon.
ATR	48	Andropogon ternarius 'Splitbeard Bluestem'	Splitbeard Bluestem	1 gallon.
AVG	48	Eragrostis spectabilis 'Purple Lovegrass'	Purple Lovegrass	1 gallon.
MC	32	Muhlenbergia capillaris	Muhly Grass	3 gallon.
SSB	48	Schizachyrium scoparium 'Little Bluestem'	Little Bluestem	1 gallon.
CCO	48	Conoclinum coelestinum 'Mistflower'	Mistflower	1 gallon.
CL	80	Coreopsis lanceolata 'Lanceleaf Tickseed'	Lanceleaf Tickseed	1 gallon.
DH	48	Dyschoriste humistrata 'Swamp Twinflower'	Swamp Twinflower	1 gallon.
EY	80	Eryngium yuccifolium	Button Rattlesnake Master	1 gallon.
AP	48	Asclepias 'Milkweed'	Perennial Milkweed	1 gallon.
LC	80	Lobeliea cardinalis	Cardinal flower	1 gallon.
MS	48	Mimosa strigilosa	Sunshine Mimosa	1 gallon.
MP	192	Mondarda punctata	Spotted Bee Balm	1 gallon.
PN	48	Phyla nodiflora 'Turkey Tangle Frogfruit'	Frogfruit	1 gallon.
SC	144	Salvia coccinea 'Sage'	Scarlet Sage	1 gallon.
SA	192	Silphium asteriscus 'Starry Rosinweed'	Starry Rosinweed	1 gallon.
SJ	96	Stachytarpheta jamaicensis	Blue Porterweed	1 gallon.
VG	80	Vernonia gigantea	Giant Ironweed	1 gallon.

METRICS

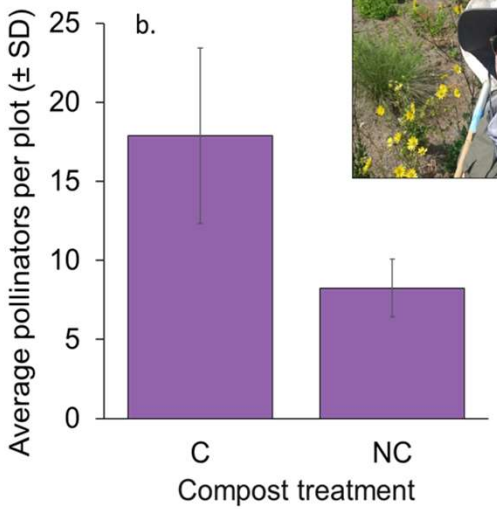
Soil
- N, P, C
- Bulk density
- Plant available water

Plant Health
- Visual quality
- Pest presence
- Disease presence

Arthropod (UCF, UF)
- Diversity
- Abundance

RESULTS

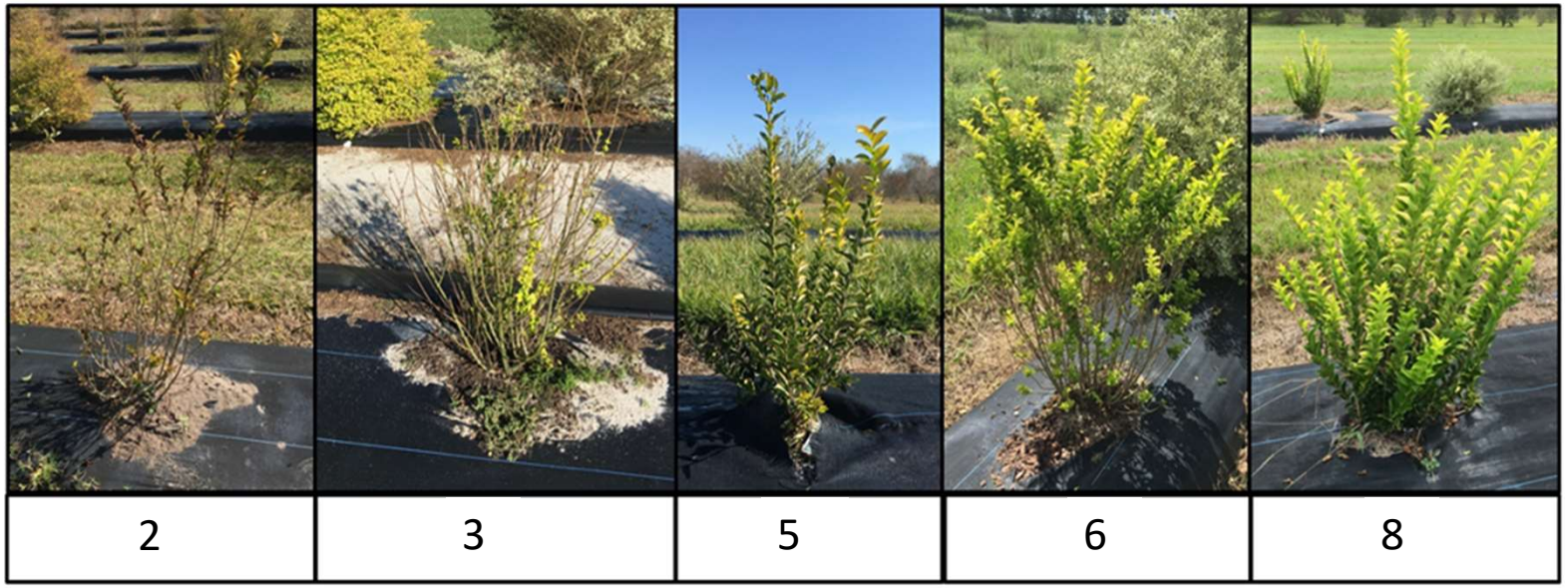
Flowers & Pollinators doubled in compost plots



As needed irrigation = 79% water savings

16 months
- **As-needed irrigation - 15,480 gal.**
- **Once-a-week irrigation - 73,960 gal.**

VISUAL QUALITY RATING 1 - 10



Adapted from UF/IFAS Sandra Wilson and Gary Knox

- 1 = dead, still intact
- 5 = fair quality, marketable
- 10 = excellent quality

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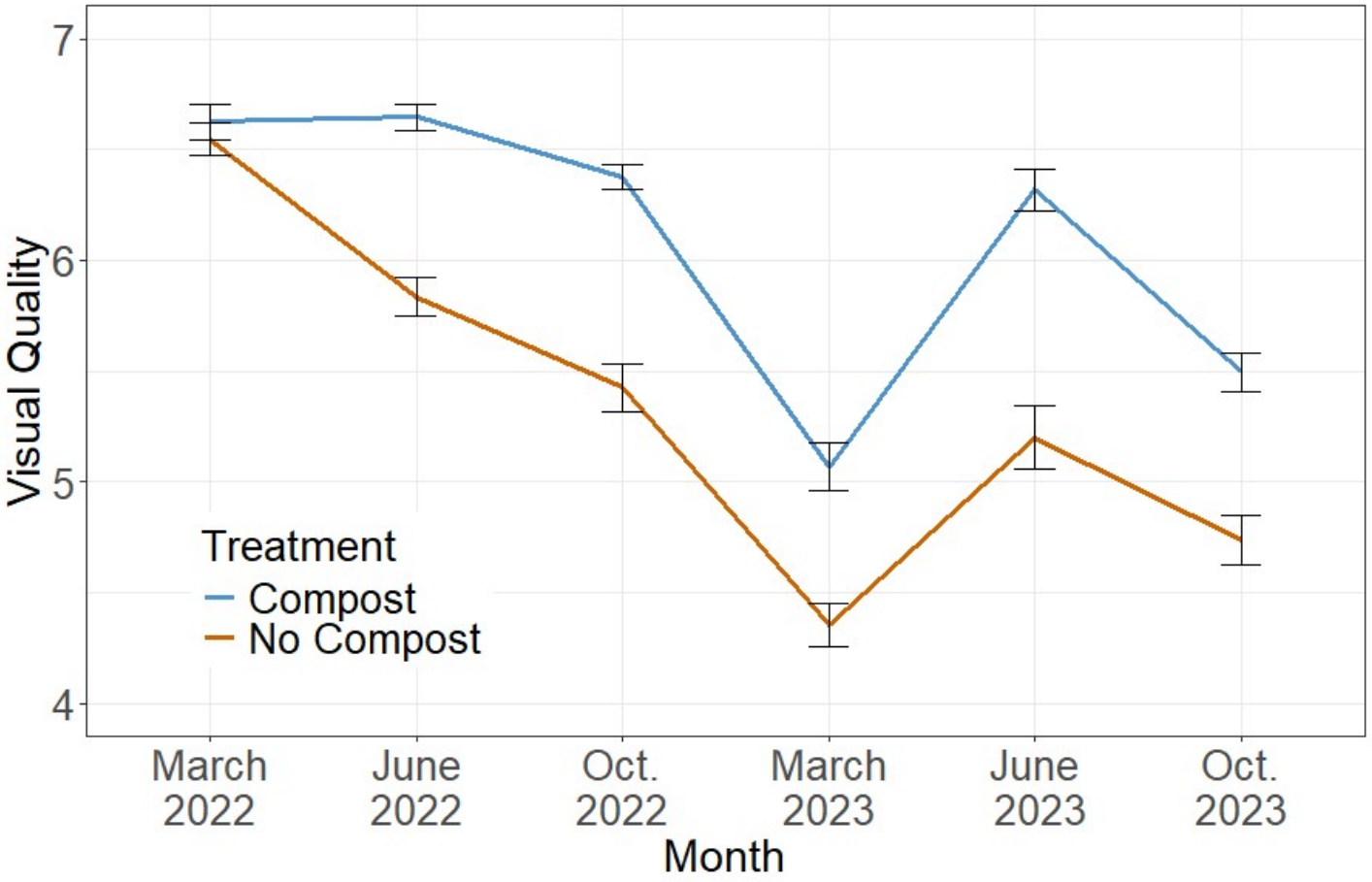
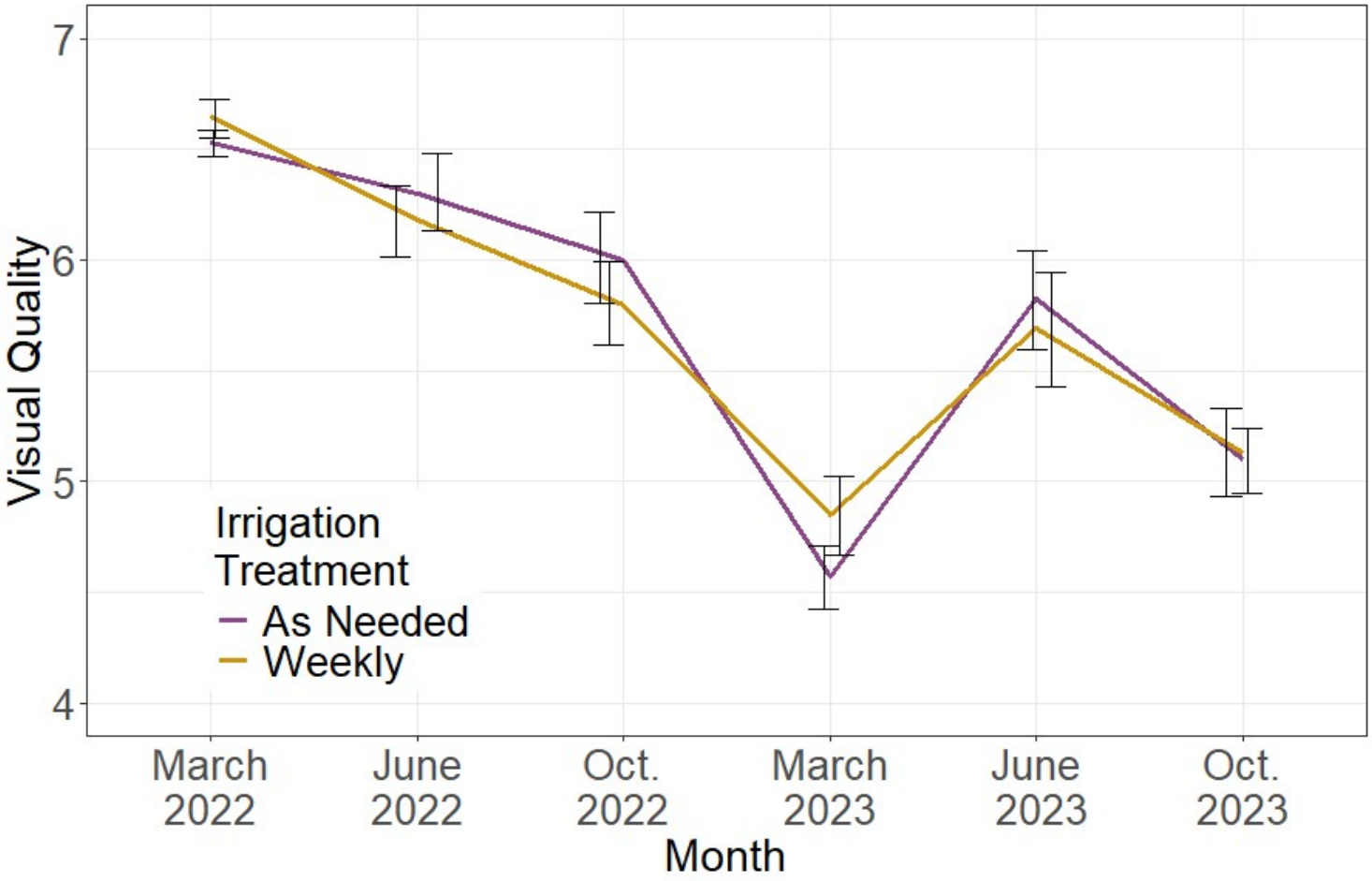
LAKE COUNTY, FL

Plot Level Visual Quality - Compost

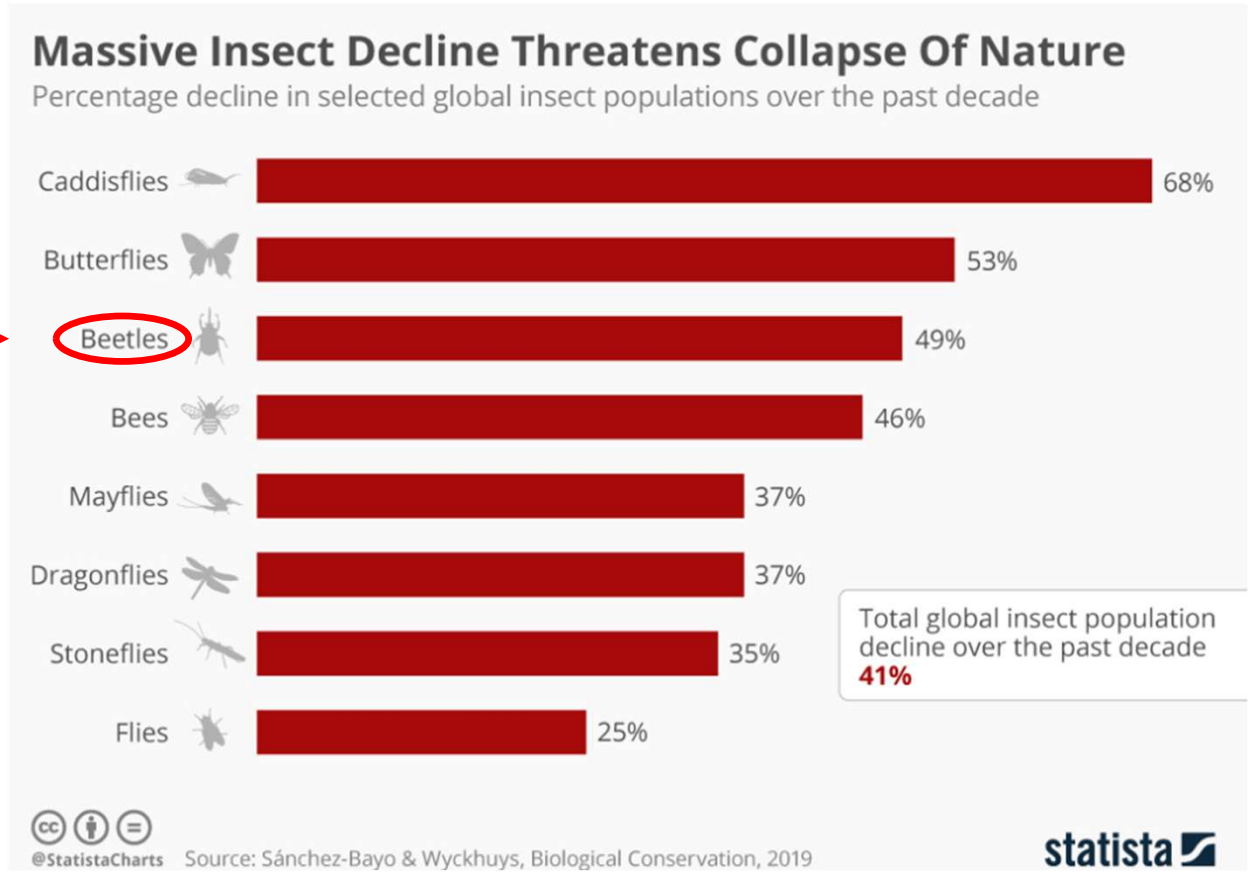


Plot Level Visual Quality - Irrigation

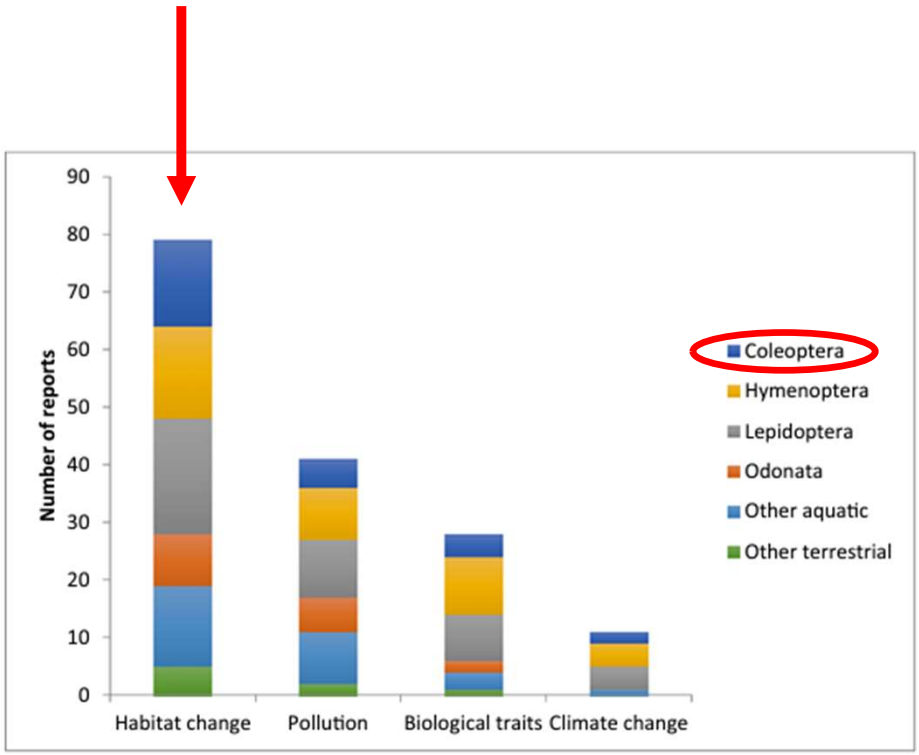


Promoting Ground-Active Insects through Sustainable Practices in a Native Landscape

Alessandra Pandolfi
Department of Biology
University of Central Florida


Massive Insect Decline Threatens Collapse Of Nature
Percentage decline in selected global insect populations over the past decade
Caddisflies
68%
Butterflies
53%
Beetles
49%
Bees
46%
Mayflies
37%
Dragonflies
37%
Stoneflies
35%
Flies
25%
Total global insect population decline over the past decade
41%
@StatistaCharts
Source: Sánchez-Bayo & Wyckhuys, Biological Conservation, 2019
statista

The four major drivers of decline



Source: Francisco Sánchez-Bayoa and Kris A.G. Wyckhuys, 2019

How can we actively contribute to reversing this decline?

Experimental goals

Compost

Irrigation

Groundcover wildflowers

Upright wildflowers

Grasses

Shrubs

Trees

Mulch

Pitfall trap

Flower beetle

Euphoria sepulcralis

Dull tumblebug

Canthon pilularius

Ground beetle

Pasimachus sublaevis

Rainbow scarab

Phanaeus vindex

Rove beetle

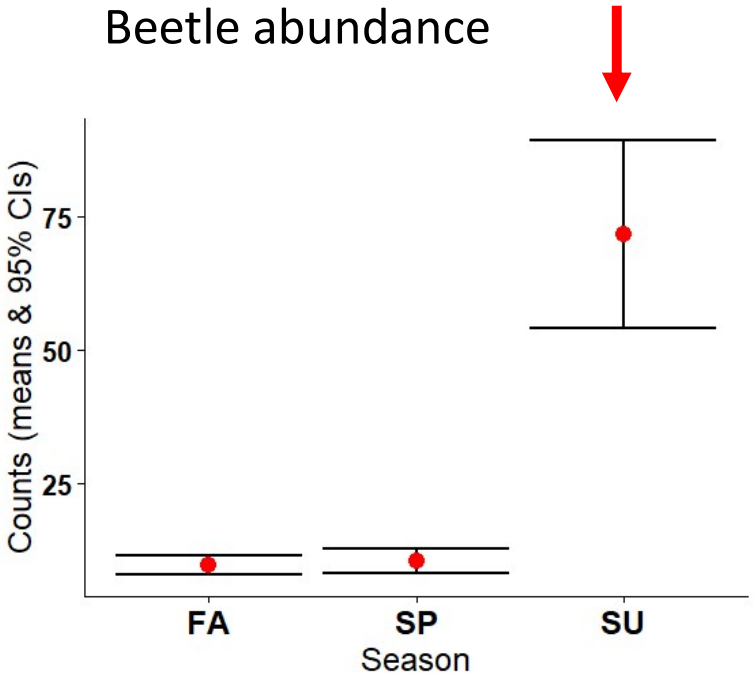
Bryoporus testaceus

Tiger beetle

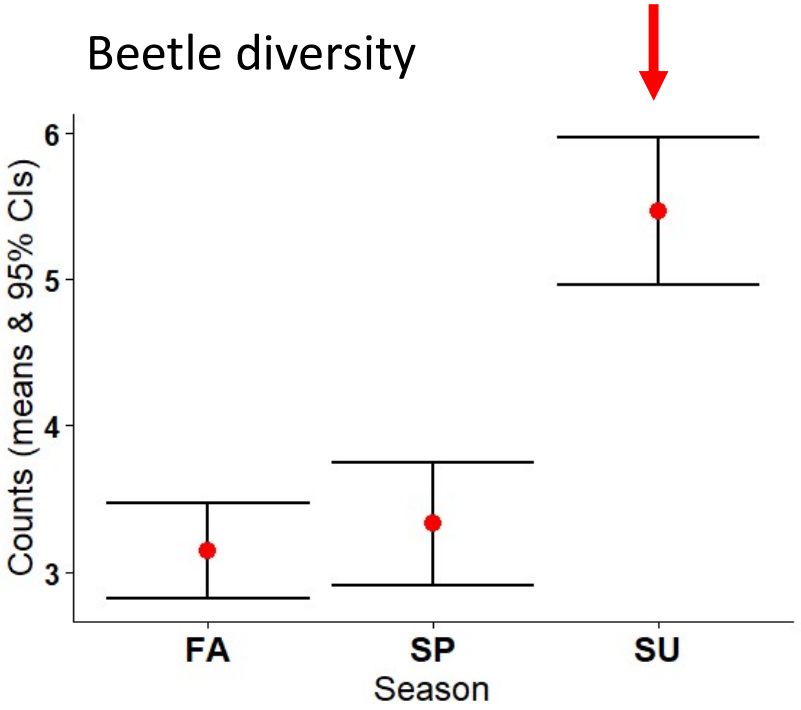
Tetracha virginica

Preliminary results

Beetle abundance

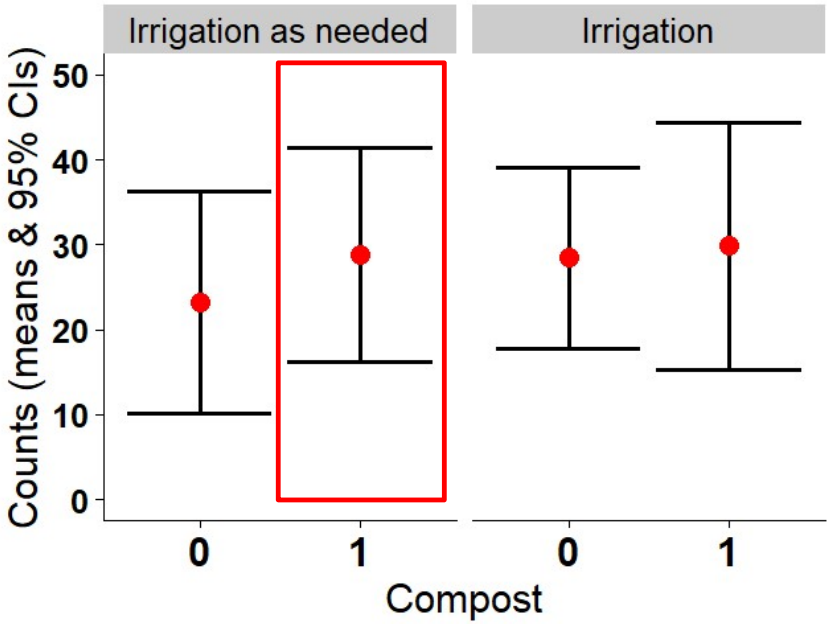


Beetle diversity

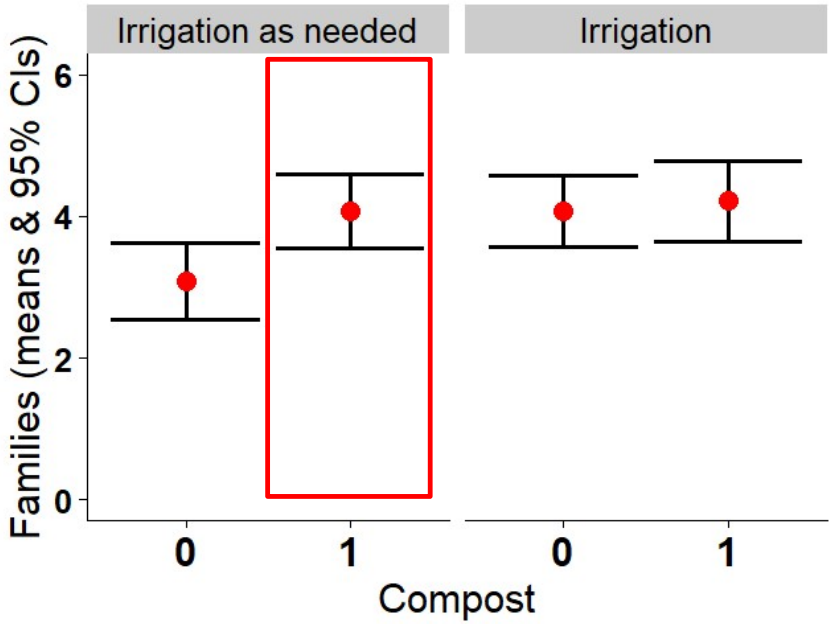


Preliminary results

Beetle abundance

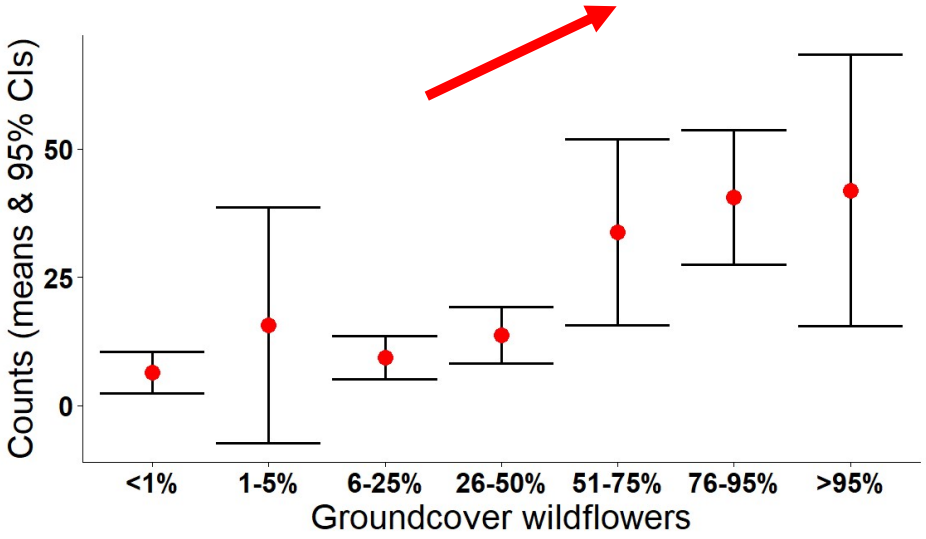


Beetle diversity



Preliminary results

Beetle abundance



Mimosa present in the plots
Summer 2023

Takeaways

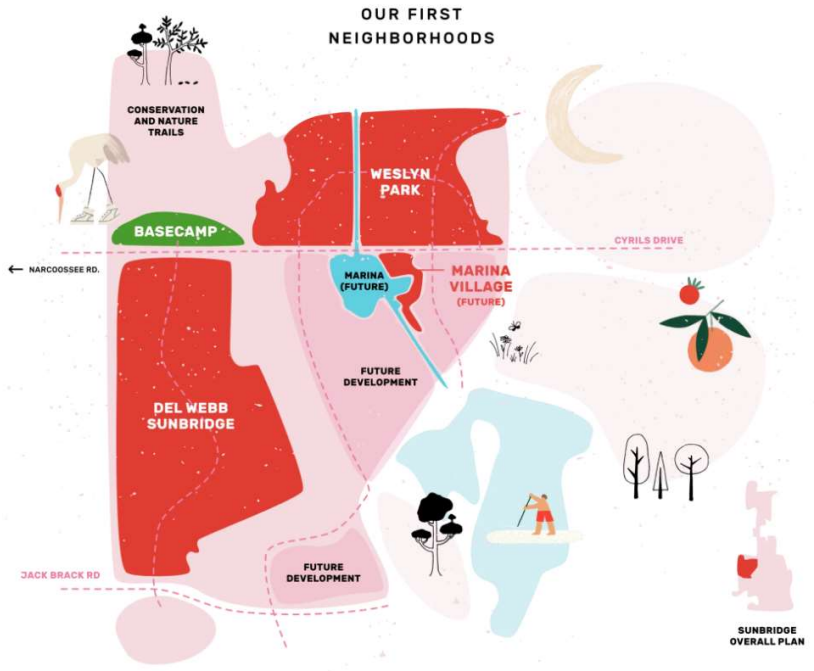
- The diverse native landscape planting is attracting various beneficial beetles
- Summer is the season with more beetles in terms of abundance and diversity
- Excessive irrigation might not be necessary if compost amendment is employed
- Groundcover plants have a role in increasing beneficial beetles

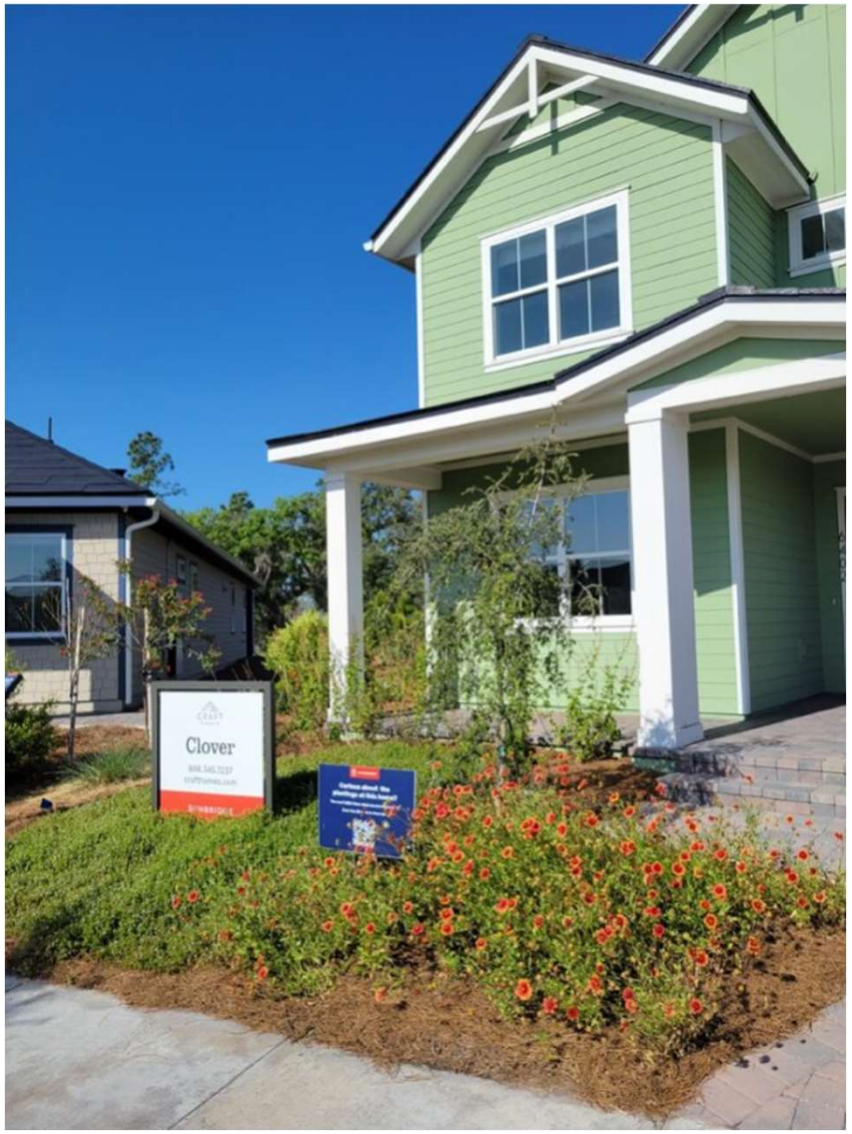
From Experimental Plots to Residential Landscapes

- Native-based landscape design
- 11 model homes in Weslyn Park

Victoria Cope

Mykayla Hagaman



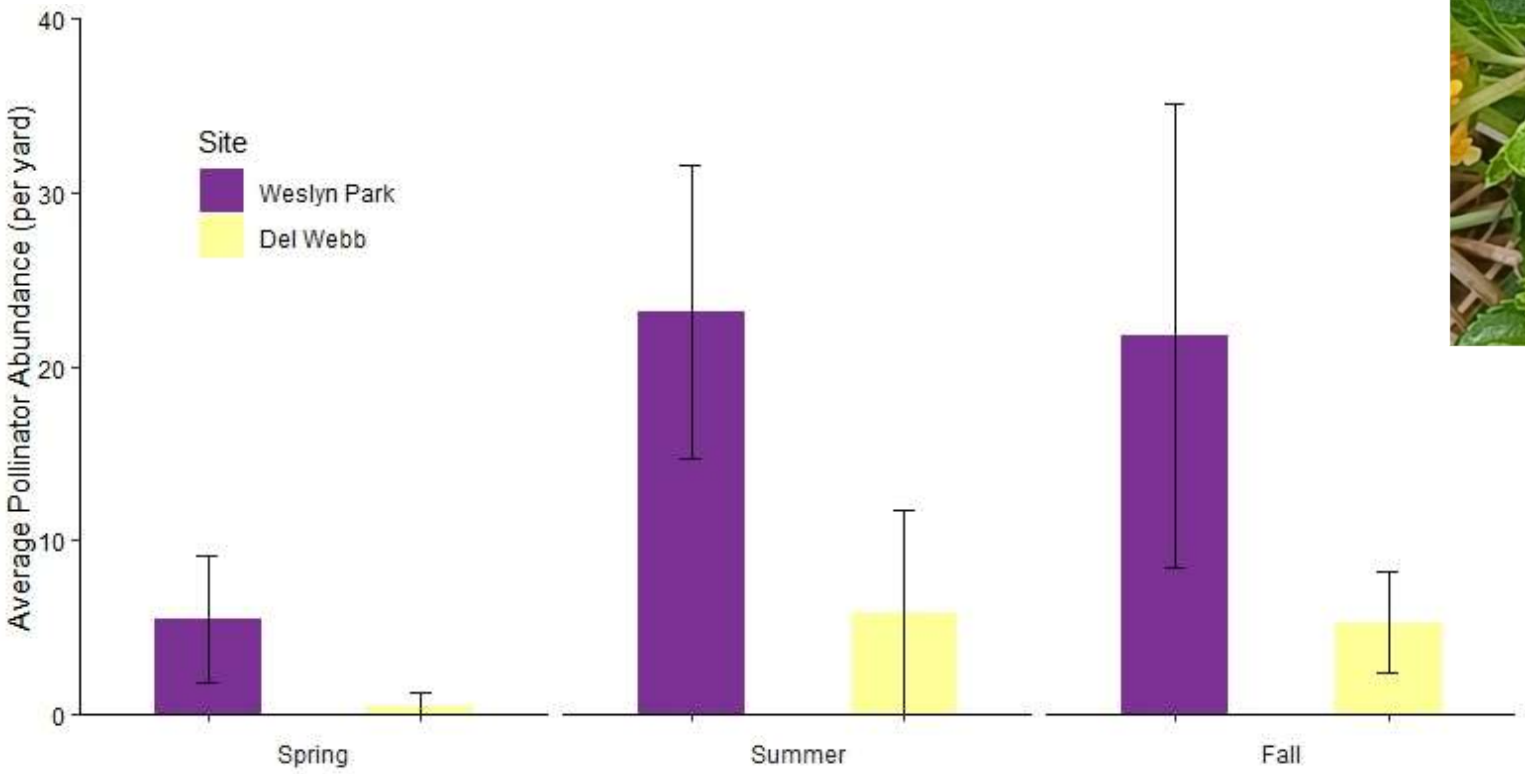


Neighborhood comparison

- 11 homes in Weslyn Park
- 14 homes in Del Webb
- Data collection:
  - Spring, Summer, and Fall
  - Plant composition, pollinator abundance, and the arthropod community

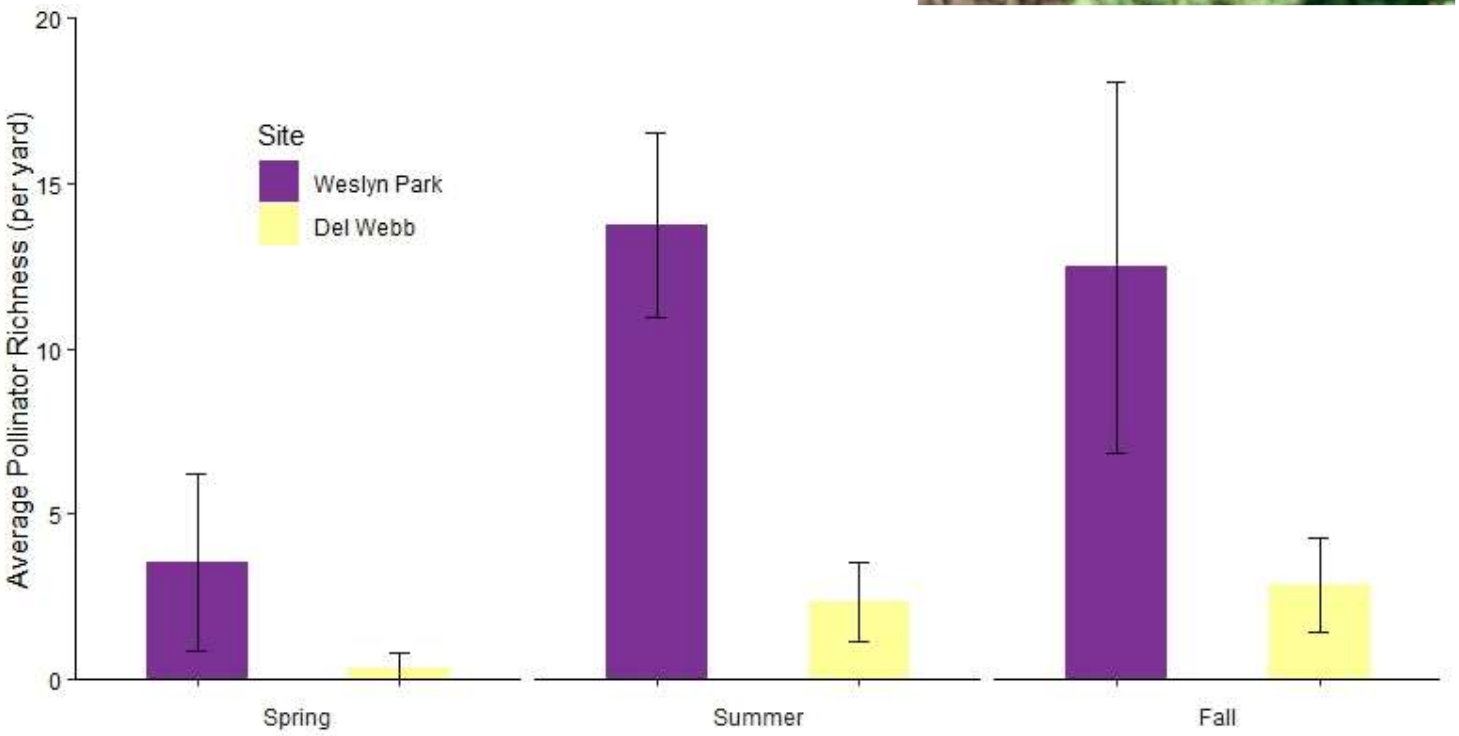
Pollinator Findings

- Total of 1,363 pollinators from 89 species
  - 317 individuals from Del Webb
  - 1,044 individuals from Weslyn Park



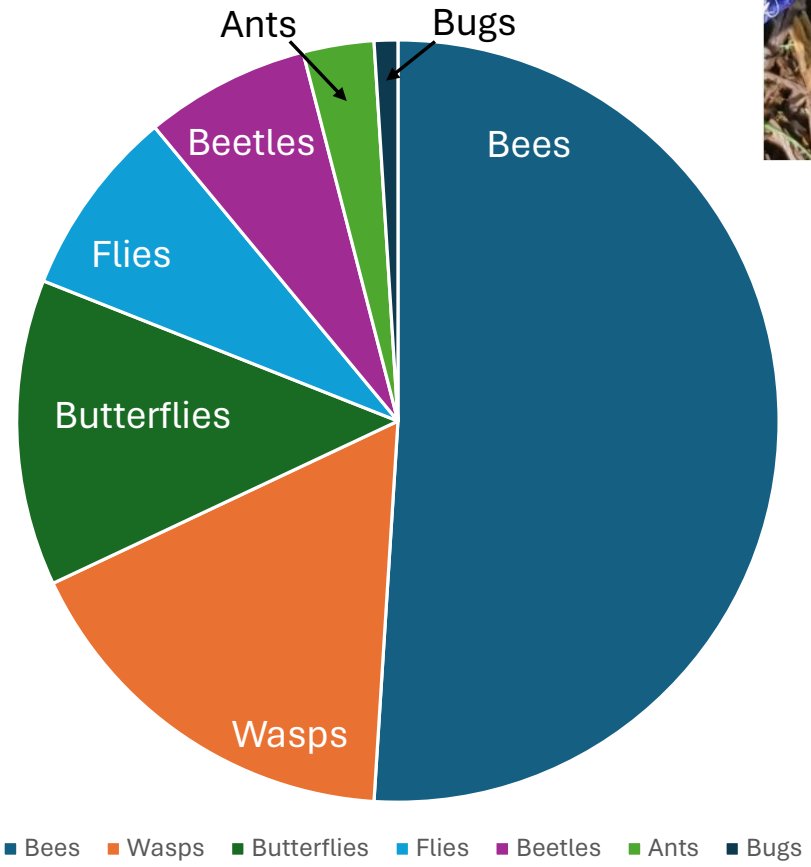
Pollinator Diversity

- 89 different species in total
- Significantly more in Weslyn Park

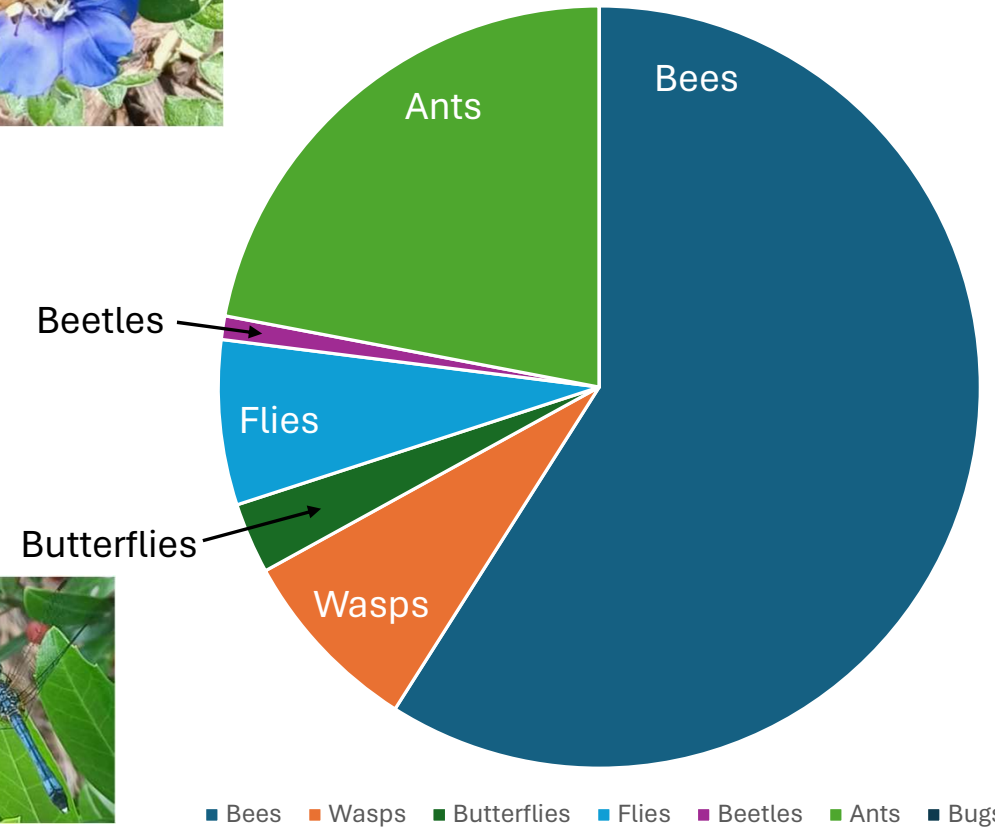


Types of Pollinators

Weslyn Park Pollinators



Del Webb Pollinators



Top Pollinator Plants

- Bottlebrush – non-native
- Firebush – native
- Beebalm – native
- Eagleston Holly – native
- Silkgrass - native

Pollinator Summary

- Native-based landscapes attract more pollinators
- Increasing the number of flowering species can help support pollinators

Food Web Resources in New Residential Developments.

Authors: Victoria Cope; Adam Dale; Patrick Bohlen; Jiangxiao Qiu; Mykayla Hagaman; Basil V. Iannone III.

Weslyn Park

Native Dominated

Del Webb

Conventional

HYPOTHESES

Relative to lots with conventional turf-dominated landscaping, lots comprised of predominantly native plants will:

I. Provide greater resources for higher trophic levels; as measured by arthropod biomass

II. Have greater taxonomic diversity

III. Exhibit greater evenness across functional groups.

Study Locations and Methods

Weslyn Park

Native Dominated

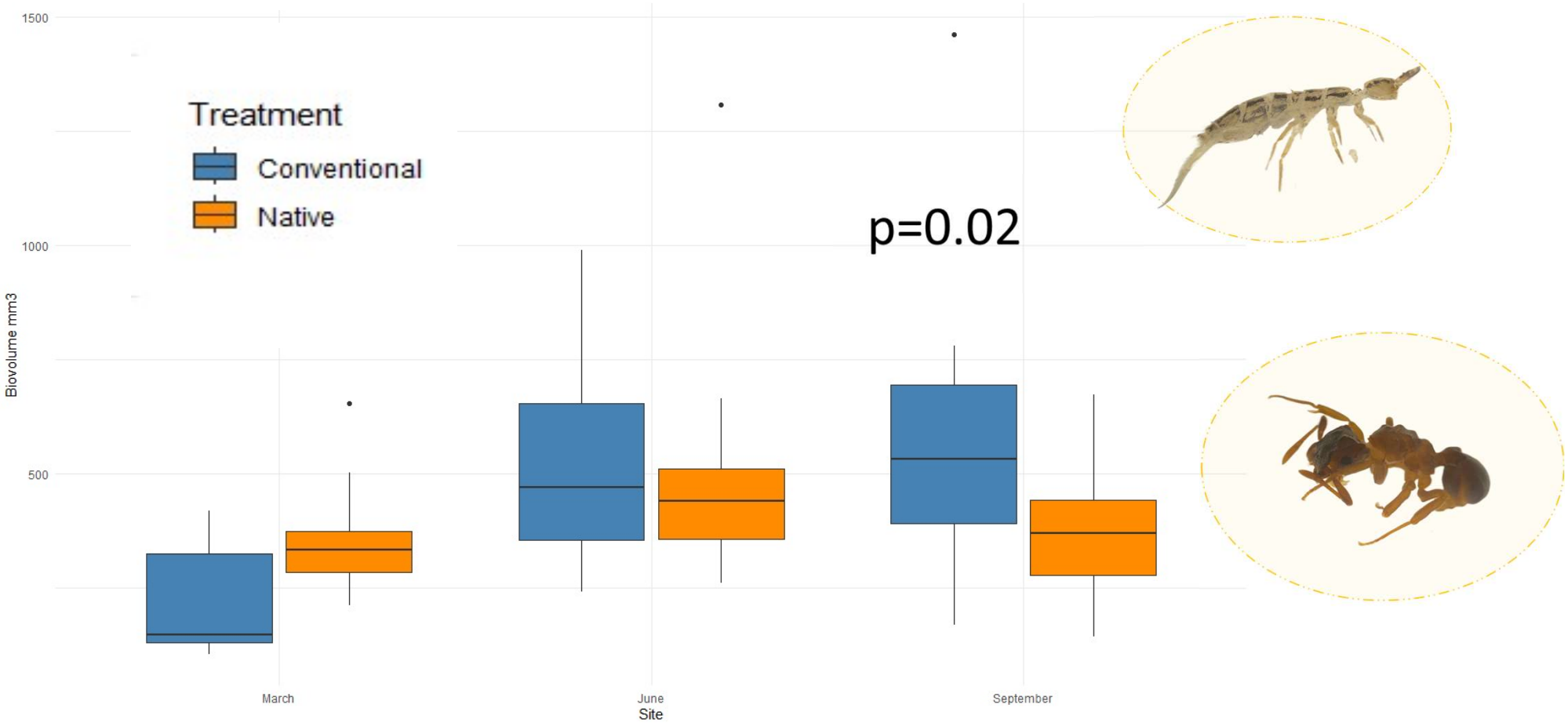
Del Webb

Conventional

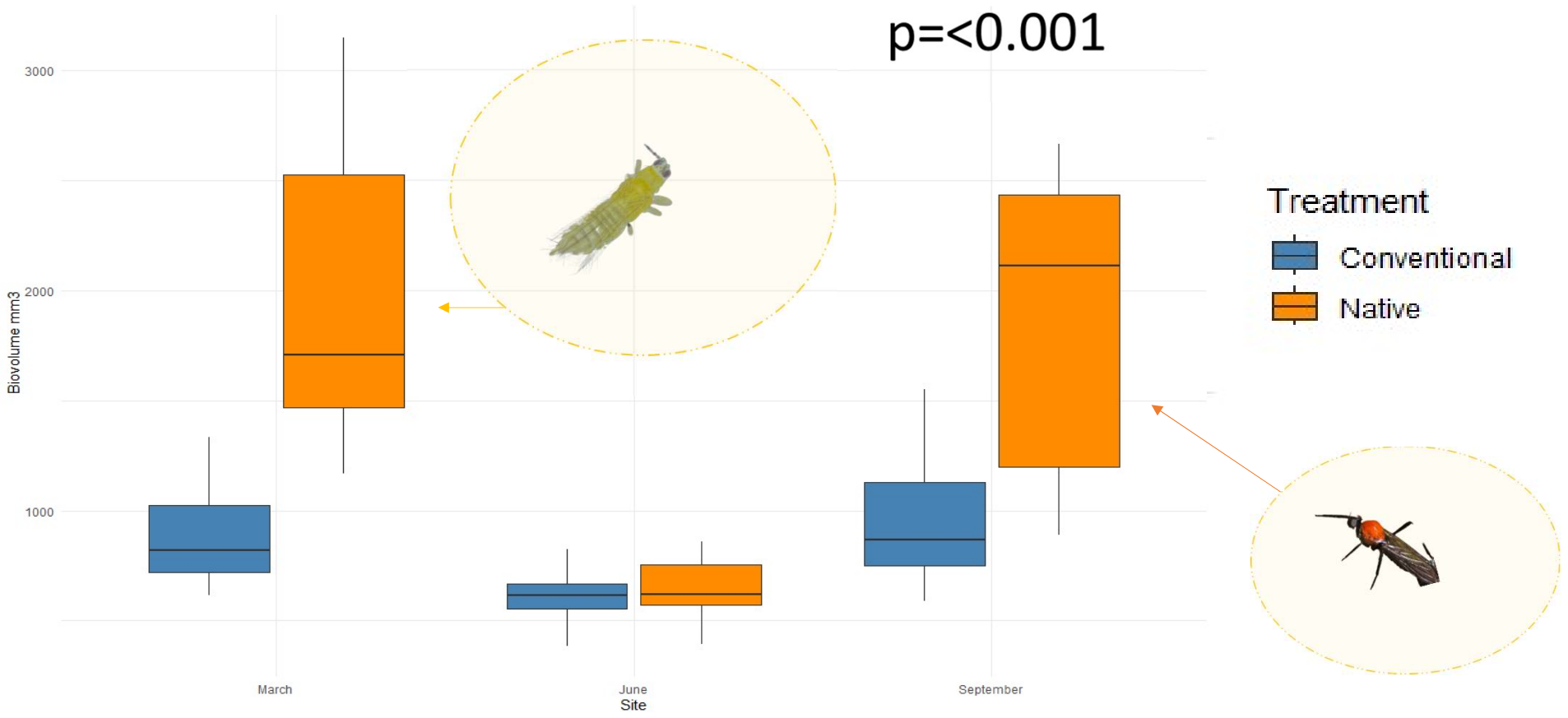
METHODS

Arthropod samples were collected in four pitfall traps and on four sticky card traps in each lot; and sampled in March, June, and September to account for seasonality.

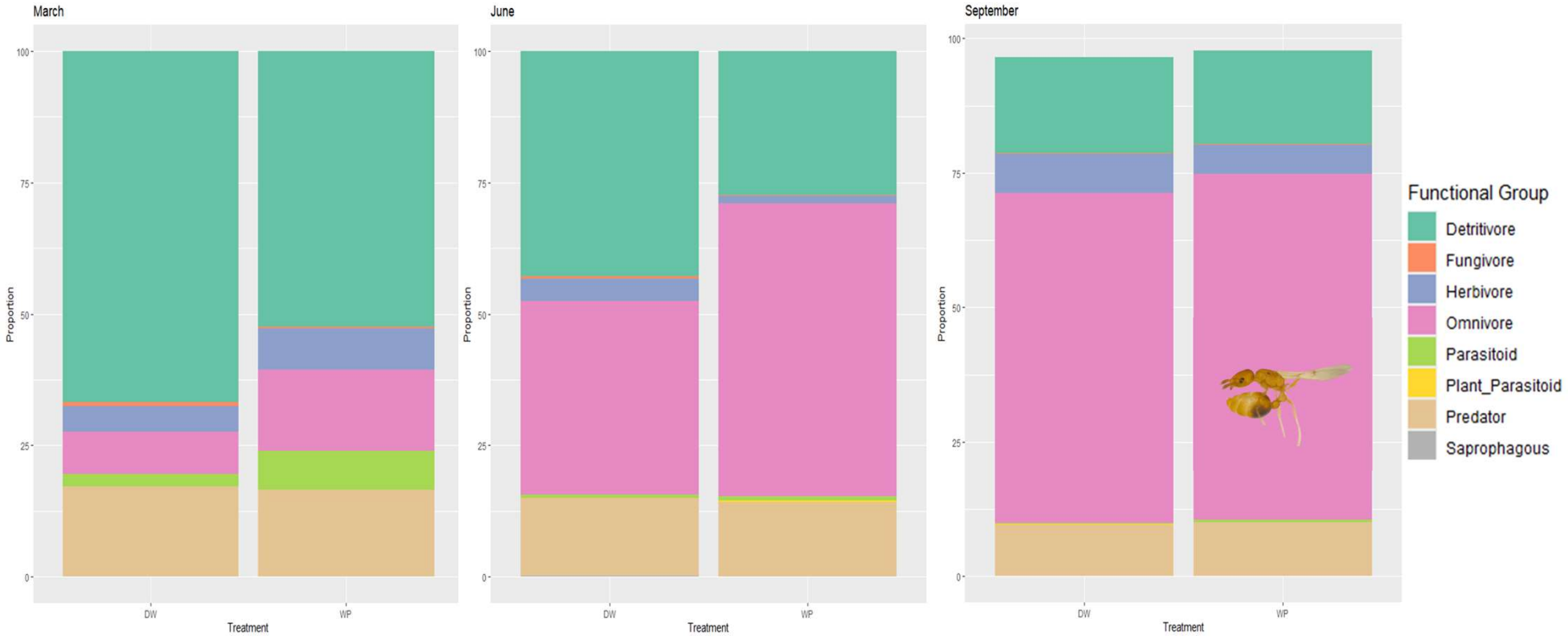
Biomass Pitfall Traps



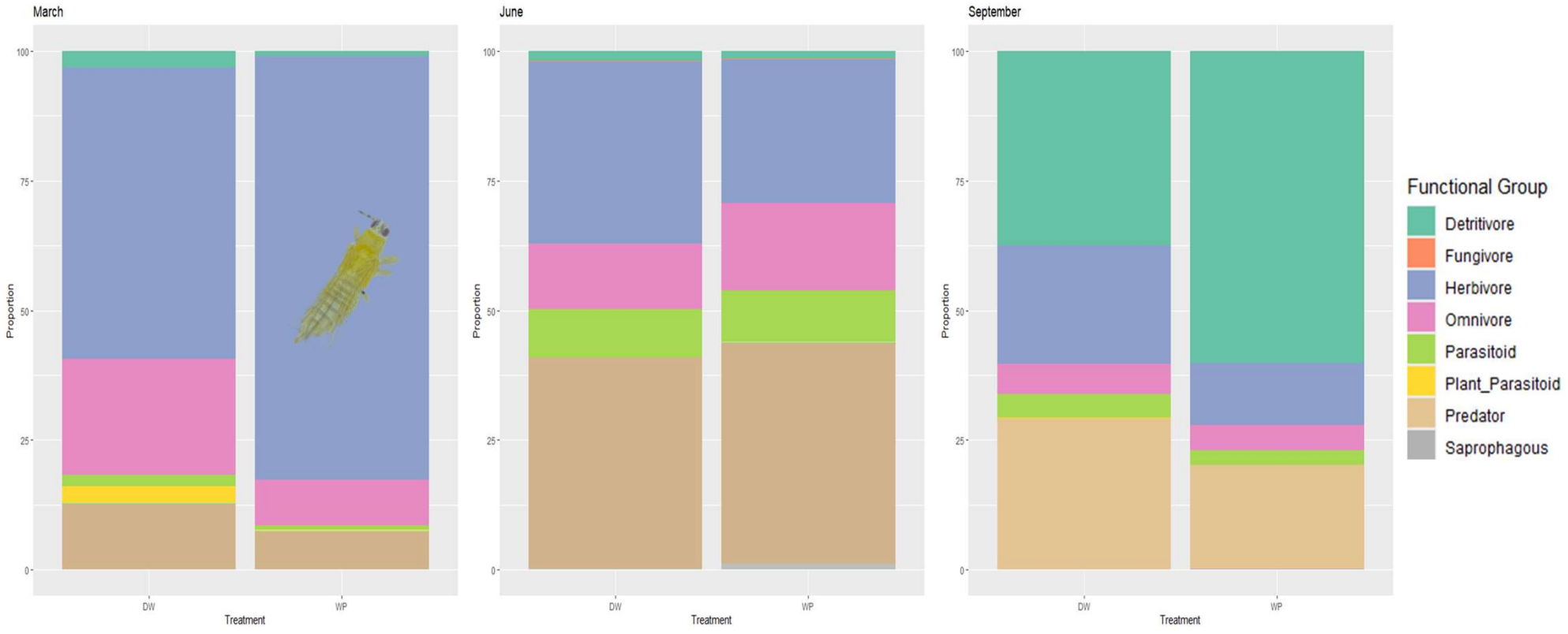
Biomass Sticky Cards



Functional Groups Pitfall Traps



Functional Groups Sticky Cards



Conclusions

Plant choices at the early stages of development affect arthropod communities.

Seasonal differences in

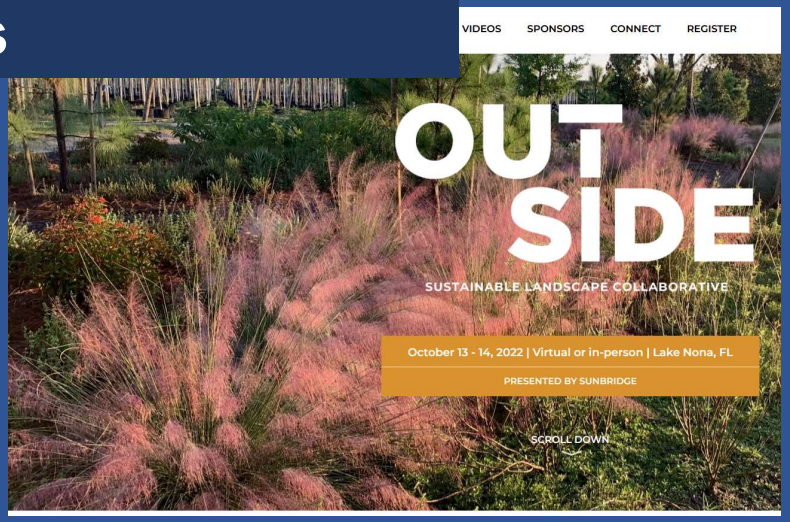
- Biovolume
- Taxonomic richness
- Evenness of functional groups

The trapping method and insect emergence affect our results

- Pitfall trapping shows greater biomass in conventional turf-dominated landscapes in the Fall
- Sticky cards show greater biomass in Spring and Fall due to
- However, this pattern does not hold if the emergence of thrips (Thysanoptera) and lovebugs (Diptera, *Plecia nearctica*) are removed from the data set.

Compared to more established neighborhoods, we do not see the same benefits of native plants for food web resources in new developments.

Impacts: Changing Land Development & Landscaping Practices



Irrigation Usage

Toho Efficiency Program

- 28 inches / year = 62,836 gals/year

  ~ 3,600 ft^2

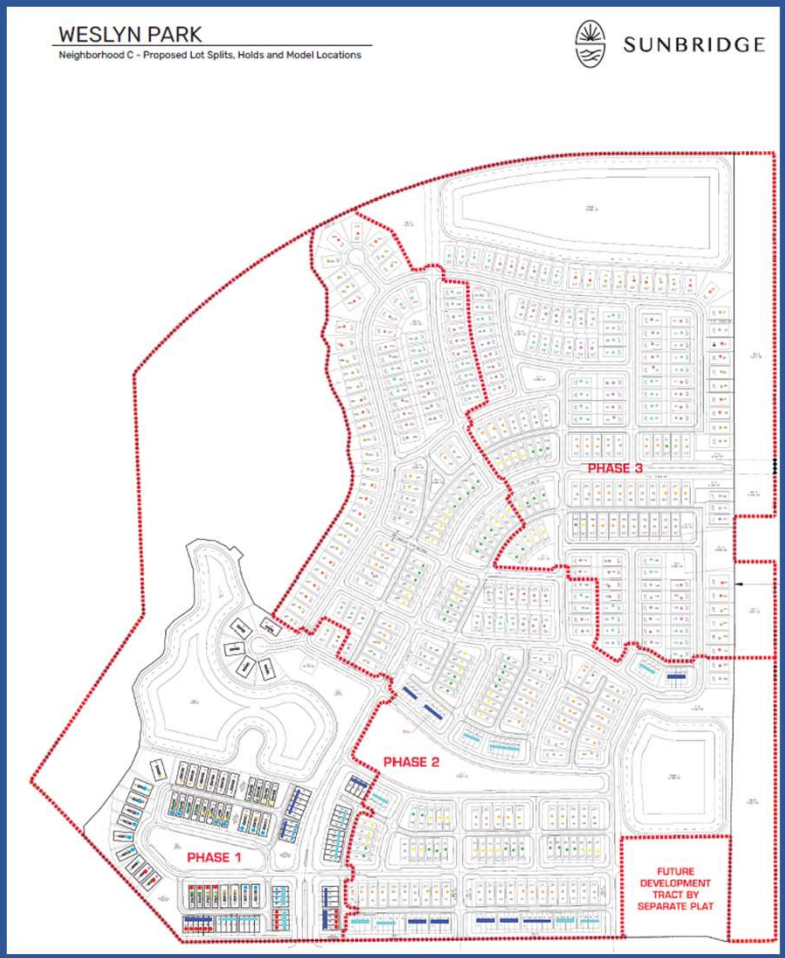
Irrigation Usage

Community	Manager	Gal/year
Del Webb (Conventional)	Del Webb	123,427
Weslyn Park (Native dominated)	Cherrylake	34,784
Weslyn Park (Native dominated)	Other	151,927

New Policies for Next Development Phase (300 Homes)

Water Impacts:

- Compost amendments
- Landscapes required to use 24” per year or less (Toho)
- Water will be master managed
- Landscape companies need to meet requirements to stay on *preferred list*
- Use native plants when available



New Policies for Next Development Phase (300 Homes)

Dream Projections:

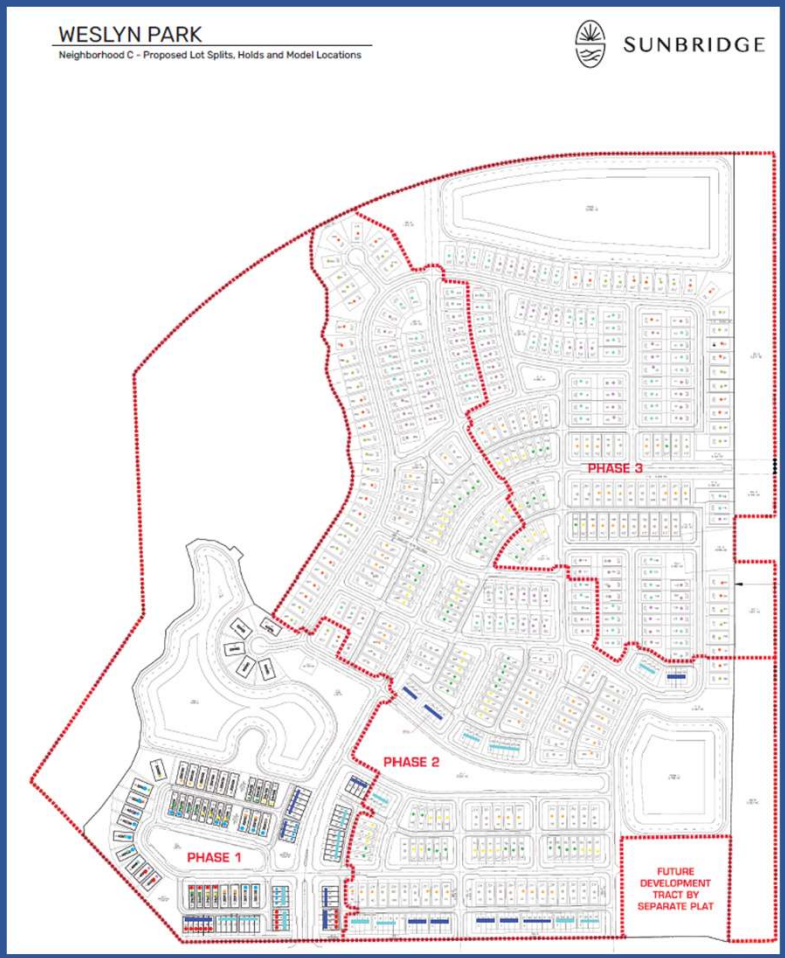
- Landscaped area = 0.03 ha
- UF/IFAS fertilizer & irrigation

N = 3.2 – 8.3 thousand lbs./year

P = 540 lbs./year

H_2O = 36 – 133 thousand gal./day

CO_2 = 85 thousand lbs./year



Conclusions

- Making progress towards conservation goals
- Benefits of Private-Academic-NGO-Municipal partnerships

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Next Steps

- Long-term effects on *Ecology* & *Water usage*?
- Resident perceptions / Making landscapes attractive