Spoil Island Restoration in Biscayne National Park: Designing for Resilience

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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
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 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
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
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 ✓
- coco plum

- 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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