

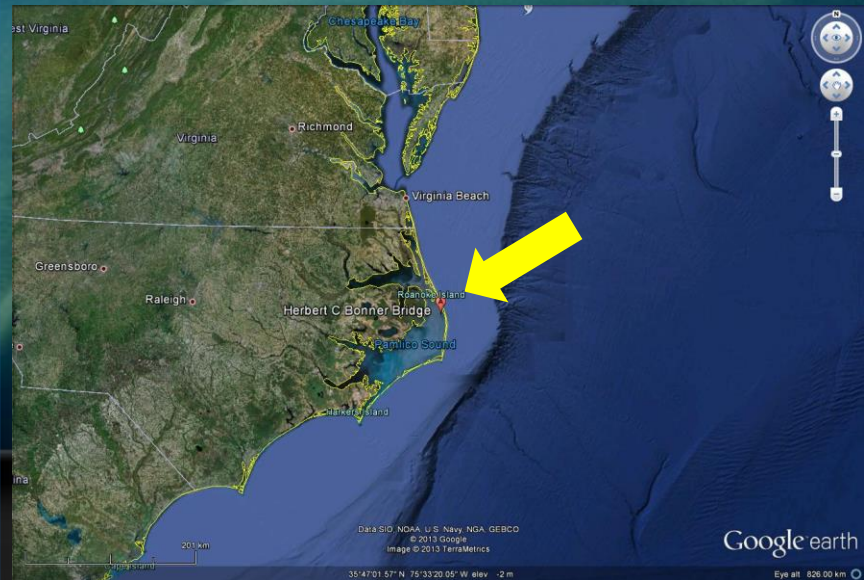
# A New Approach to Seagrass Restoration Through Landscape Manipulation

CSA Ocean Sciences Inc.



Anne McCarthy, Mark S.  
Fonseca, and \*Raymond F.  
Dennis III

# Bonner Bridge Seagrass Mitigation Oregon Inlet, Northern Outer Banks, North Carolina



# Presentation Topics

- Define Problem – Availability of Seagrass Mitigation Sites
- Proposed Solution –Landscape Manipulation; Acre-Years of Service
- Next Steps – Ecological Services

# Problem: Availability of Suitable Seagrass Mitigation Sites

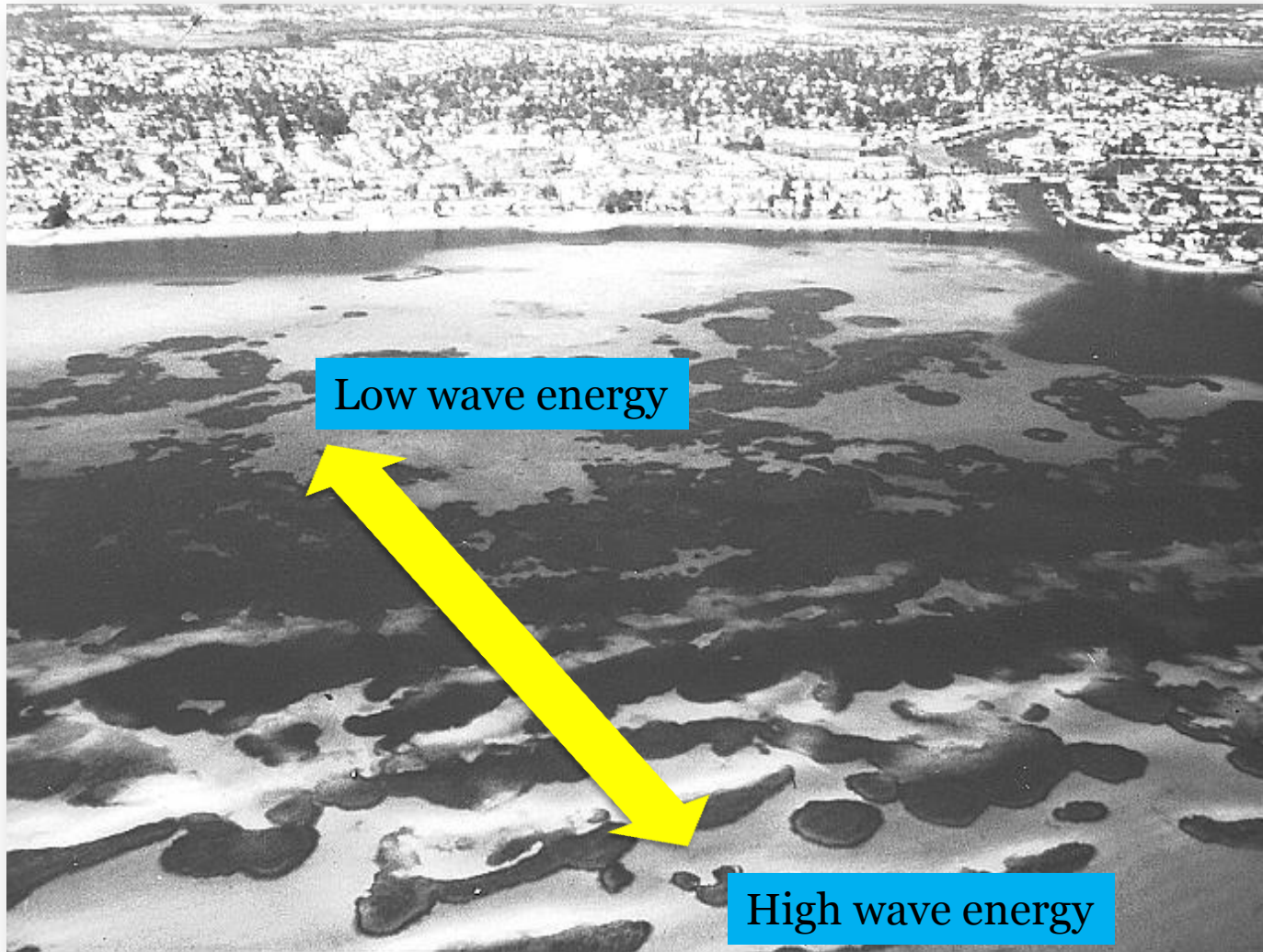
# Issues

- Public project – critical economic and safety needs
- Project injures critical seagrass habitat
- No nearby injury sites
- Choice:
  - Out-of-kind mitigation
  - Experimental in-kind mitigation



Solution: Landscape  
Manipulation to Create Acre-  
Years of Service

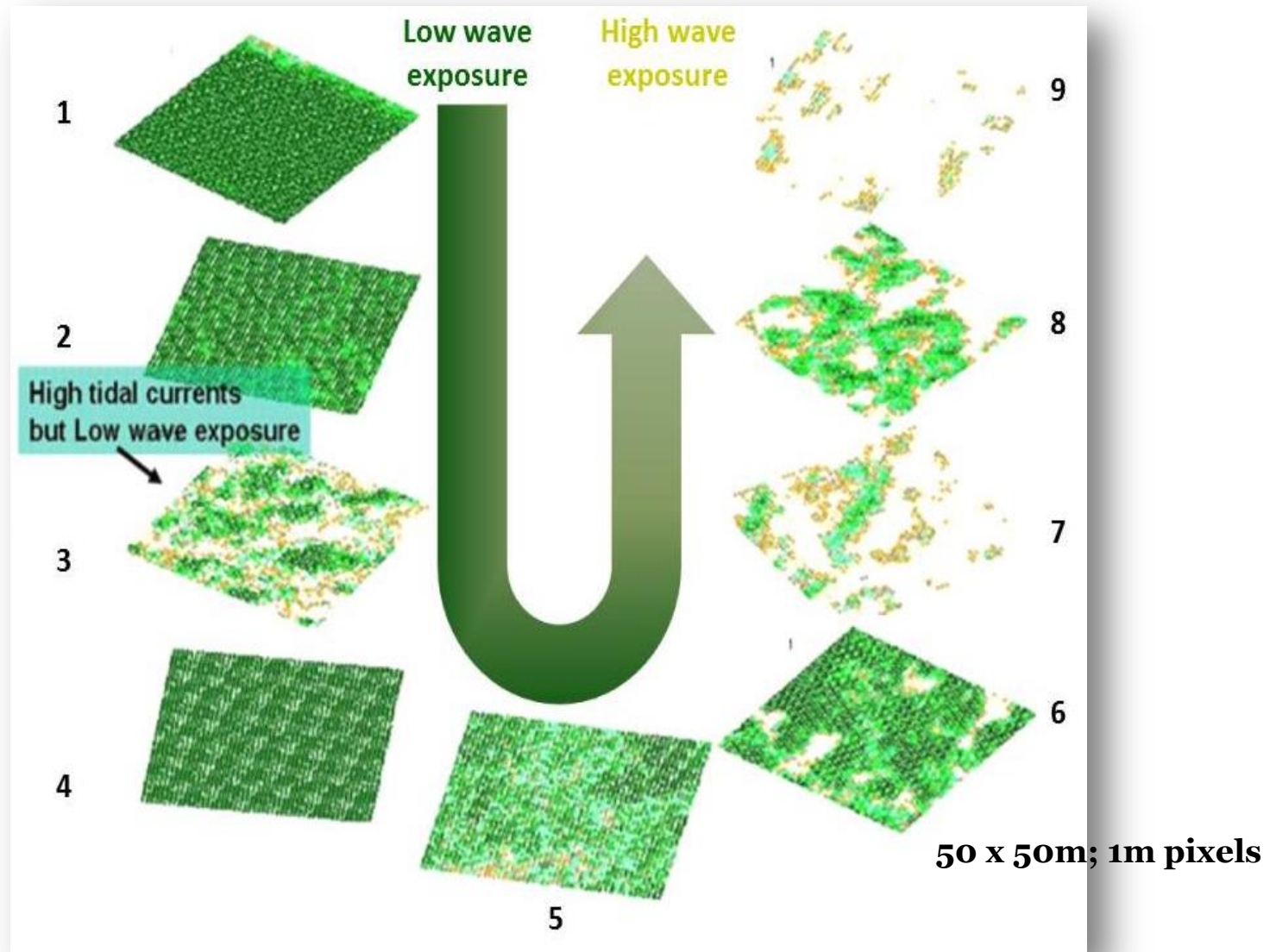




Low wave energy

High wave energy

## Time-compress maps of different seagrass beds across a gradient of wave exposure



### Peer Reviewed Literature Basis

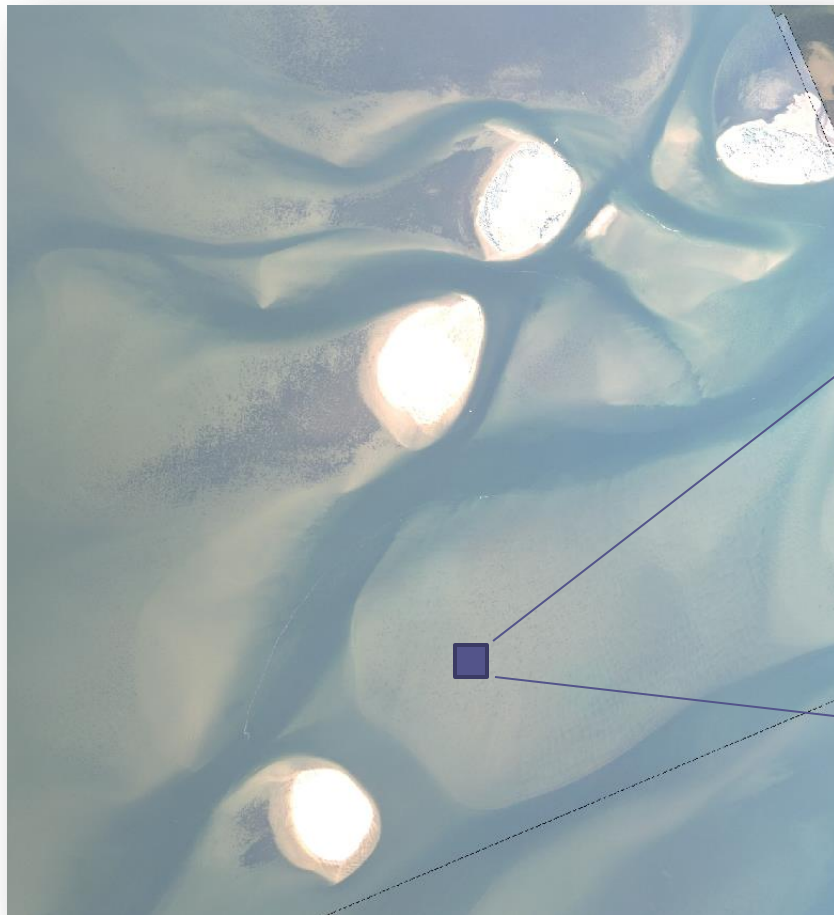
Fonseca et al., 1983; Fonseca and Bell 1998; Fonseca et al. 1998; Fonseca et al. 2000; Kelly et al. 2001; Fonseca et al. 2002; Bell et al. 2006; Fonseca et al. 2007



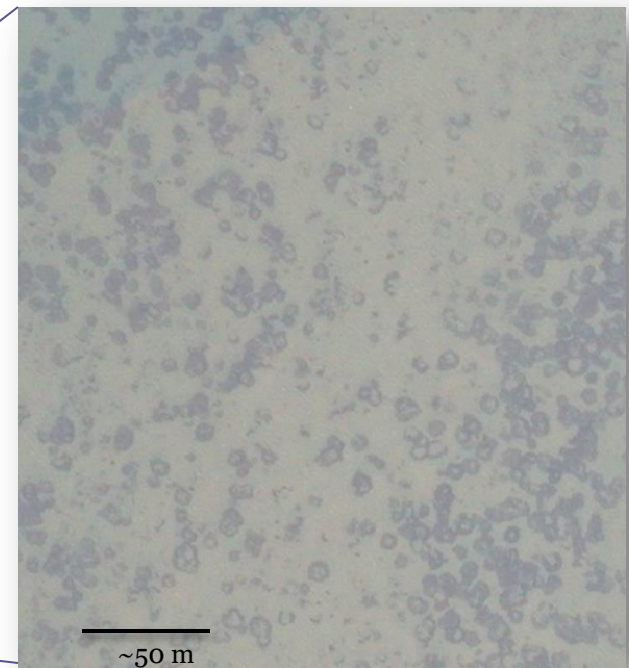


## MITIGATION STRATEGY

- Reduce wave energy on patchy seagrass beds
- Facilitate bed coalescence
- Increase cover per unit area seafloor
- Create acre-years of seagrass service flows (lift)



Oregon Inlet dredge material islands



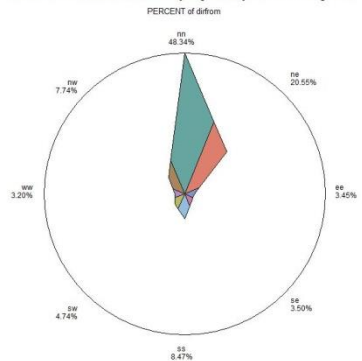
# MITIGATION APPROACH

- Install temporary wave barrier
- Create wave energy shadow
- Based on regression, forecast change in seagrass cover

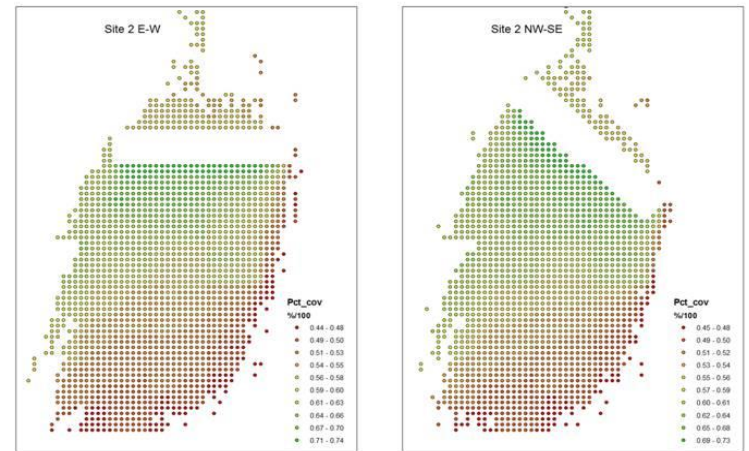
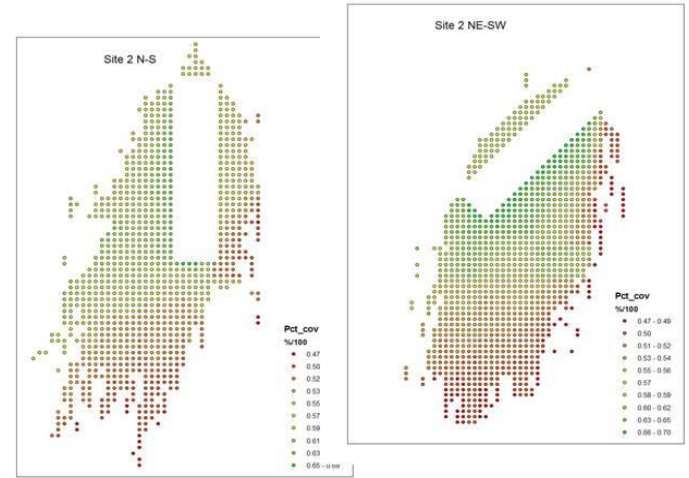
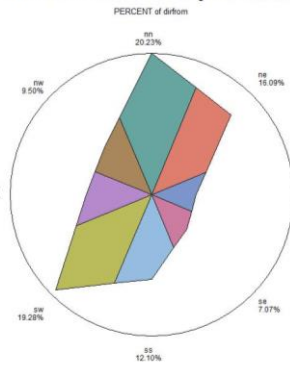
# SIMULATIONS

- Solve for optimal orientation
  - wind direction
  - wind speed
  - wind frequency

Pct. of exceedance (top 5%) winds by dir



Pct. of all wind obs. by direction



Site 1: Chevron shape facing dominant northerly exceedance winds

Site 2: Chevron shape facing secondary winds; utilize nearby island

Shaded areas = areas with > 20% reduction in wave energy



Site 1: + 3 acres



Site 2: + 0.7 acres

Images not to scale

# Next Steps: Consequences for Ecological Services



# Landscape Pattern - Patchy to Continuous

- Altering seagrass landscape pattern satisfies:
  - Basic regulatory requirements; and
  - Published site selection criteria
- Potential for changes in ecological functions relative to:
  - Faunal composition;
  - Movement; and/or
  - Abundance

# Faunal Response to Change in Landscape Pattern

- Demonstrated response to changes in landscape patterns
- Variable with species
  - Small motile fauna respond to edge
  - Larger motile fauna generally do not
  - Epiphytic species – little pattern
  - Sessile species (esp. infauna) some response



[rdennis@conshelf.com](mailto:rdennis@conshelf.com)



# CSA Ocean Sciences Inc.

---

8502 SW Kansas Avenue · Stuart, Florida 34997

[www.csacoean.com](http://www.csacoean.com) · 772-219-3000

