How the Ecology and Biology of Florida’s Seagrasses Drive the Reality of Regulatory Options

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Mark Fonseca: How the Ecology and Biology of Florida’s Seagrasses Drive the Reality of Regulatory Options

- What are seagrasses?
- Challenges to restoration / what have we learned?
- Success evaluation criteria
- Summary

Ray Dennis: Port Manatee Seagrass Mitigation Project: Case Study Relative to Lessons Learned
What are Seagrasses?

- Flowering, vascular plants – not algae
- 6 to 8 species in Florida:
  - *Halophila decipiens* – paddle grass
  - *Halophila engelmannii* – star grass
  - *Halophila johnsonii* (?) – Johnson's seagrass
  - *Ruppia maritima* – widgeon grass
  - *Halodule wrightii* – (cuban) shoal grass
  - *Halodule beaudettii* (?) – shoal grass
  - *Syringodium filiforme* – manatee grass
  - *Thalassia testudinum* – turtle grass

Extreme “pioneering” Owen annual “climax”

Euryhaline / sheltered

Putative “*H. beaudettii*”
Thalassia

Halodule

Syringodium

Halophila

1 meter
Challenges

Larger Issues

• Habitat restoration rarely a net gain
• Avoidance > minimization > mitigation
• Seagrass niche is full
• Biggest gains – past, large-scale modifications
  • watersheds, borrow pits, roadways, scarring

Regulatory Issues

• Consistency
• Trade-offs of seagrass loss for conservation off-site = net long term loss
• Prop scars – not always much ‘lift’
• UMAM process not designed for seagrass
  o Complicates performance and compliance levels
  o Cross-agency issues
• Bird stakes & carbonate sediments (ONLY south Fl and Halodule)
• Spatially & temporally dynamic cover – defining habitat
Site Selection Problems with a Full ‘Niche’

- Depth similar as natural beds
- Anthropogenically disturbed
- No rapid or natural recolonization
- Track record
- Sufficient area
- Similar quality habitat restored
- Uncontrolled disturbance
  (storms, bioturbation)
What Have We Learned?

• Site selection
  – Stalled at simple observations of depth, and human causality
  – Not including dynamics confounds interpreting status

• Methods – most of them work

• Extreme expectations...too much like crops
  (80% vs. 50%)

• Defining success: persistence and acreage

• Impediments to success
  – Disturbance (water clarity, storms and bioturbation)
  – Grazing

• Applying seagrass biology and ecology
  – Spreading rates, vegetative vs. seeding
  – Compressed succession
  – Landscape responses

• Economics
Success Evaluation Criteria

Success = Coverage and persistence

Other measures.....
• Interesting research
• Do not guide interim action
• Unreliable indicators
  $f$ (small scale gradients)
  – Blade width
  – Leaf length
  – Epiphytes
  – Rhizome length
  – Biomass
How much acreage?

HEA and UMAM Similarities

- Assessment tools for habitat impacts and mitigation
- Calculate amount of mitigation required
- Consider the change in the value of services over time
Habitat Equivalency Analysis

• Quantitative assessment based on a recovery function
• Two primary components
  – Amount of injury (area and severity)
  – Lost services vs natural recovery + restoration
    (all discounted over time)
• Units = acre-years of service
• No formal risk assessment or preservation factor
• Often yields a 1:1 replacement ratio
Uniform Mitigation Assessment Method

- Qualitative assessment
- Relative to fish and wildlife utilization
- Problematic terminology – currently under review for seagrass/benthic habitats
  - Time scales – salinity, water clarity/quality, wave energy
  - Reference communities – actual or but for stressors
  - Species (e.g., “All species observed within the assessment area are appropriate for the reference community type and location.”)
  - Demographic structure
  - Stress
Assessment Uncertainties

- Spatially and temporally dynamic habitat vs 30 min assessment
- Natural growth variations f (habitat conditions)
- Functional roles
- Open system for wildlife/fish utilization
- Separating anthropogenic degradation vs natural variation
What are the challenges for Florida seagrass restoration?

1. Understanding disturbances, defining extremes,
2. Managing spatially and temporally dynamic communities (often non-charismatic species)
3. Forecasting site suitability
4. Applying economics
5. Using genetic information at the scale of action
6. Effective use of information – examples of redundant or dimensionally nonsensical criteria
7. Reconciling UMAM
Guidelines for the Conservation and Restoration of Seagrasses in the United States and Adjacent Waters

Mark S. Fonseca, W. Judson Kenworthy, and Gordon W. Thayer

November 1998

Google: “Seagrass guidelines”
Port Manatee
Seagrass Mitigation Project:

Raymond F. Dennis III
Senior Project Manager, Environmental Services
Stantec

Case Study
Relative to
Lessons Learned
Seagrass Restoration Perception

• “...the track record for successful mitigation projects remains variable.”

• “Spectacular failures have created a lasting impression that seagrass restoration is still an experimental management tool.”

5.3 ac. impacts

- 9 mitigation sites = 32.6 possible credits
- 15.02 credits awarded vs. 12.7 required

1.9 ac. temporary impacts
8,000 rhizome PU
2,000 bare root bundle PU
4,582 peat pot PU
2,000 peat pot PU *
44,321 mechanized (JEB)
11,609 mechanized (GUTS)

- Low survival
- No mitigation credits awarded
- Currents, bioturbation, methods
• Understanding plant ecology

• Planting 1: 13,684 PU/ac.

• Planting 2: 2,050 PU/ac.

100% Impact Salvage – Is it necessary?
Utilize Proven Restoration Methods

- 163,000 PU (modified shovel method)
- 73% of mitigation credits
- Donor bed applications

- 1,001 PU (pneumatic plugger method)
- 75% survival of PU after 3 years
- 100% recovery of donor beds
Success Criteria
Jan-01 Sep-05 Apr-06 May-06 Aug-07

$6.3 Million (USD) or $255,337 per ac.

Lessons Learned

- Over-Design Plan
- Suitable Site Selection
- Seagrass Ecology
- Utilize Proven Methods
- Less Risk
- Reduction of ratio
- Restoration Cost Savings
- Feasible Project
### Seagrass Restoration Costs

**1.5 acre (0.607 HA) project**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Map &amp; Ground truth</td>
<td>6</td>
</tr>
<tr>
<td>Planting</td>
<td>19</td>
</tr>
<tr>
<td>Monitoring</td>
<td>59</td>
</tr>
<tr>
<td>Contractor</td>
<td>8</td>
</tr>
<tr>
<td>Gov’t. oversight</td>
<td>9</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td><strong>$504 to 826K</strong> in 2013 dollars</td>
</tr>
</tbody>
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*Source: United States vs. Salvors Inc.*
Plan<ing	
  unit	
  size	
  (m^2)

Bare	
  root	
  units
10 x 10 cm
(0.01 m^2)

Sod
25 x 25 cm
(0.0625 m^2)

Mega	
  sod
3.5 x 3.5 m
(11 m^2)

~ Survival (days)

Planting unit size (m^2)