

Spoil Island Restoration in Biscayne National Park: Designing for Resilience

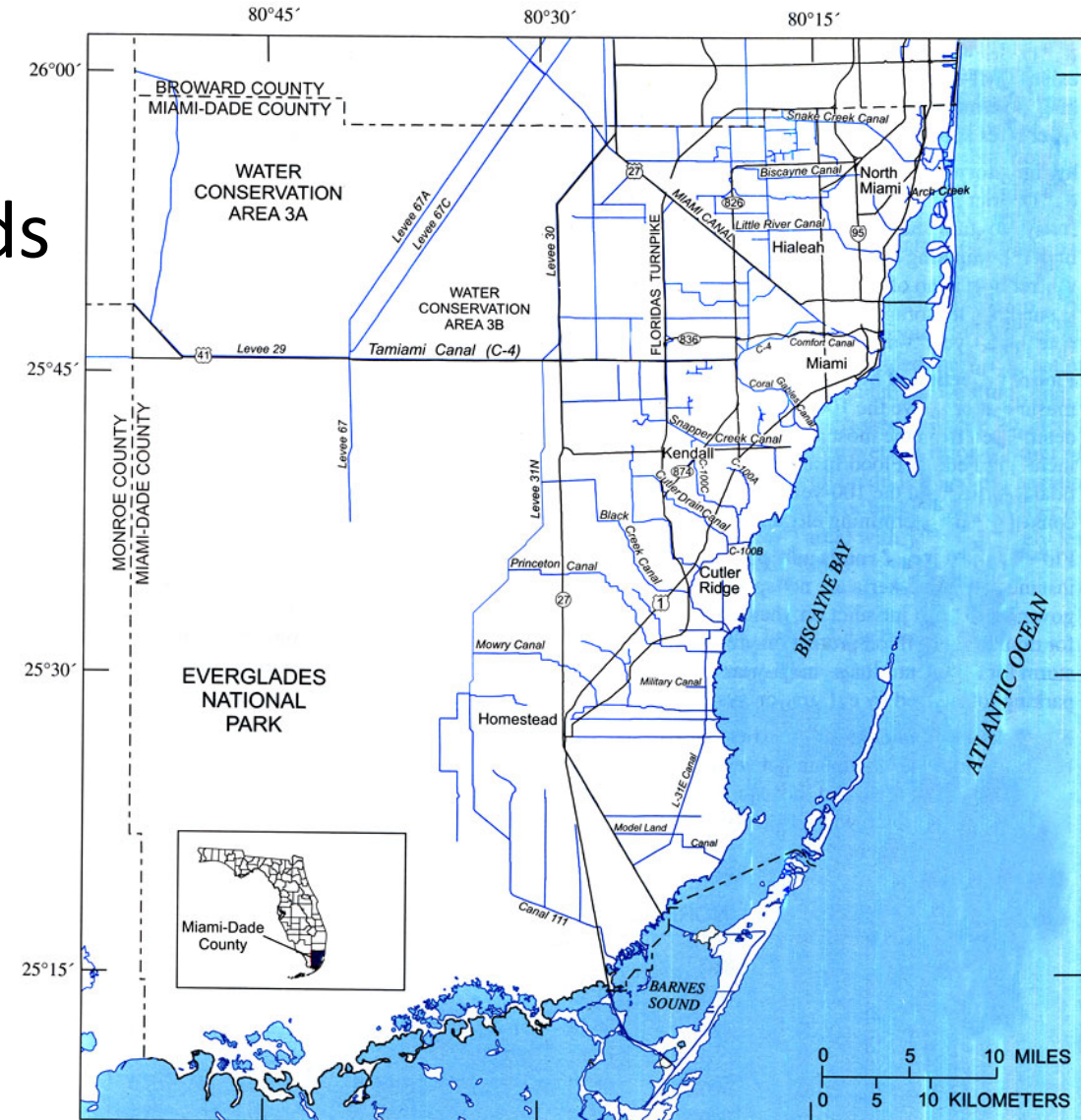
Amanda Bourque, PhD
Habitat Restoration Program, Biscayne National Park

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GEER2019



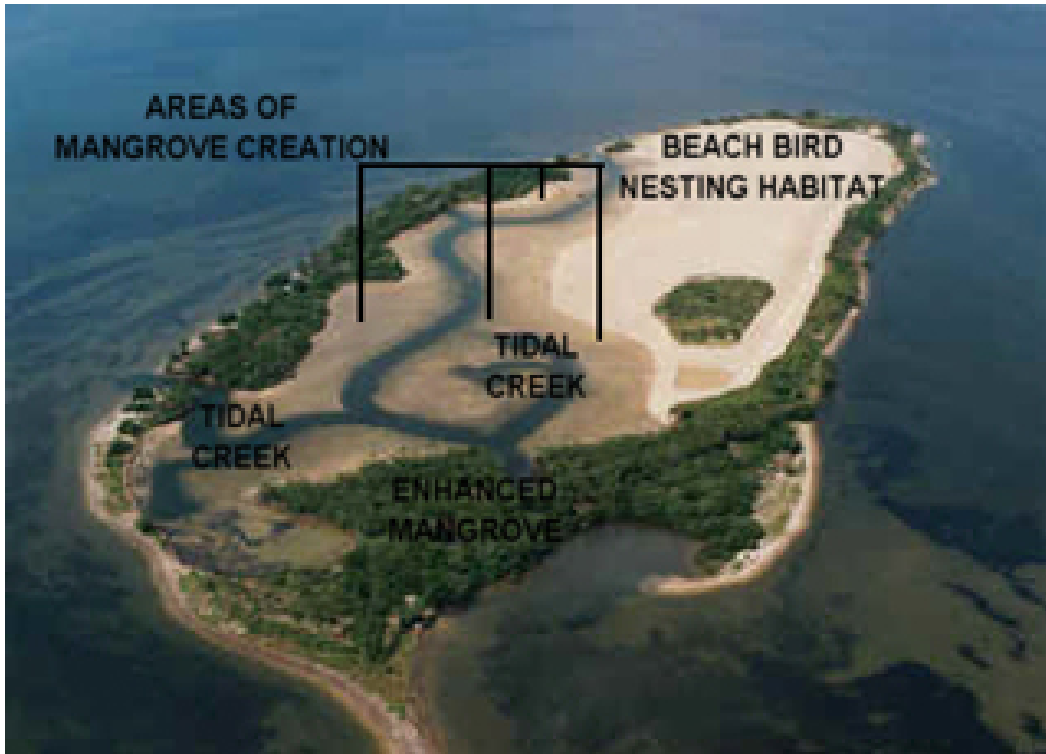
Once upon a time, canals were dredged...

- ...and then there were spoil islands
- Invaded by exotic plant species
- Eroding shorelines
- Water clarity issues in shallow waters
- Accumulation of marine debris



What can be done?

- Enhancement for conservation, passive or active

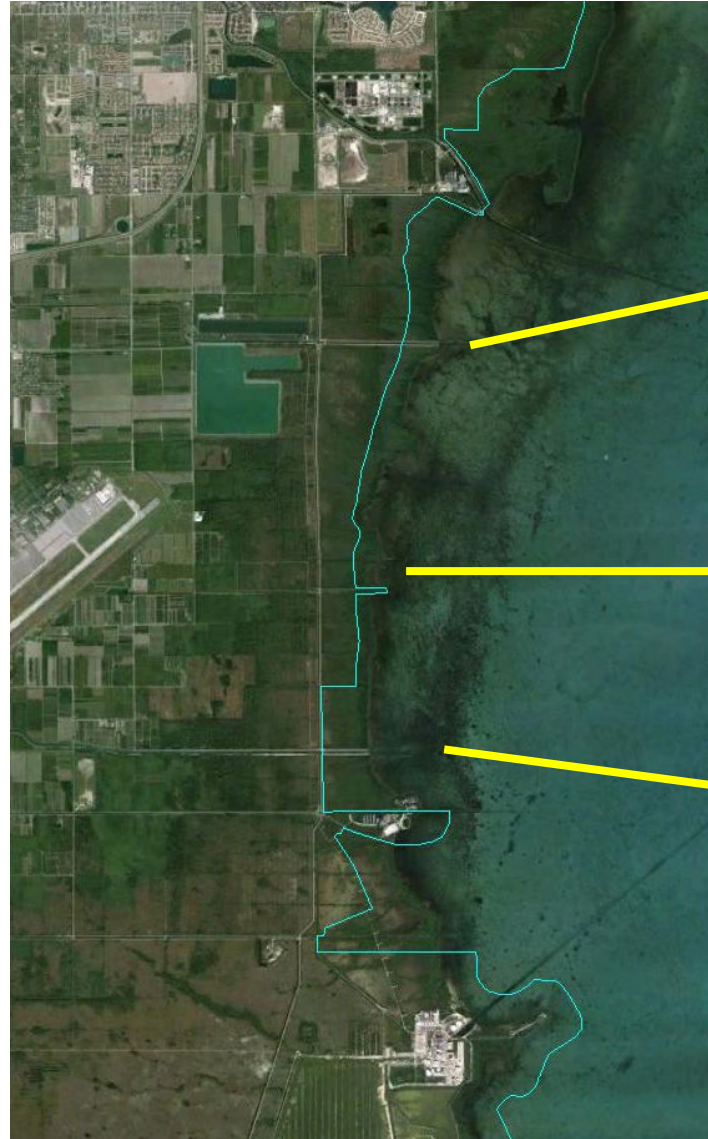
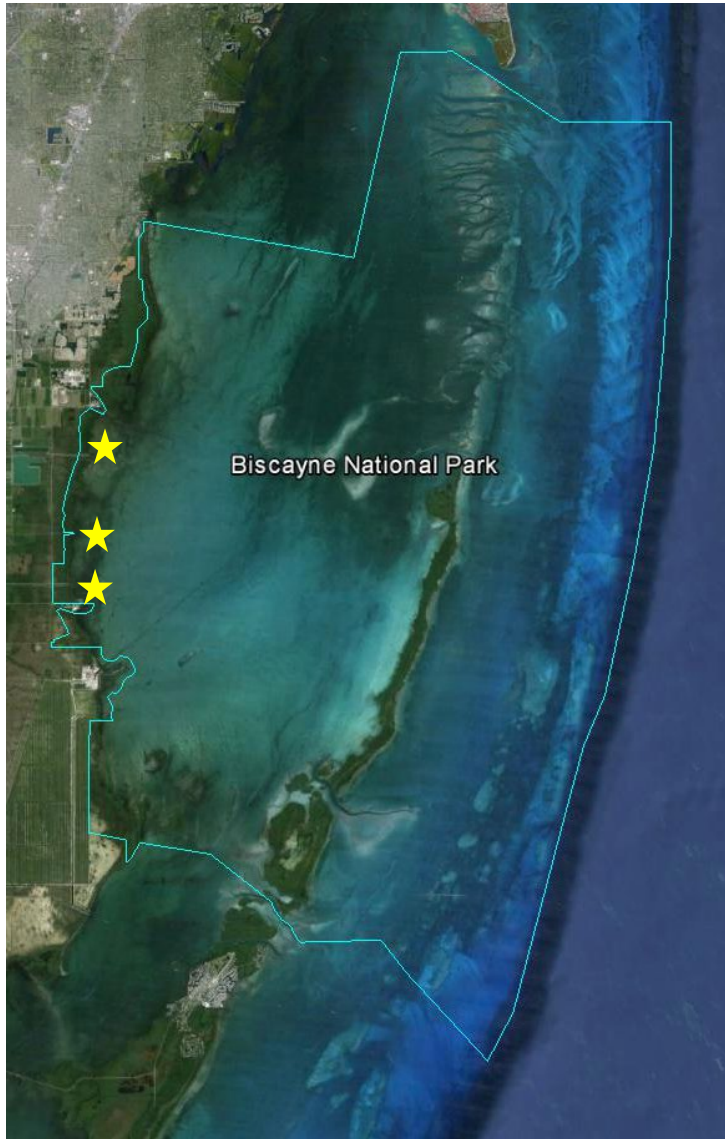


Lots of good work already done

- Standing on the shoulders of giants
- The last spoil remnants in Miami Dade County are in Biscayne National Park!



Where exactly in BISC?



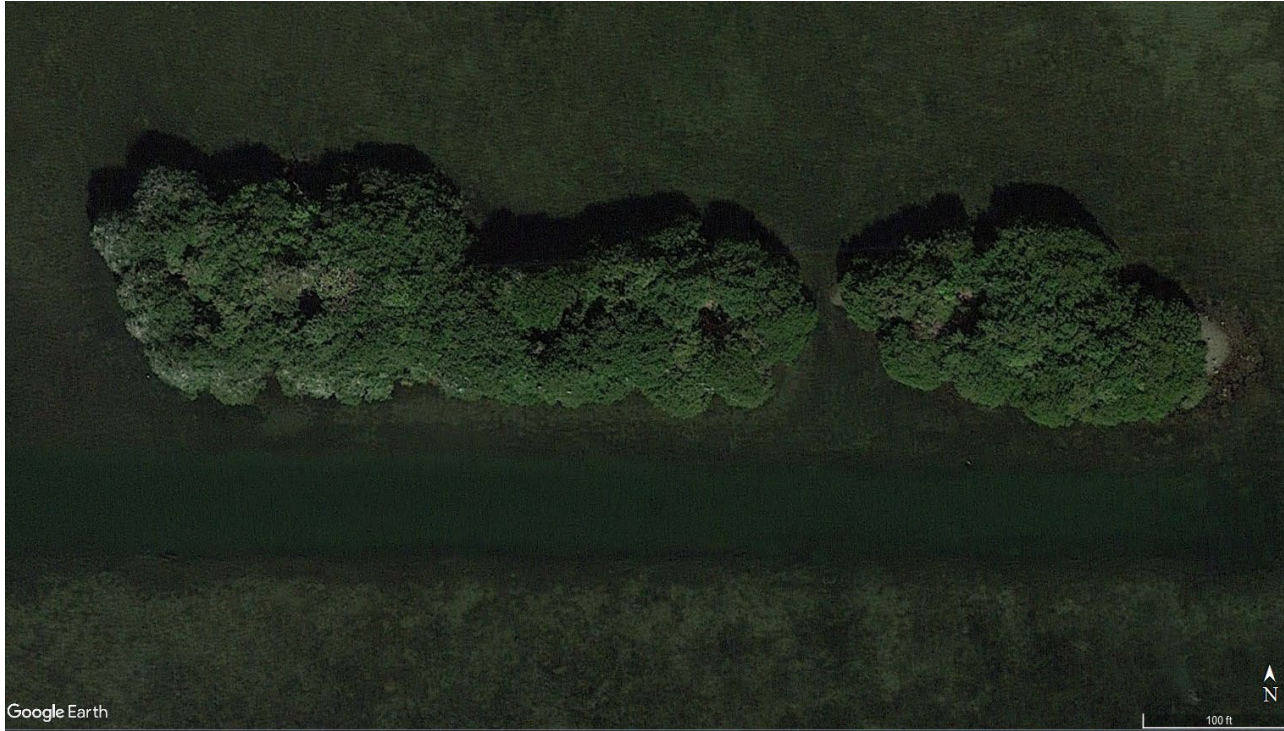
C-102
(Princeton/Moody
Canal)

Military Canal



C-103
(Mowry Canal)

Island status: not good!



2013: Opportunity knocks

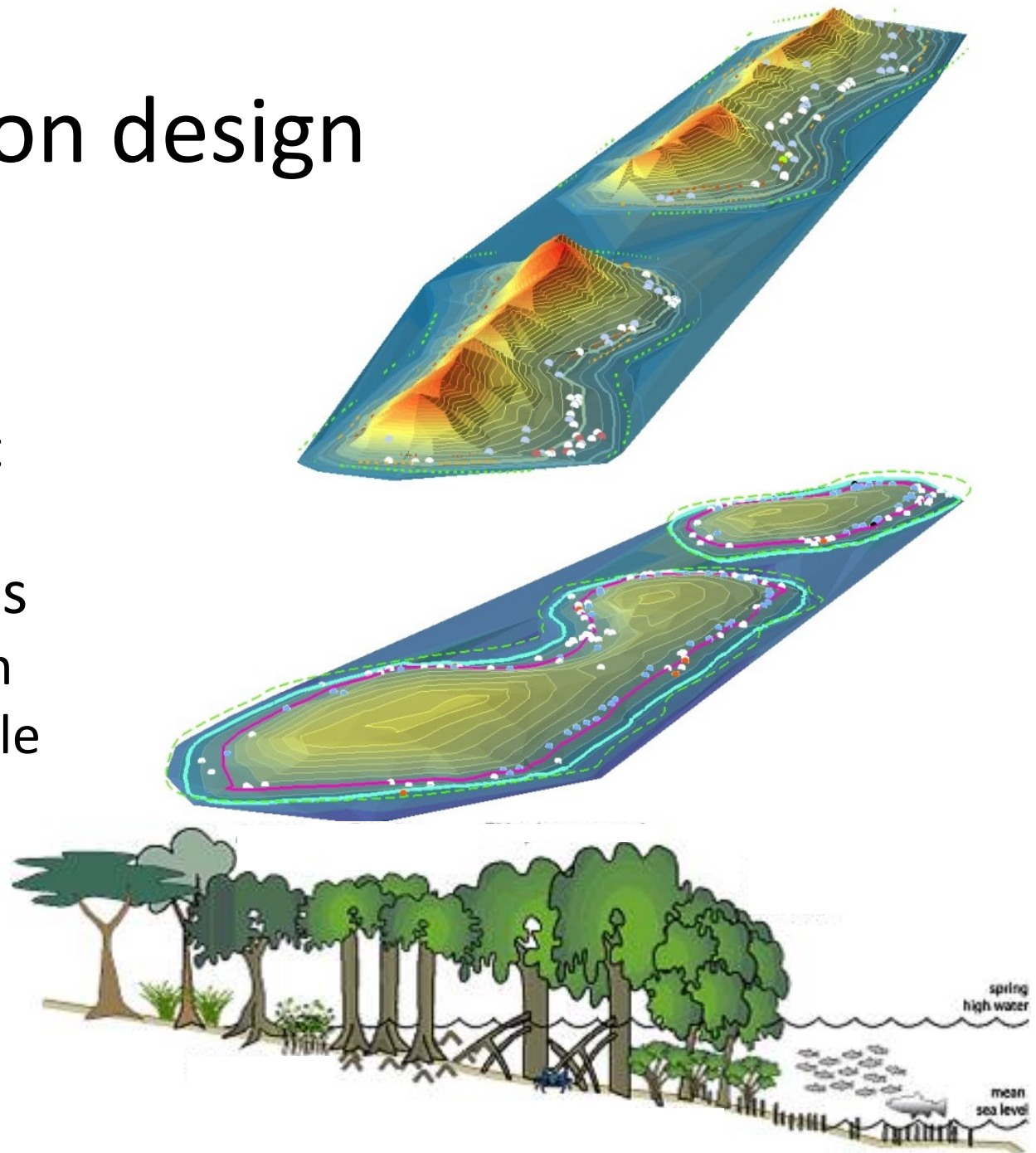
Spoil island restoration begins

- Project steps
 - Topographic and vegetation surveys
 - Restoration design
 - NEPA compliance
 - NPS planning activities
 - Permitting
 - Contracting
 - Implementation
 - Monitoring



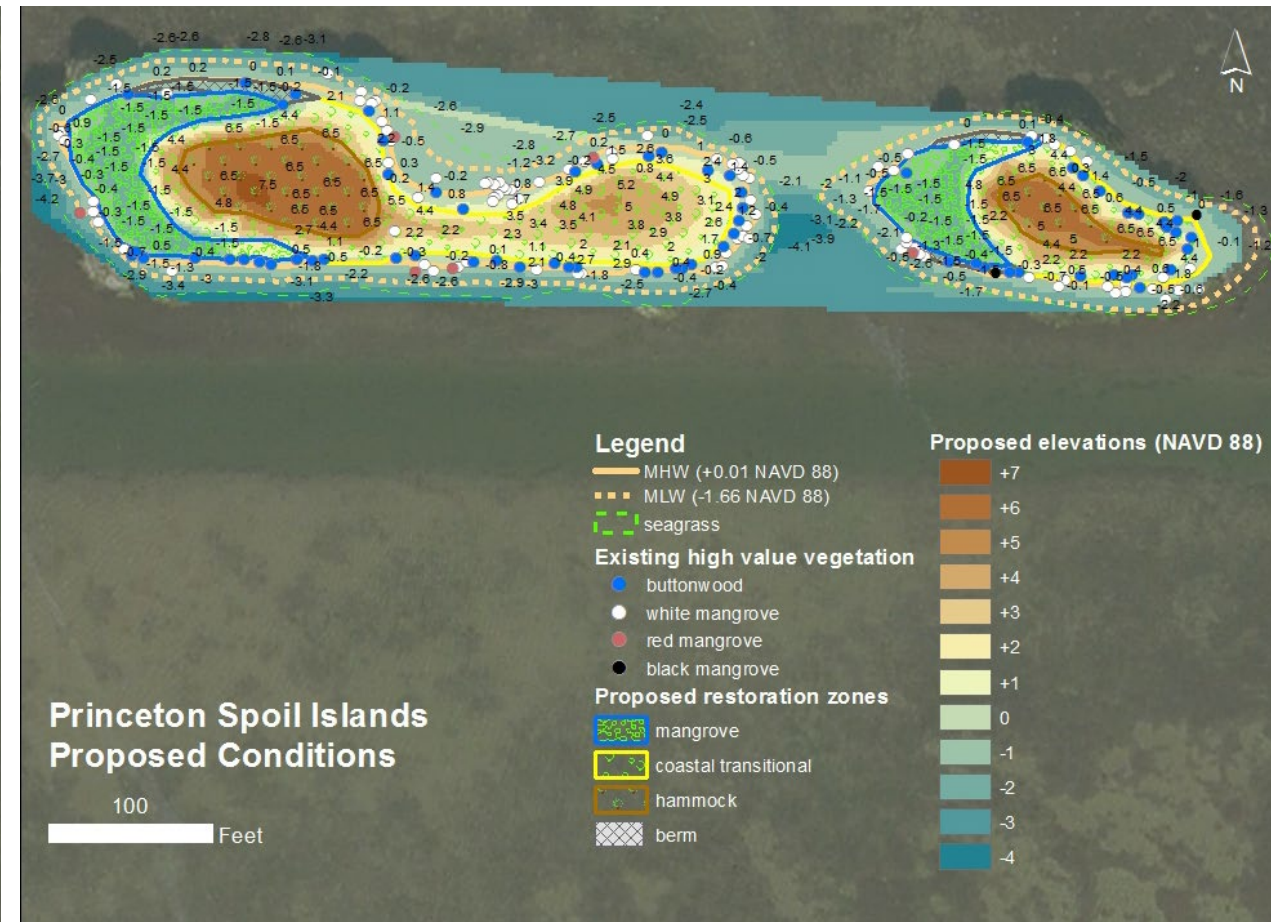
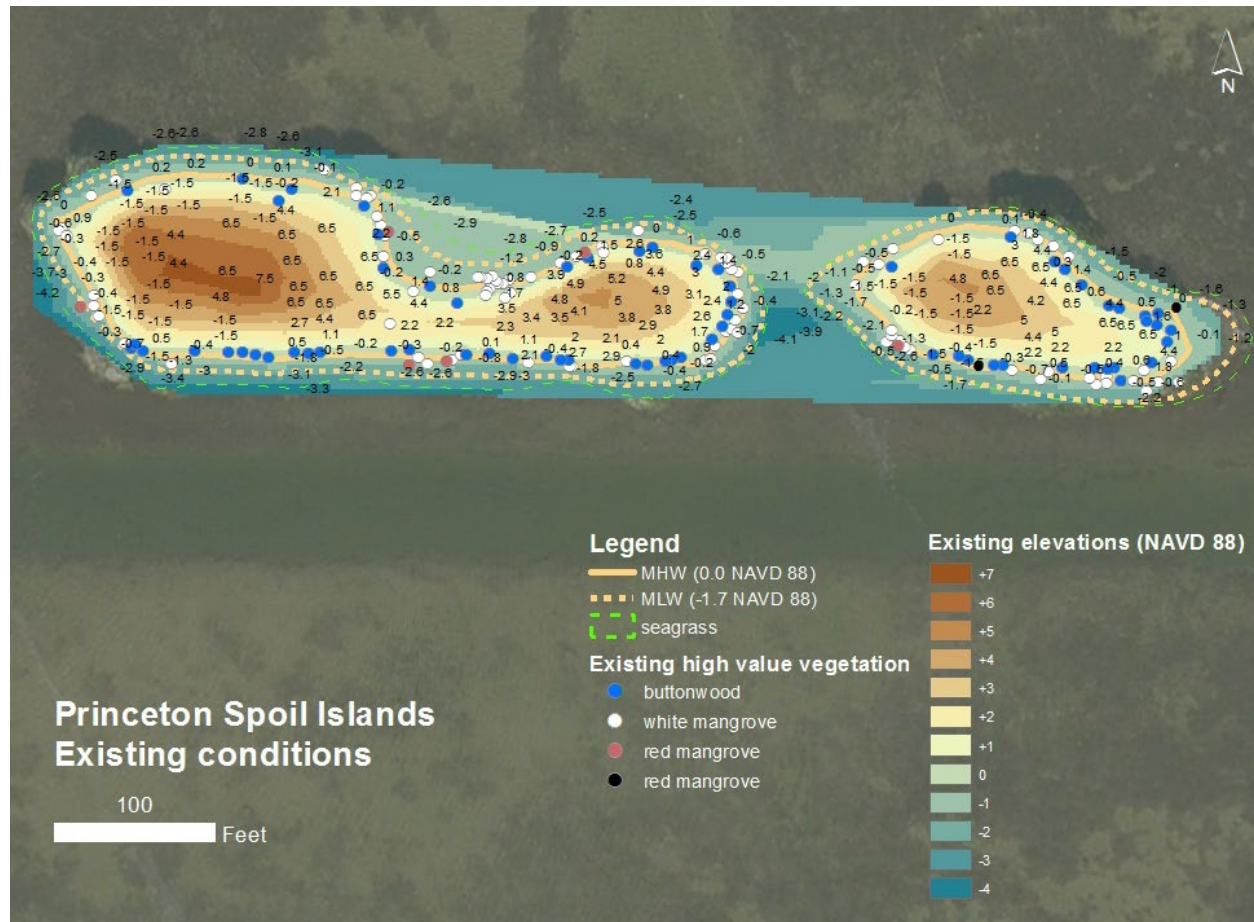
Restoration design

- Establish restoration goals
 - Stabilize shoreline and slopes
 - Provide higher quality coastal habitat
- Restoration actions to achieve goals
 - Selective clearing of exotic vegetation
 - Regrade upland topography into stable zones favorable for native plant communities
 - Plant salt-tolerant native vegetation
 - mangrove zones on leeward sides
 - coastal transitional and hammock zones on upper slopes



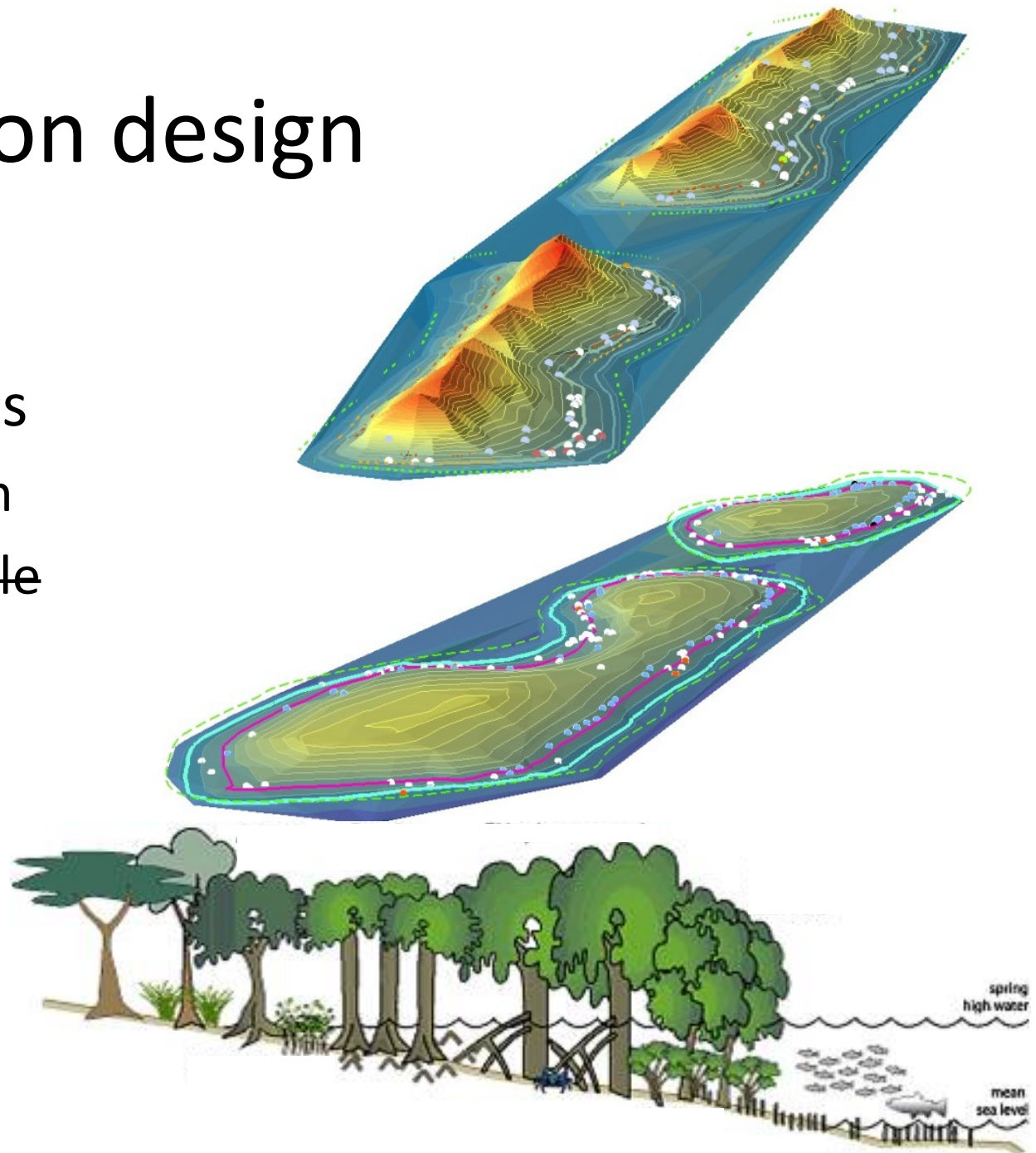
Restoration design: C-102 islands

- 0.86 acres



Restoration design

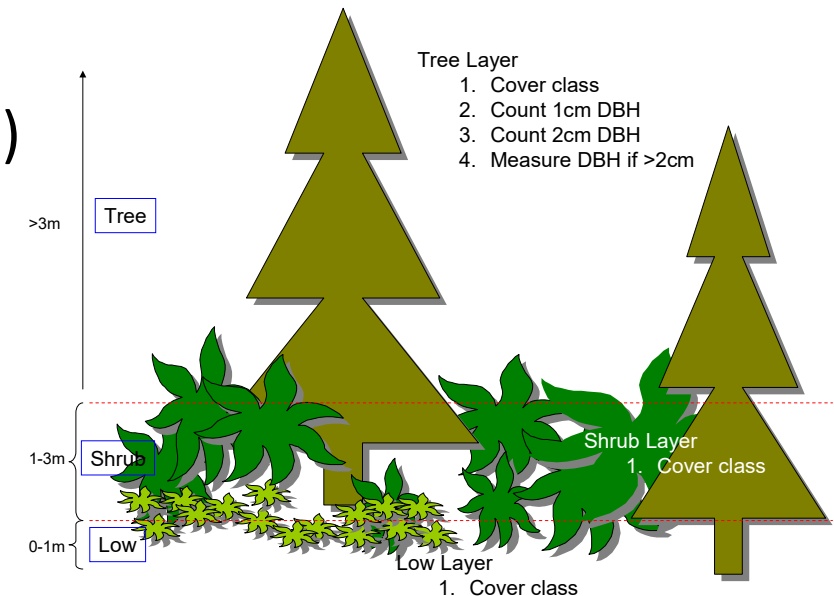
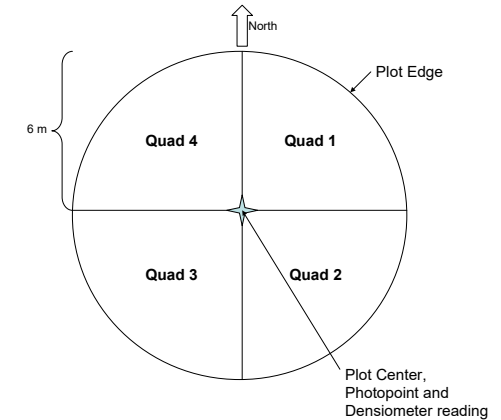
- Restoration actions to achieve goals
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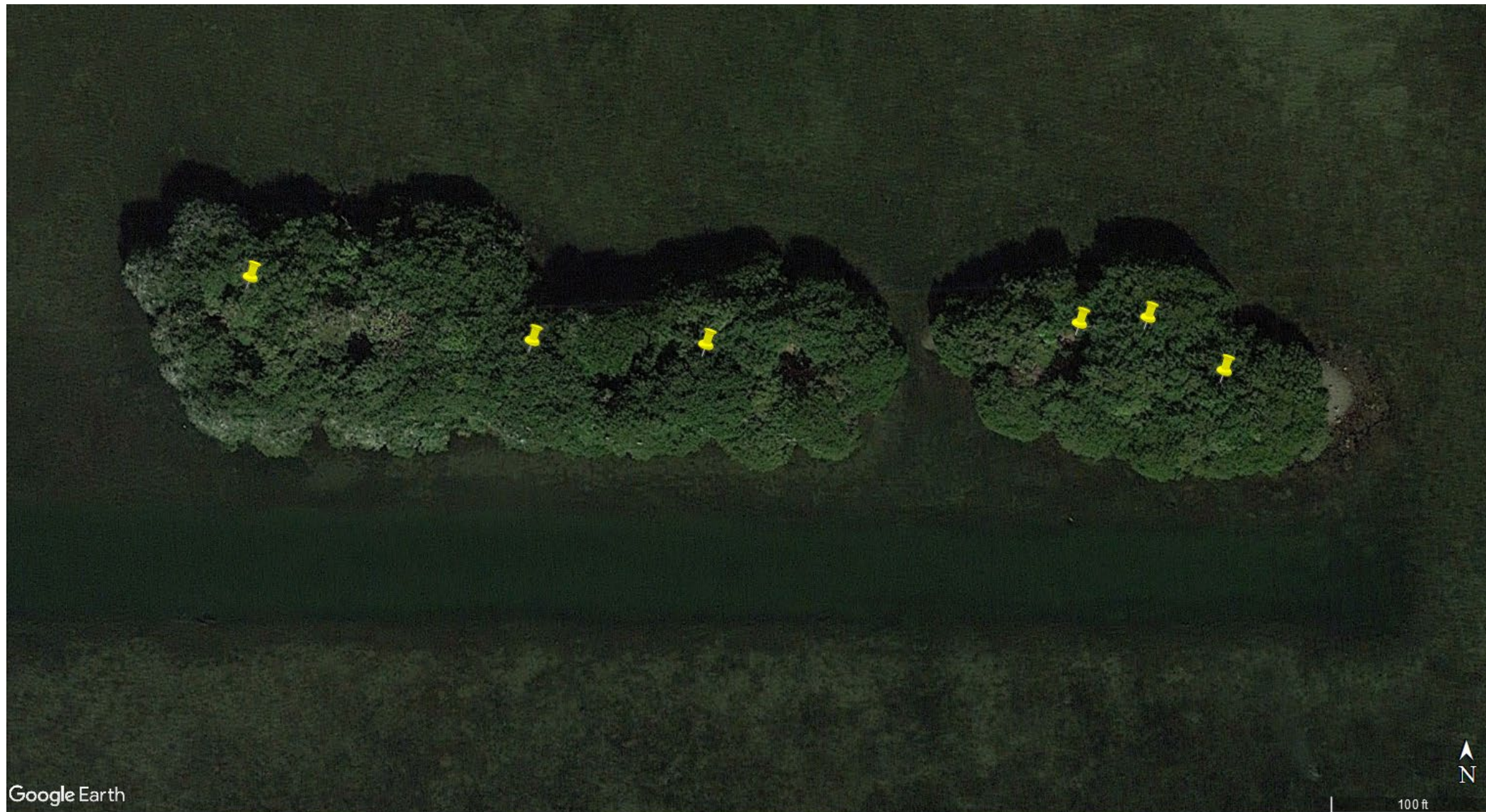
NPS South Florida/Caribbean EPMT

Treatment efficacy monitoring protocol

- Fixed radial plots 6m radius (108 m²)
- Four quadrats (NE, SE, SW, NW)
- Species list
- Cover estimates per species
 - Daubenmire class system:
 - 0-5%, 6-25%, 26-50%, 51-75%, 76-95%, 96-100%
 - Cover estimates per low, shrub, tree layer
 - Tree counts per DBH categories (1cm, 2cm, >2cm)
- Overstory density
- Plot canopy height
- Photopoints



Dec 2014



Exotics Removal

- May 2015: east island
- August 2016, May 2017: west island



Logs

- Loaded into Bagsters
- Offloaded with crane
- Forklift to truck
- Landfill disposal



All Clear!



The Plant List

- ▶ buttonwood
- ▶ sea purslane
- ▶ sea oxeye daisy
- ▶ necklace pod
- ▶ cordgrass
- ▶ blackbead
- ▶ indigo berry
- ▶ joint grass
- ▶ torchwood
- ▶ cocoplum
- ▶ Jamaican caper
- ▶ wild lime
- ▶ Spanish stopper
- ▶ white stopper
- ▶ Jamaican dogwood
- ▶ sea grape
- ▶ Florida privet
- ▶ blolly
- ▶ gumbo limbo
- ▶ pigeon plum
- ▶ strangler fig
- ▶ mangrove spiderlily



Let's Plant!

- Sept-Oct 2015: east island
- June 2017: west island
- 22 species
- 3,660 trees, shrubs and grasses
- 2" liners to 15 gallon pot sizes



Let's Plant!



Volunteer Workforce

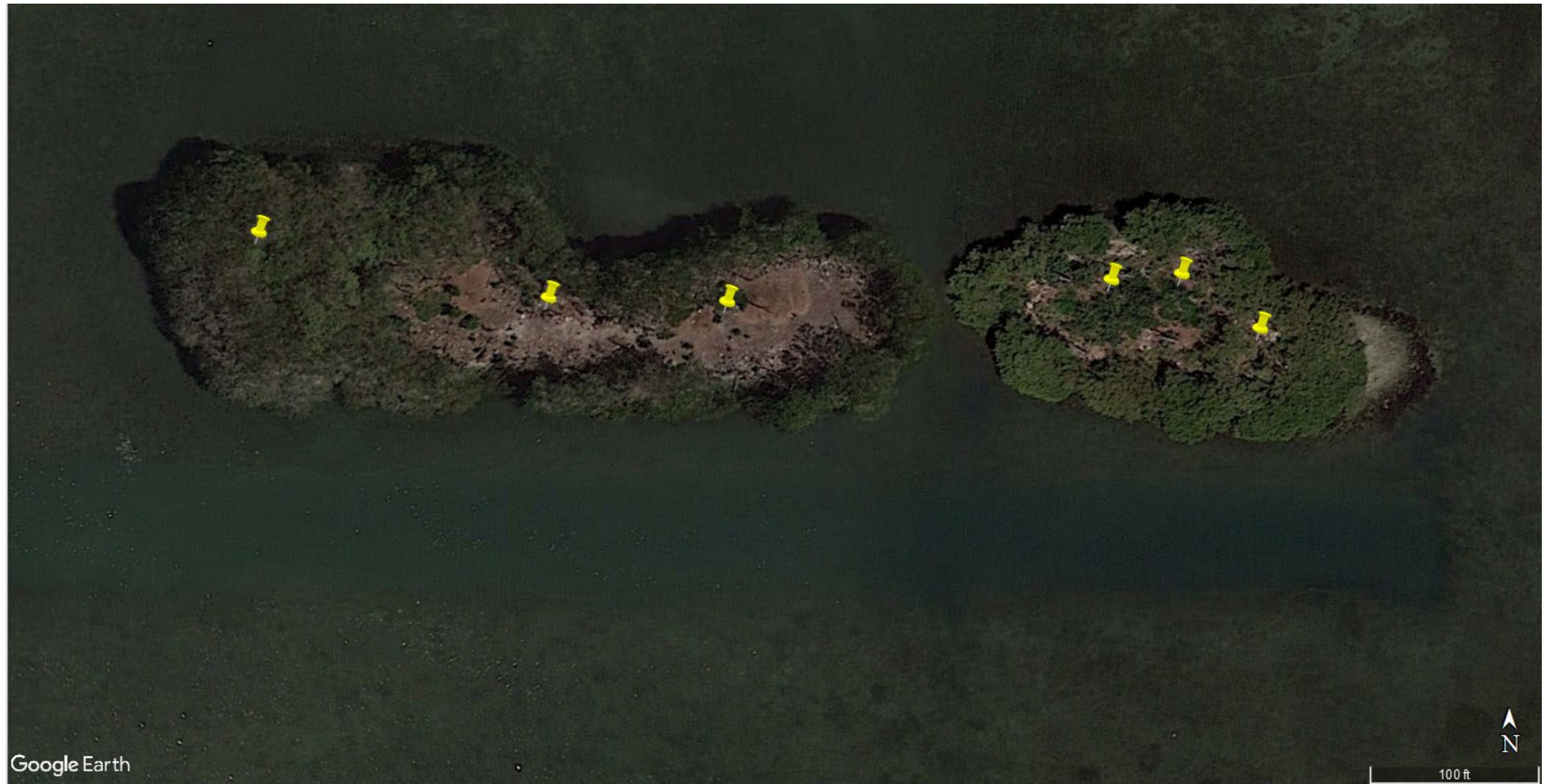
- 2015: 37 volunteers, 250+ hours, 6 days
- 2017: 22 volunteers, 300+ hours, 11 days



East island, October 2015



2017

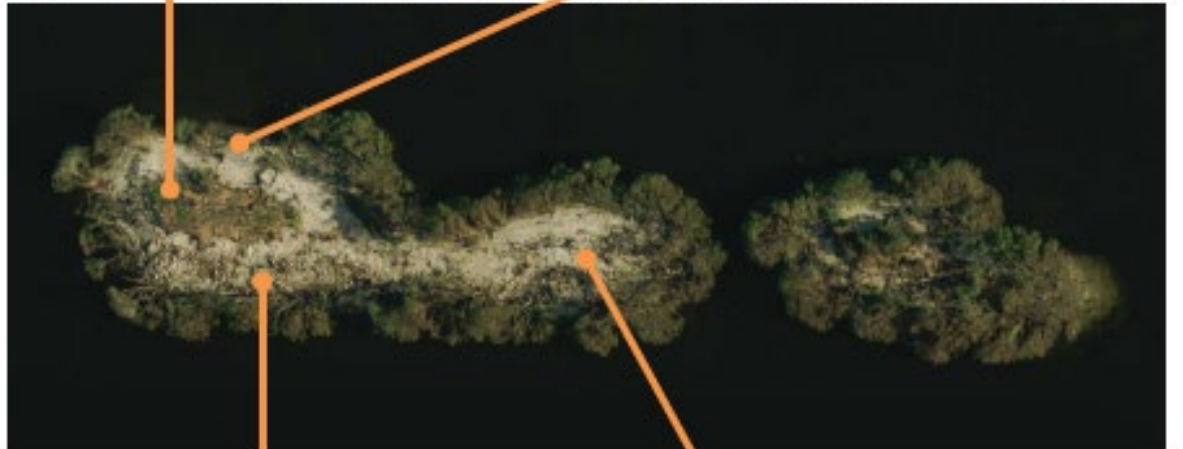


Hurricane Irma: 7'+ storm surge

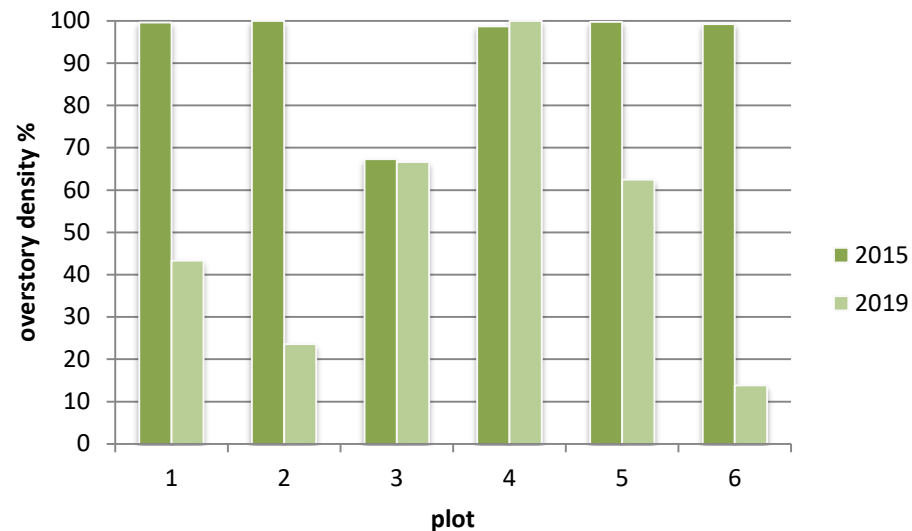
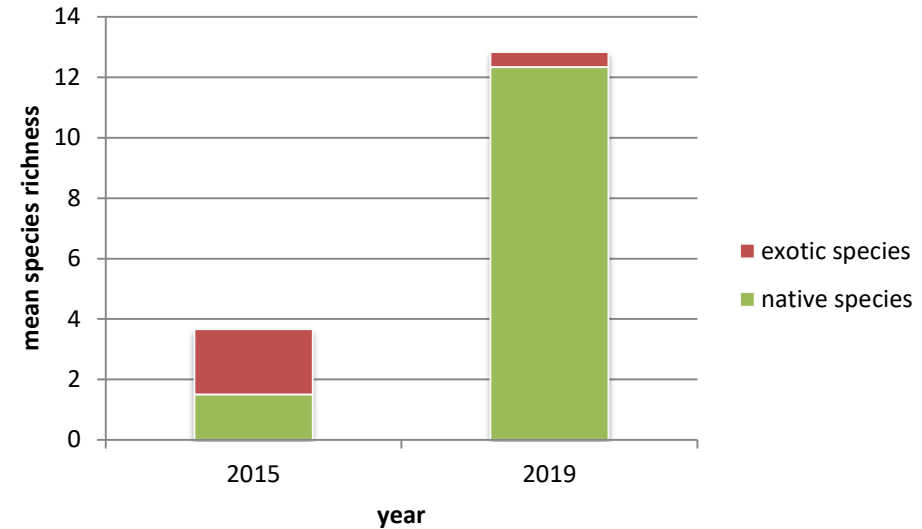
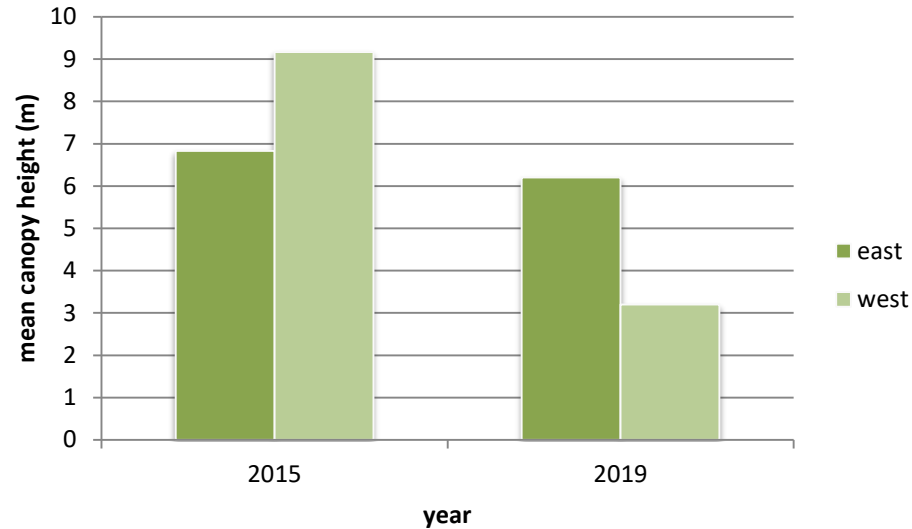


Post-Irma

- Fringing native vegetation (mature mangroves and buttonwoods) heavily wind damaged.
- All 2017 plantings lost except on “crown” of island.
- 2015 plantings fared substantially better.



2019 monitoring event



- Canopy replacement is occurring
 - 2015: mahoe, pepper, acacia
 - 2019: buttonwood, Jamaican dogwood, white mangrove, Burma reed
- More diverse plant community
 - Duh, but still...
 - Developing low and shrub layer
- Native species are thriving
 - though maintenance is needed

2015
vs
2019



Current situation



Designing resilience into coastal revegetation projects

- Variable susceptibility of planted species to severe perturbations
- Patterns of post-storm recruitment
 - Timing of planting
 - Revise plant list
 - Environmental tolerance (water, salt)
 - Herbivory
 - Maintenance is key
- Don't leave mulch around (iguanas)
- Keep it simple

“...focus and simplicity. Simple can be harder than complex: You have to work hard to get your thinking clean to make it simple. But it's worth it in the end because once you get there, you can move mountains.”
---Steve Jobs



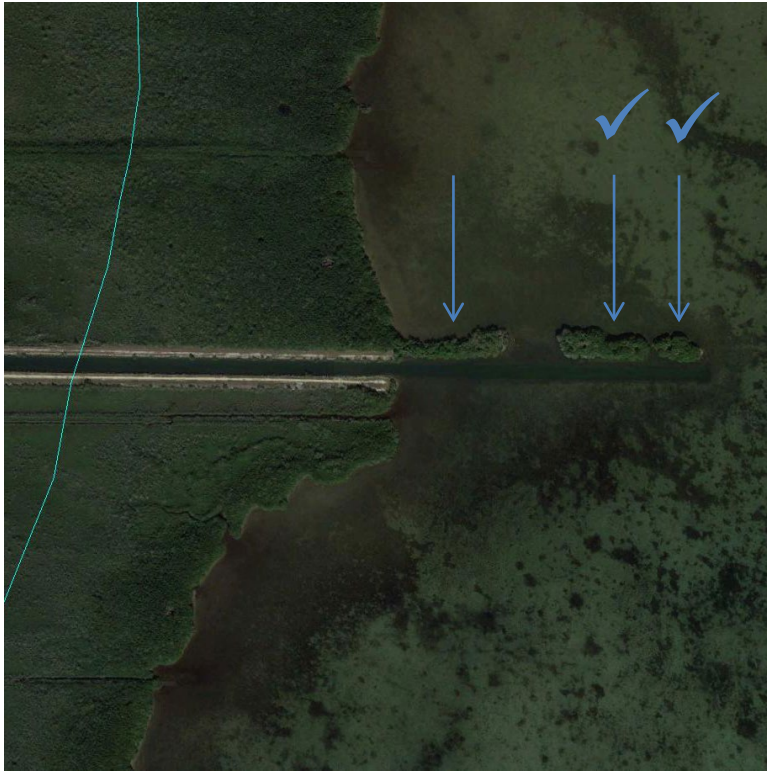
The Plant List: winners and losers

- ▶ buttonwood ✓
- ▶ ~~sea purslane~~
- ▶ sea oxeye daisy
- ▶ ~~necklace pod~~
- ▶ cordgrass ✓
- ▶ blackbead ✓
- ▶ indigo berry
- ▶ joint grass ✓
- ▶ torchwood ✓
- ▶ ~~cocoplum~~
- ▶ ~~Jamaican caper~~
- ▶ wild lime ✓
- ▶ Spanish stopper
- ▶ white stopper
- ▶ Jamaican dogwood ✓
- ▶ sea grape ✓
- ▶ ~~Florida privet~~
- ▶ blolly ✓
- ▶ ~~gumbo limbo~~
- ▶ pigeon plum ✓
- ▶ ~~strangler fig~~
- ▶ mangrove spiderlily

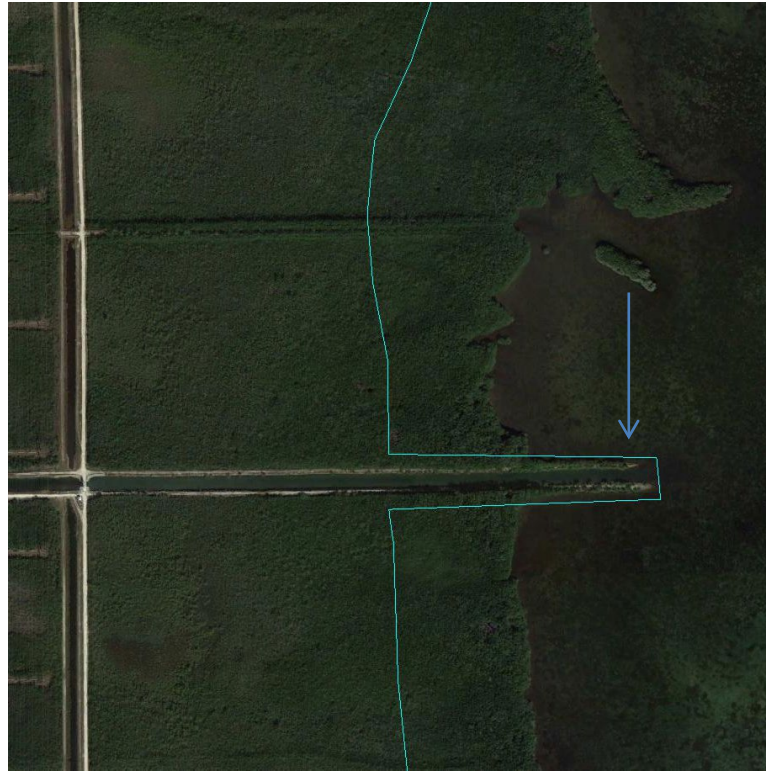


Next steps...

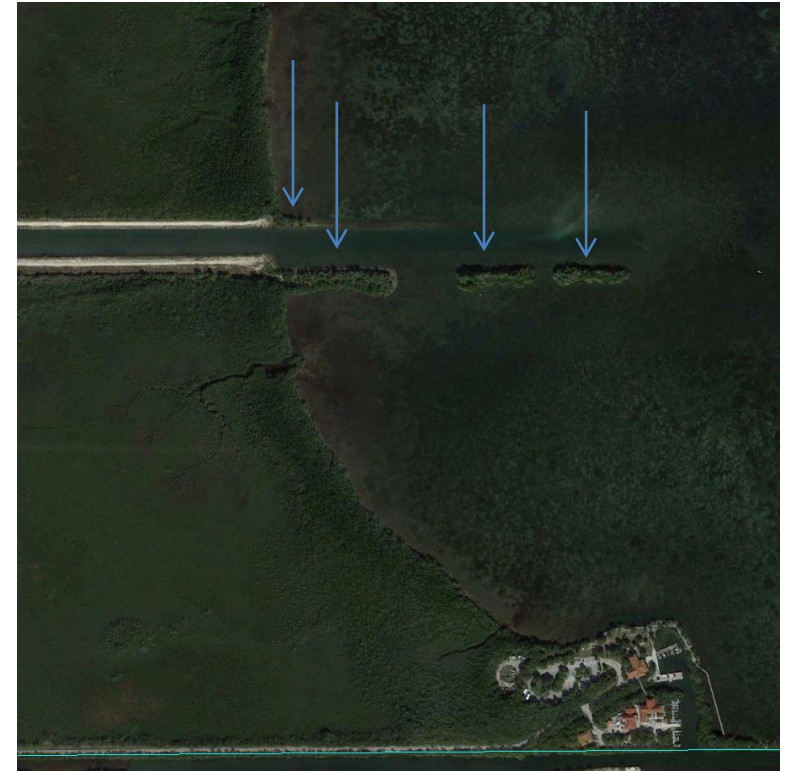
- C-102 (Princeton Canal)



- Military Canal



- C-103 (Mowry Canal)



With gratitude:



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THANK YOU!

