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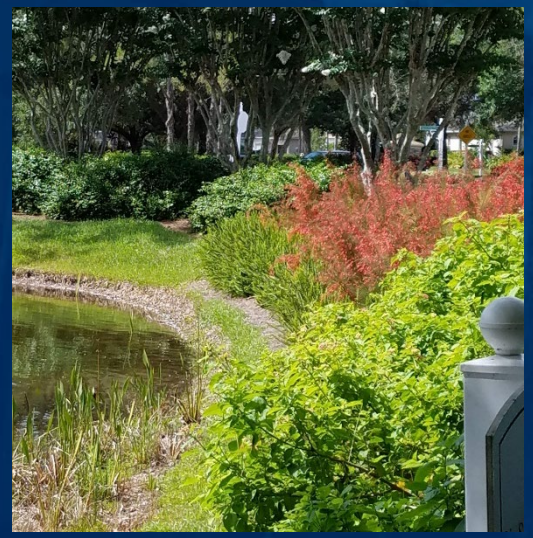
Stormwater Pond Plantings as a Strategy for Improving Water Quality



Basil V. Iannone III, Michelle Atkinson, Eban Z. Bean, Mary Lusk, Paul Monaghan, and Alexander J. Reisinger

School of FOREST RESOURCES & CONSERVATION
SFRC

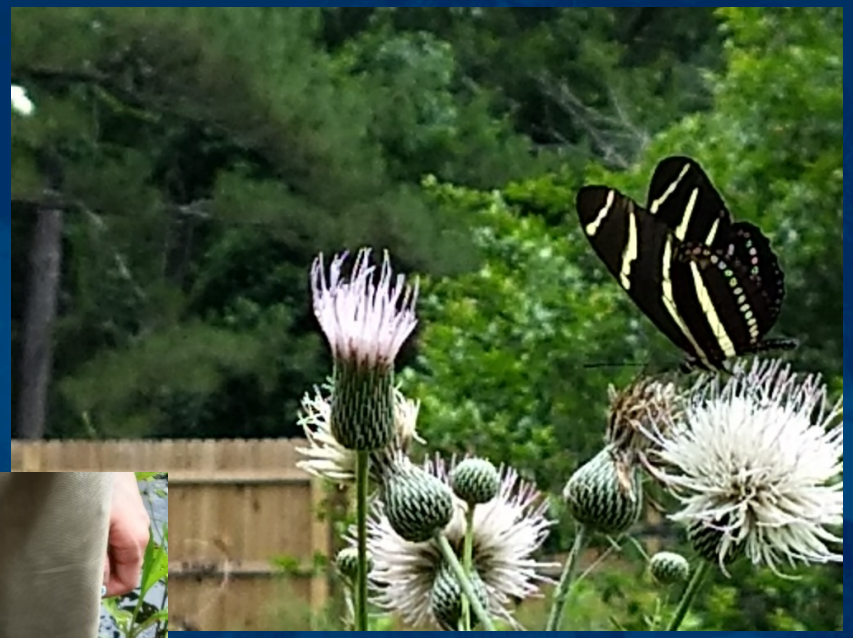
SUSTAINABLE HUMAN & ECOLOGICAL DEVELOPMENT

CLUE | CENTER FOR LAND USE EFFICIENCY

Stormwater Ponds --- Abundant & Diverse Engineered Ecosystem

- Managing urban runoff
- Flood & pollution control

Stormwater Ponds: Habitat / Ecosystems (Hassall 2014, Hill et al 2017)

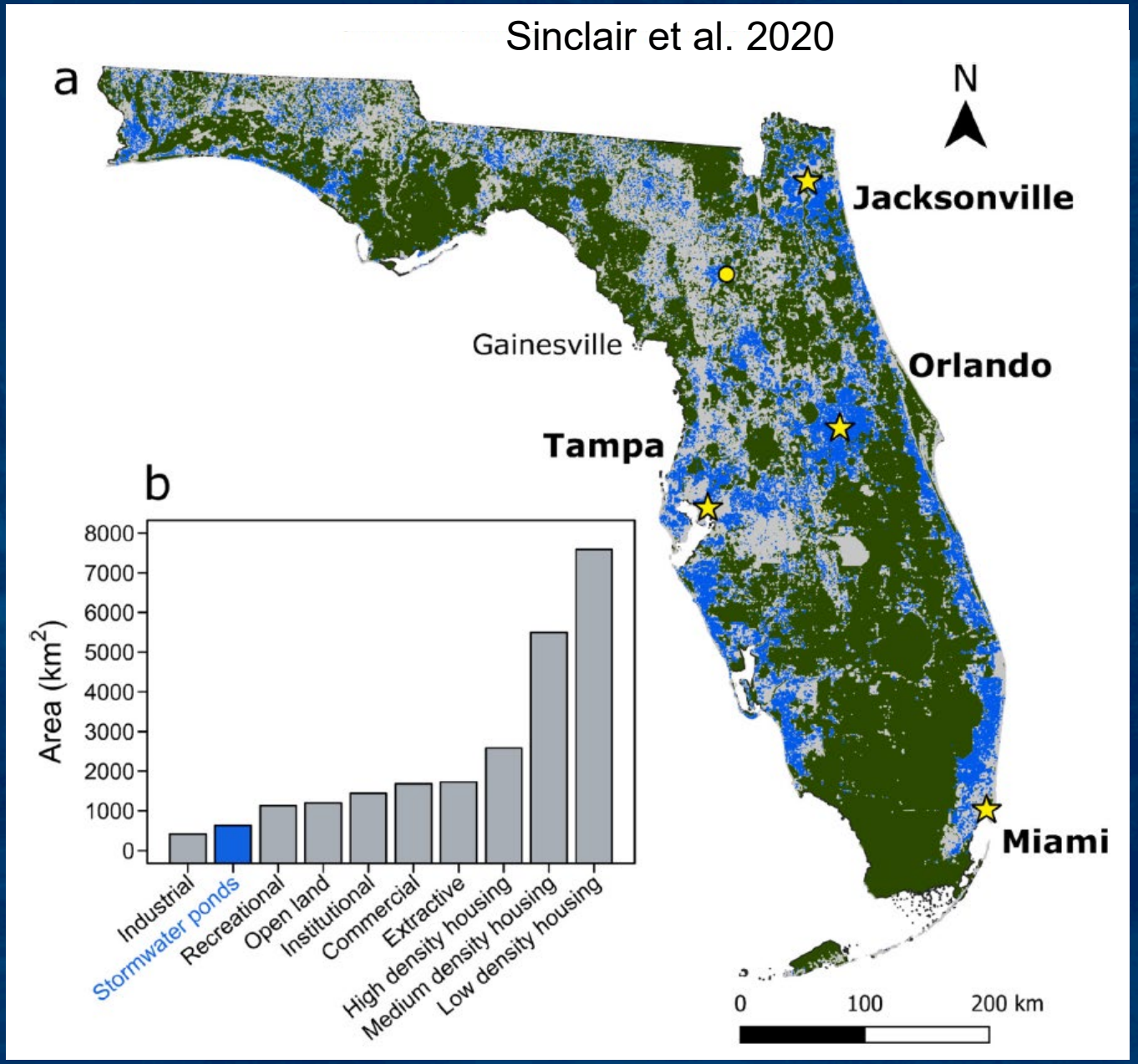


Increasing commonality

- Increase in abundance parallels rates of urbanization

(Beckinghan et al. 2019)

Sinclair et al. 2020



Are they doing their job?

Florida:

- Credited with removing > 80% Total P, Total N, and TSS

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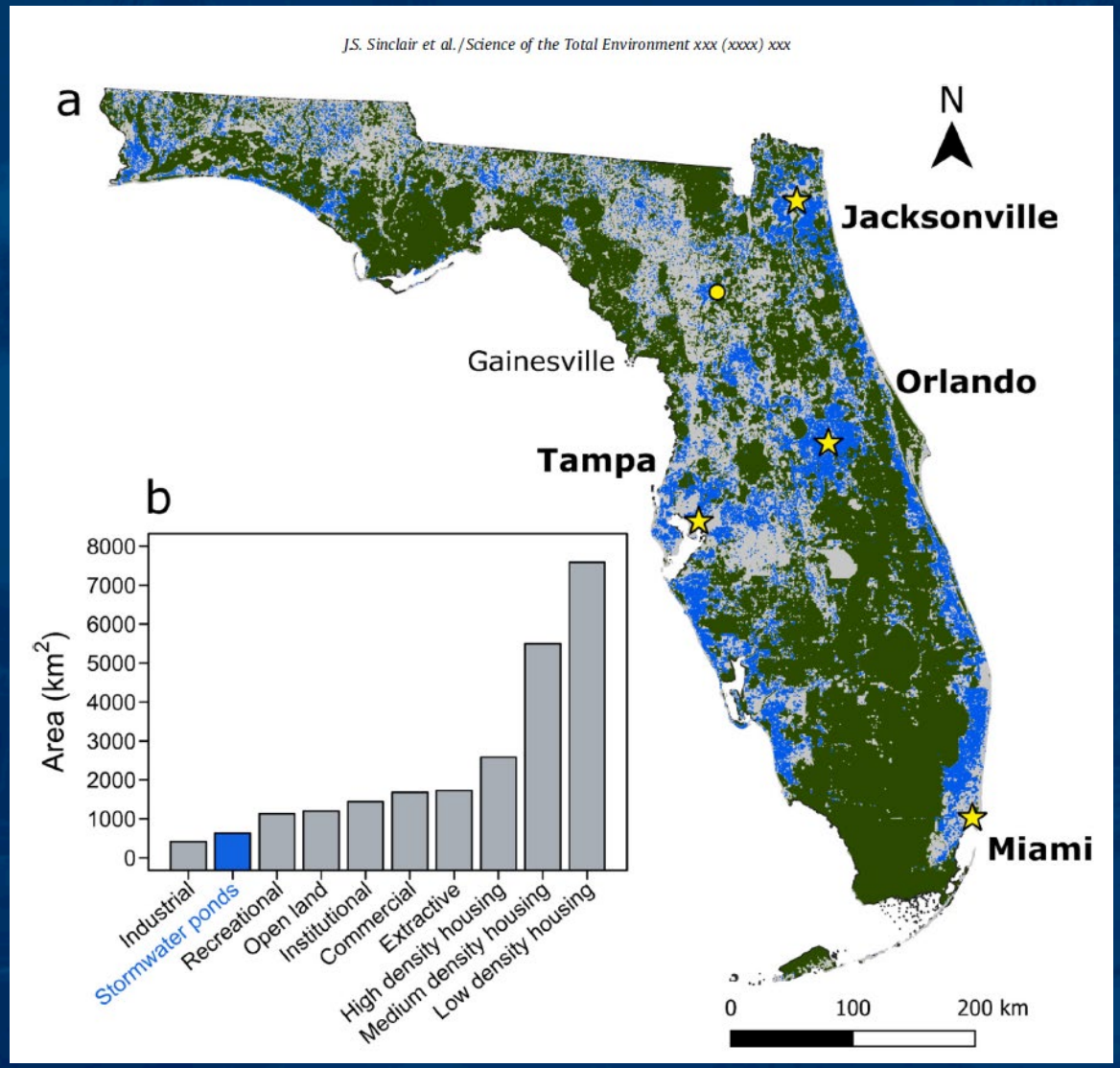
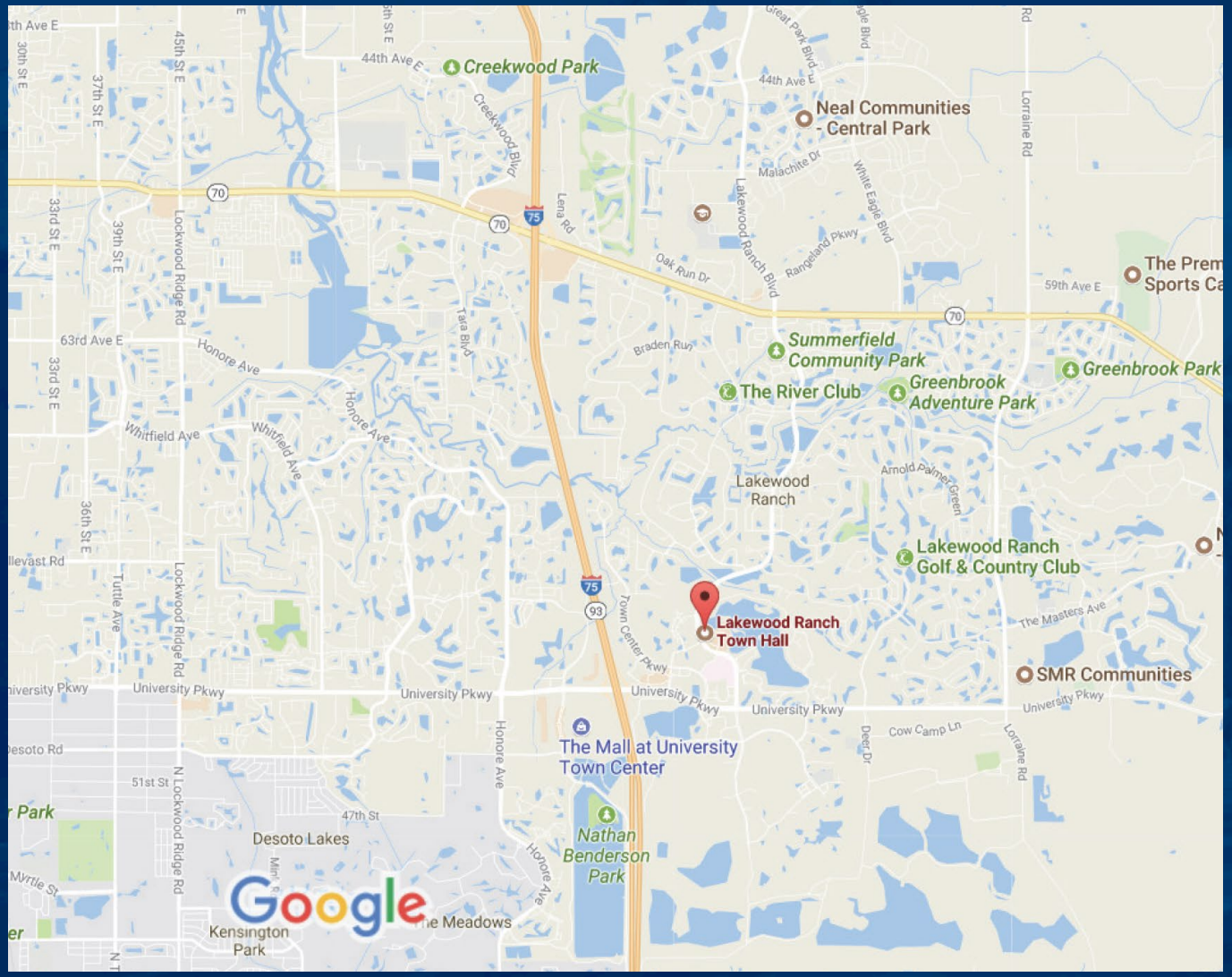
- Removal estimates: Total P = 60-65%
  Total N = 12-63%
  (Harper & Baker 2007)

- Release inorganic N: N-fixation
  Breakdown of organic matter (yard waste, leaf litter)
  (Lusk & Toor 2016; Gold et al. 2017)

What can we do to improve benefits?



Lakewood Ranch: SWP as amenities "Lakefront" property



Water quality issues due to management style

Water quality issues due to management style

Resolved through no-mow zones or plantings

- Residents don't like
  - Messy
  - Block view

  (Monaghan et al. 2016)

Depot Park: Stormwater pond

Objective: Determine if ornamental plantings help to improve water quality and bank stabilization

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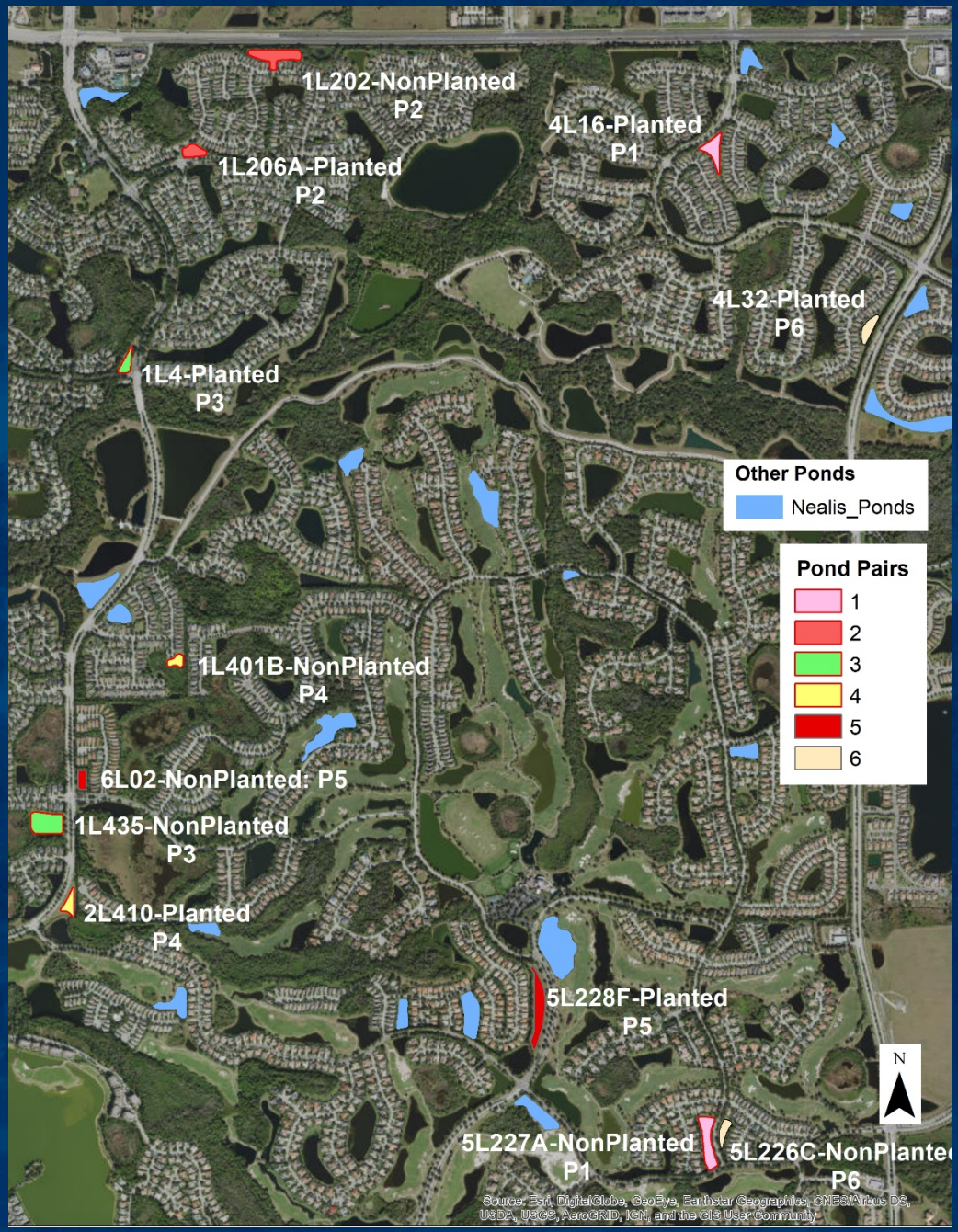
Pond selection:

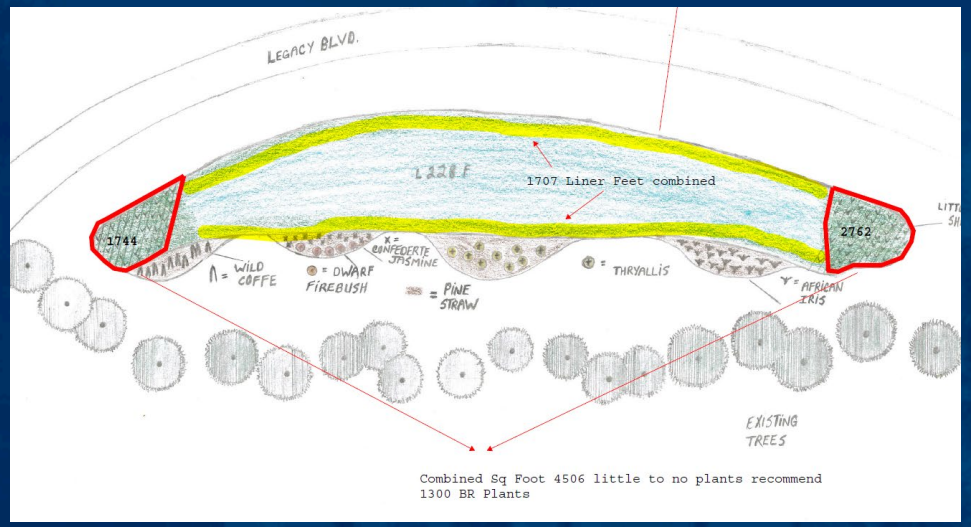
- Cluster analysis to select pond pairs

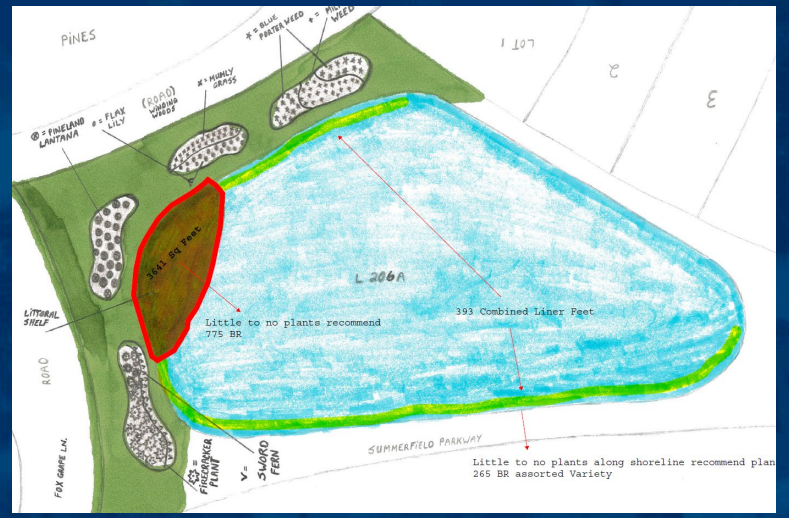
  (based on Nealis 2017)

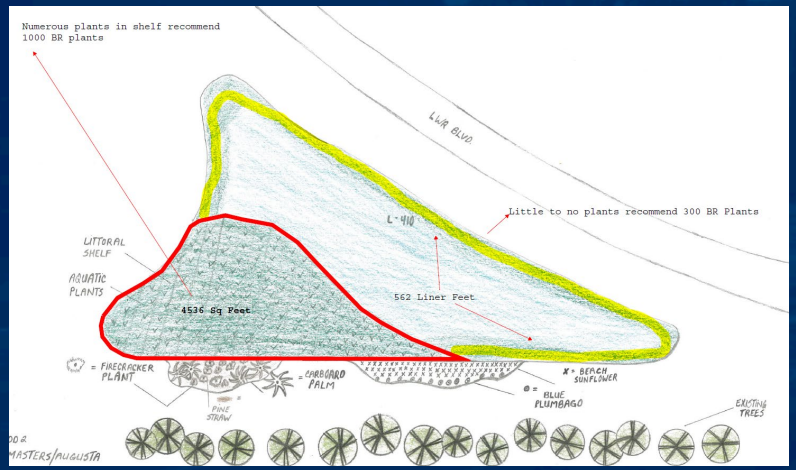


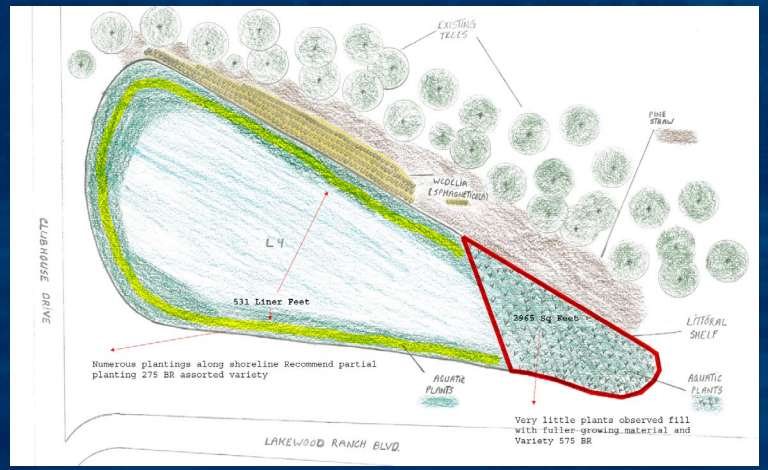
Planting designs: ~ 30% to 50% planted

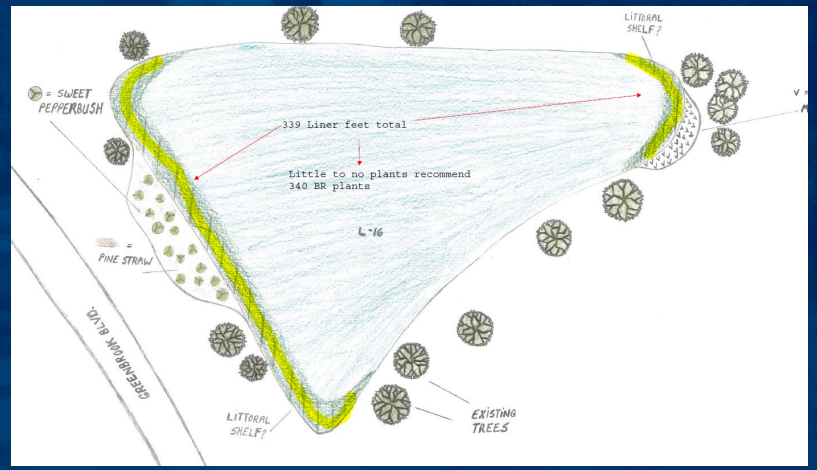
- ~$3,000 per pond





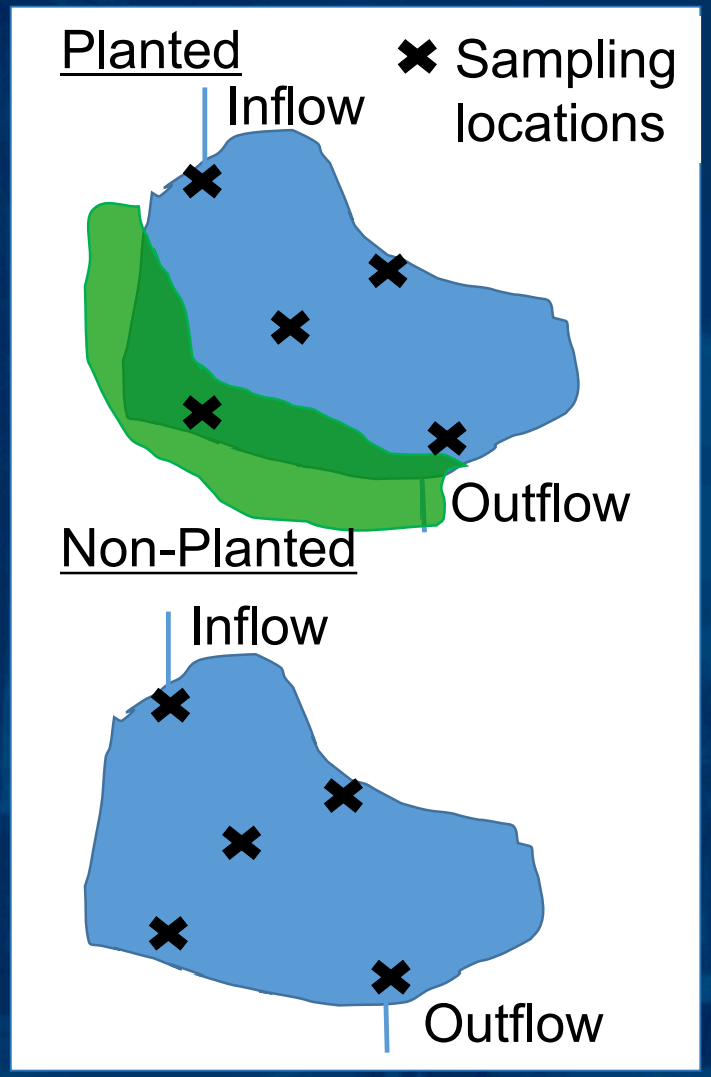






Sampling design

- Total N
- Total P
- Nitrate, Ammonium, OrthoPhosphate
- Total organic N
- Total inorganic N
- pH, Temp, Conductivity, DO, Seki depth
- Noted erosion



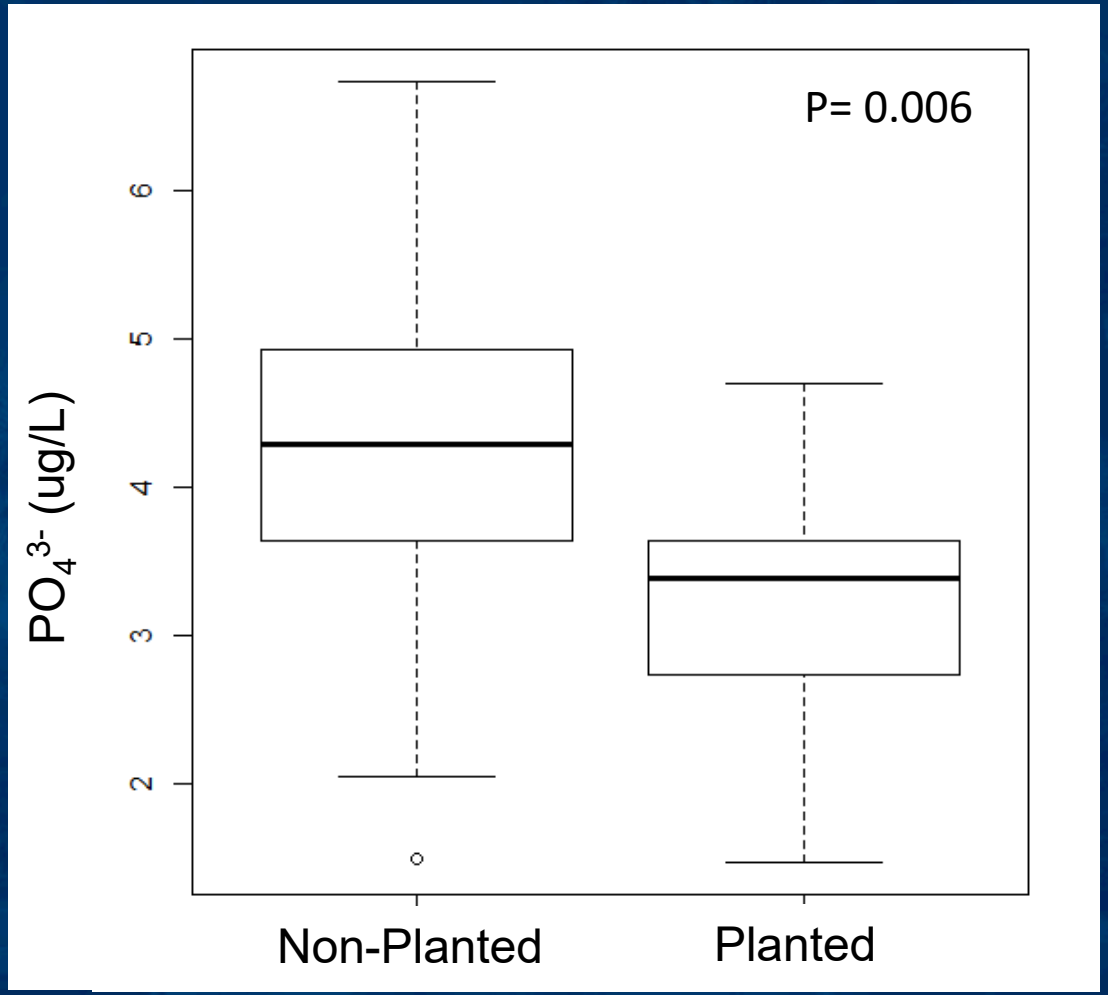
- May 2018 (Baseline), Oct 2018, March 2019, June 2019

Results: Between pond type

- Water quality: No differences detected
- Banks stabilization: Appeared to help

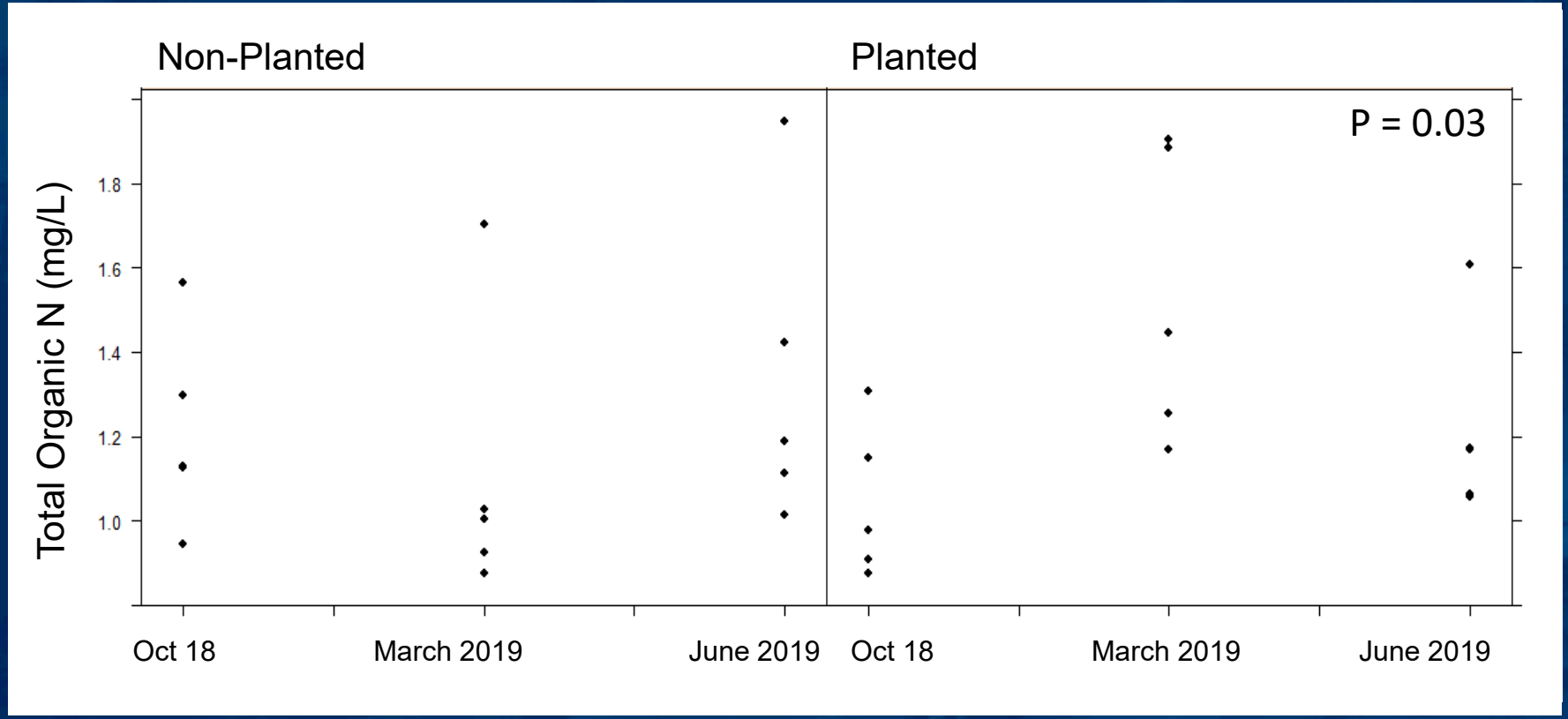
Results: Within pond

- 23% decrease Ortho P
- Difference constant over time



Results: Within pond

- Differences in Total Organic N



Samp Per.	% Δ
Oct 2018	↓ 14%
March 2019	↑ 38%
June 2019	↓ 10%

What we learned:

- Plantings can help water quality / bank stabilization
- Need to incorporate more plant material
    - Not mowing an economical solution
- Littoral shelf plantings likely driving differences
- Consider costs of prescriptive vs. reactive plantings

Other lessons learned: Benefit of *multispecies plantings*

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A New Database on Trait-Based Selection of Stormwater Pond Plants[1]

Gisele P. Nighswander, Mary E. Szoka, Kayla M. Hess, Eban Z. Bean, Gail Hansen de Chapman, and Basil V. Iannone III[2]

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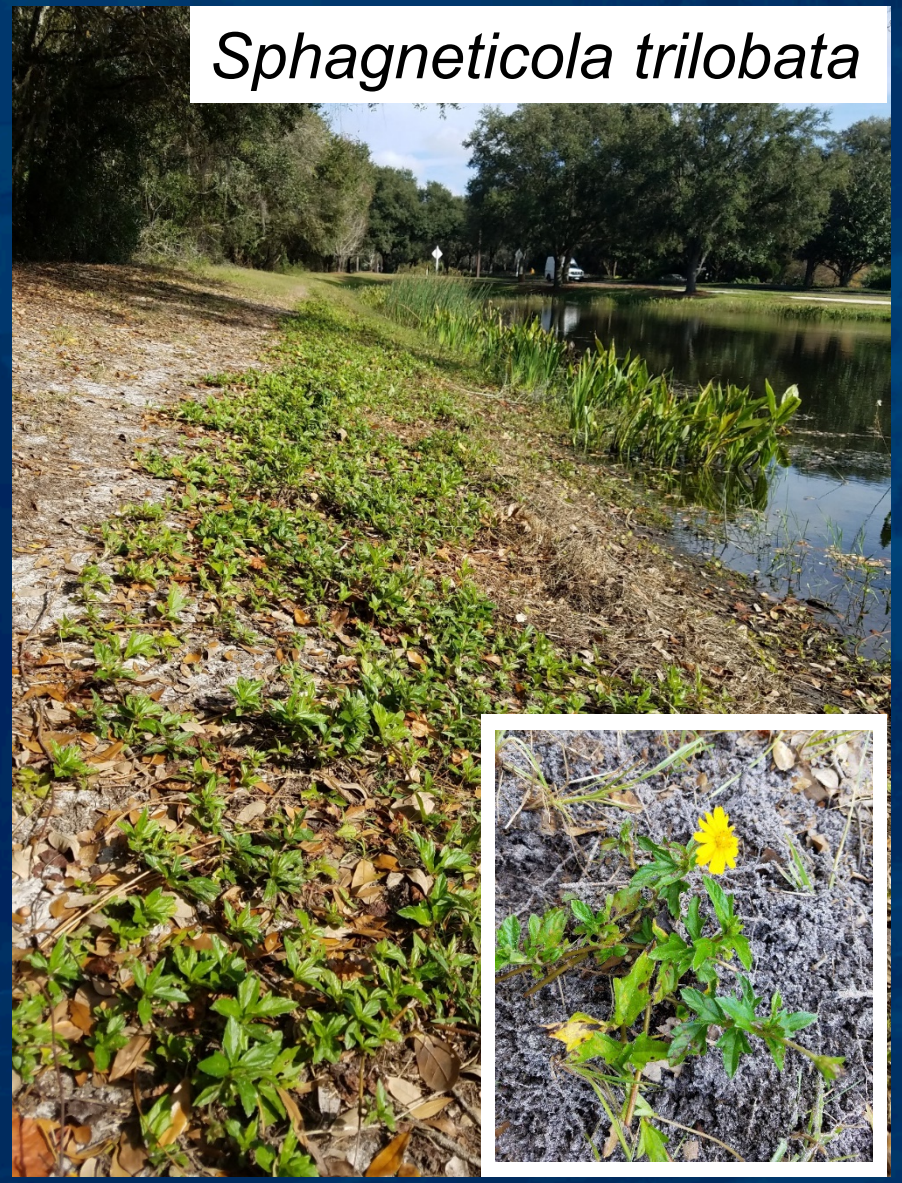
Other lessons learned: Don’t use invasive plants

Sphagneticola trilobata

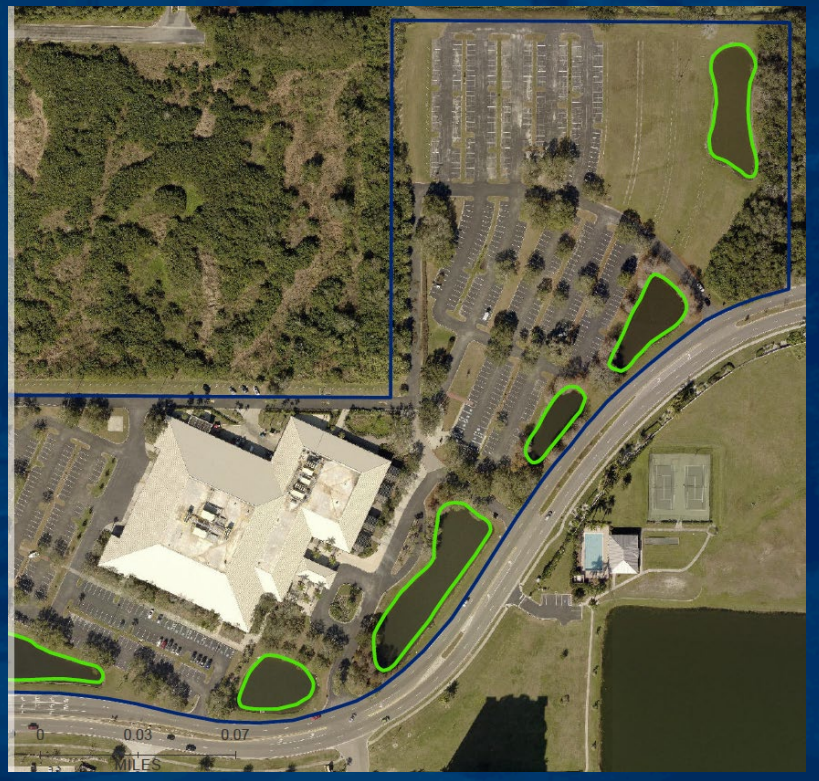


Lantana camara

Next steps: More plantings in Manatee County

- Quantify: Effects on water quality
  Nutrient uptake

- Identify useful Extension strategies to promote SWP plantings
- Manicured vs. More-natural looking / less maintained plantings



Thanks!

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