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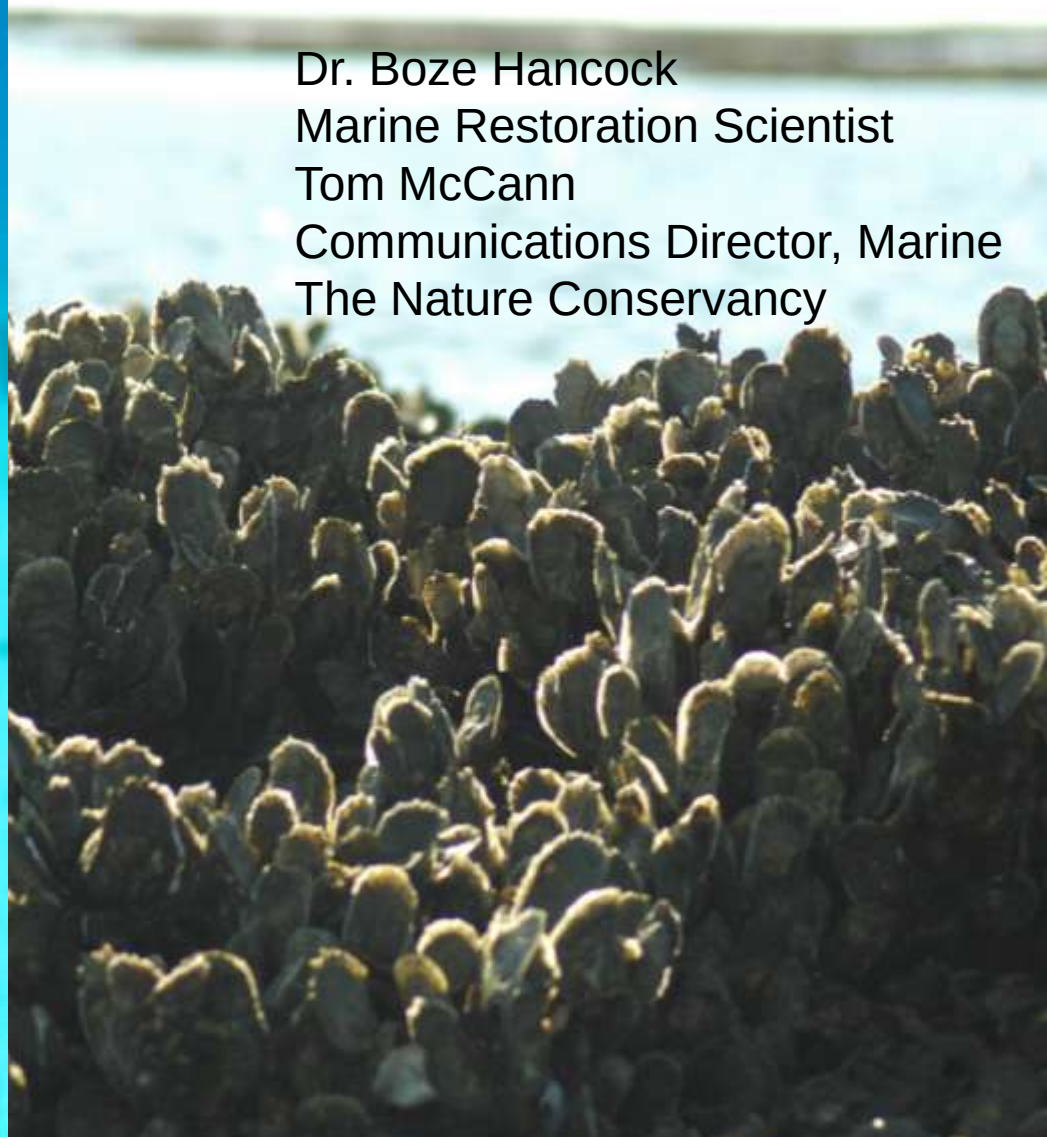
The Nature Conservancy's Marine conservation



Dr. Boze Hancock
Marine Restoration Scientist
Tom McCann
Communications Director, Marine
The Nature Conservancy

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Presentation Overview

TNC and Marine Conservation

Where we work, How we work

Why habitat restoration

Benefits of restoration

Example projects

Reducing risk to vulnerable coastal communities

Tools for restoration

Valuing habitat services

Current TNC Geographic Priorities for Marine Conservation

TNC's Global Marine Team provides support and leadership, develops new opportunities, and increases cohesiveness

Current TNC Priority Marine Projects

- U.S. Coasts and Oceans
- Costa Rica
- Caribbean
- Pacific Islands
- Coral Triangle

Additional TNC Marine Programs

- Mexico Mosaics, Western Caribbean, Eastern Tropical Pacific, Humboldt Current, Mozambique, Western Australia

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TNC Marine Conservation

Sustainable Fisheries

Ecosystem-based Adaptation Disaster Risk Reduction

Integrated Ocean Management

HABITAT RESTORATION









Marine habitats-

Oyster Reef Restoration

Living Shoreline Restoration

Invasive Species Control

Fish Passage

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Why Restoration

Coral Reefs – 75% threatened

(Burke et al. 2011)

Marshes and Mangroves – 50% loss

(Burke et al. 2001; Valiela and Bowen 2001; Zedler and Kercher 2005)

Oyster Reefs – 85% loss

(Beck et al. 2011)

Rivers – 97% of the worlds major rivers are dammed

(Postel and Richter 2003)

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Benefits of Restoration

Ecological

- More habitat, Better condition
- Insights into ecological function

Public Relations

- High levels of community ownership
  - ⇨ Political support

Financial

- Improved & cheaper shoreline protection
- Reduced insurance costs
- Valuable ecosystem services

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Partner organizations

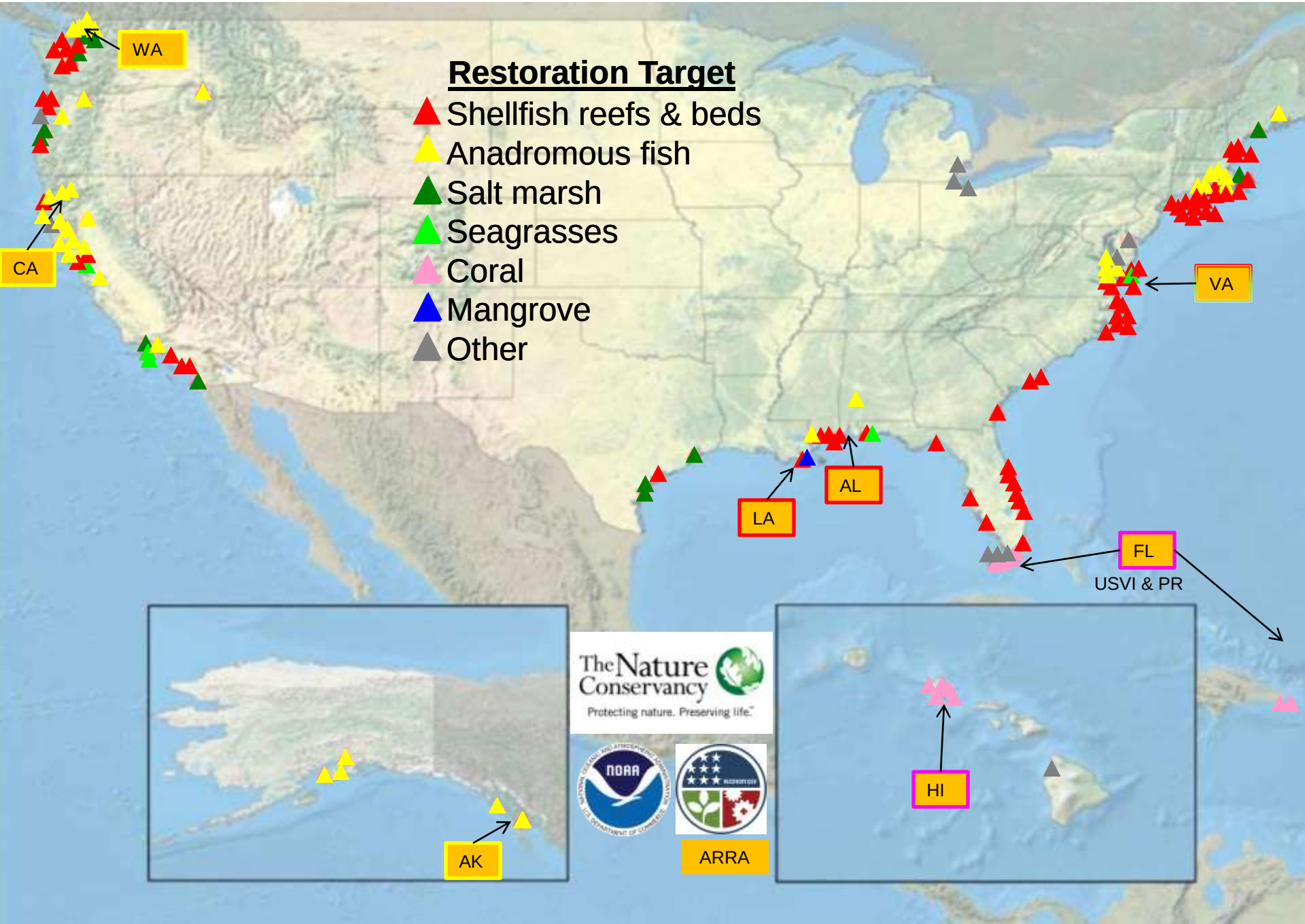
Agency Cooperative Agreements / MOU's

- NOAA's Restoration Center – CRP
- NOAA's NRDA / DARRP Program
- Army Corps of Engineers
- DOA's Natural Resource Conservation Service

Industry

- DOW Chemicals
- Shell
- Swiss Re

NOAA CRP Partnership- 150 projects to 2013



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VA Seaside Bays Restoration

VA Seaside Bays Seagrass Restoration

Eelgrass Restoration → **Transplant**

→ **Direct seeding**

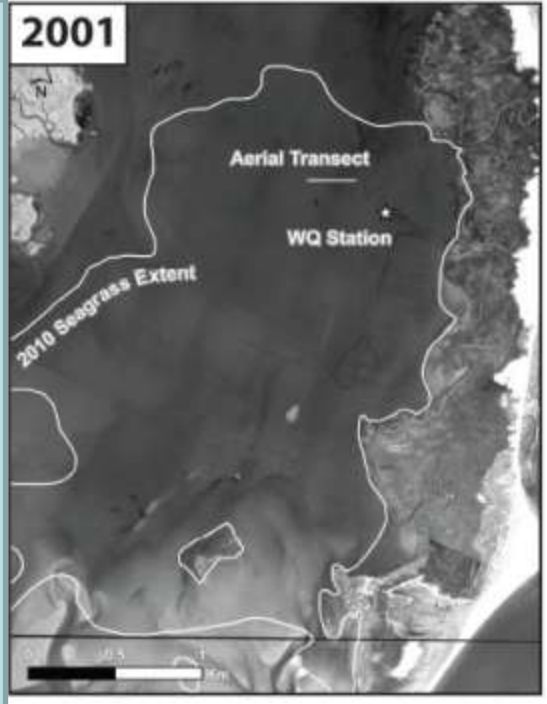
Volunteers Collecting Eelgrass Seed stems

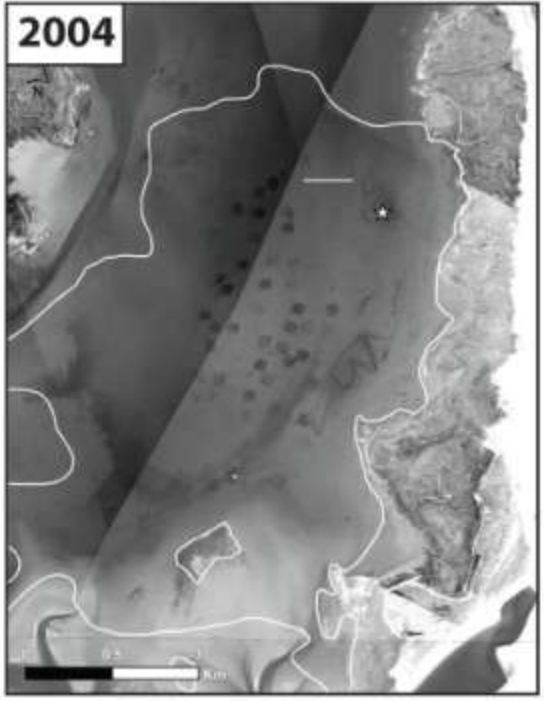
Between 2001 - 2012

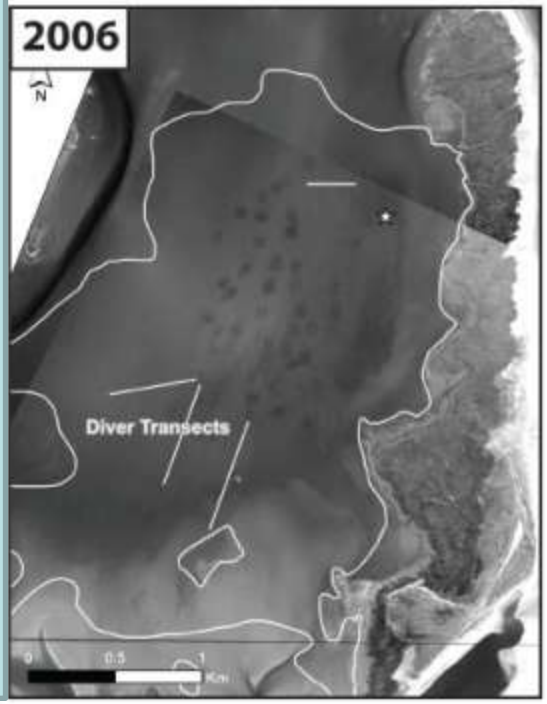
Approx. 40 million seeds,
300 acres seeded
5,000 acres and increasing

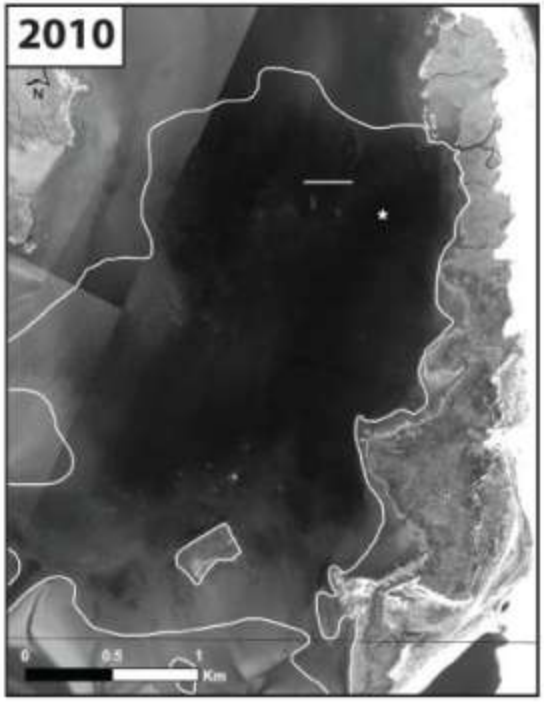
Monitored: aerial photos, sediment, genetics, water quality (seven years)

Source:
TNC VA Coastal bays Prog.
Bob Orth VIMS









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Lasting Solution: Resetting an Ecosystem

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FL/USVI Coral Recovery and Restoration

Goals: **Restore 35 coral reefs eight locations**

Habitat Restoration:

12,000 colonies

Threatened staghorn elkhorn coral

8 nurseries

35 reef sites

Florida ,U.S. Virgin Islands.

Jobs: 60 jobs totaling 118,759 labor hours

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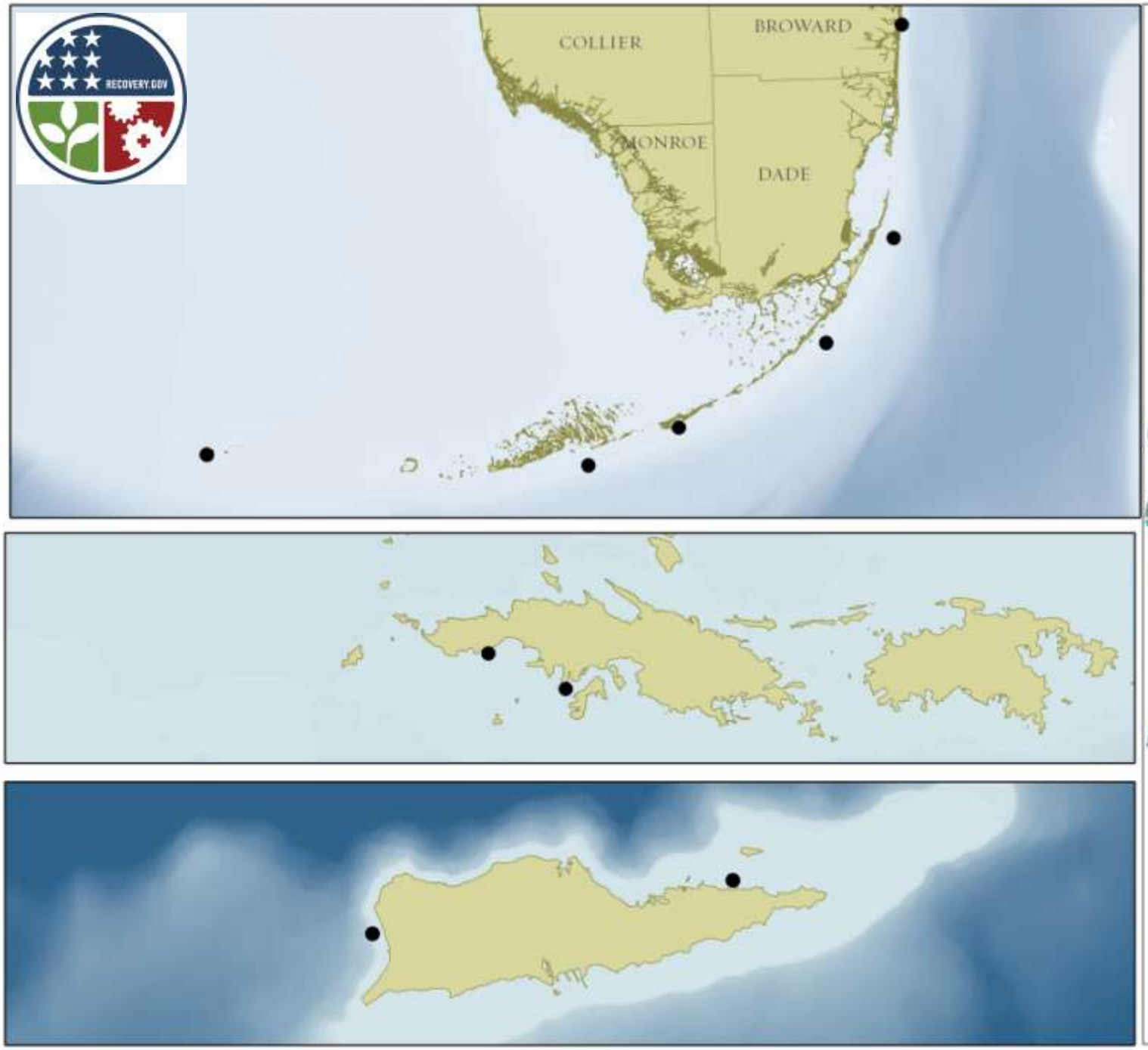
Nurseries as a Tool for Restoration


COLLIER
BROWARD
MONROE
DADE
Threatened Coral Recovery in Florida and the U.S.V.I.
Nursery (Approx. Location)
N
The Nature Conservancy
MOTE MARINE LABORATORY
PENNSTATE
Copyright 2009 The Nature Conservancy
Prepared by J. E. Knowles
Data
FL Counties (FGDL)
Zones (RSMAS/TNC)
Shoreline (ESRI)
Parks (FWA)

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Habitat Restoration for Shoreline Protection

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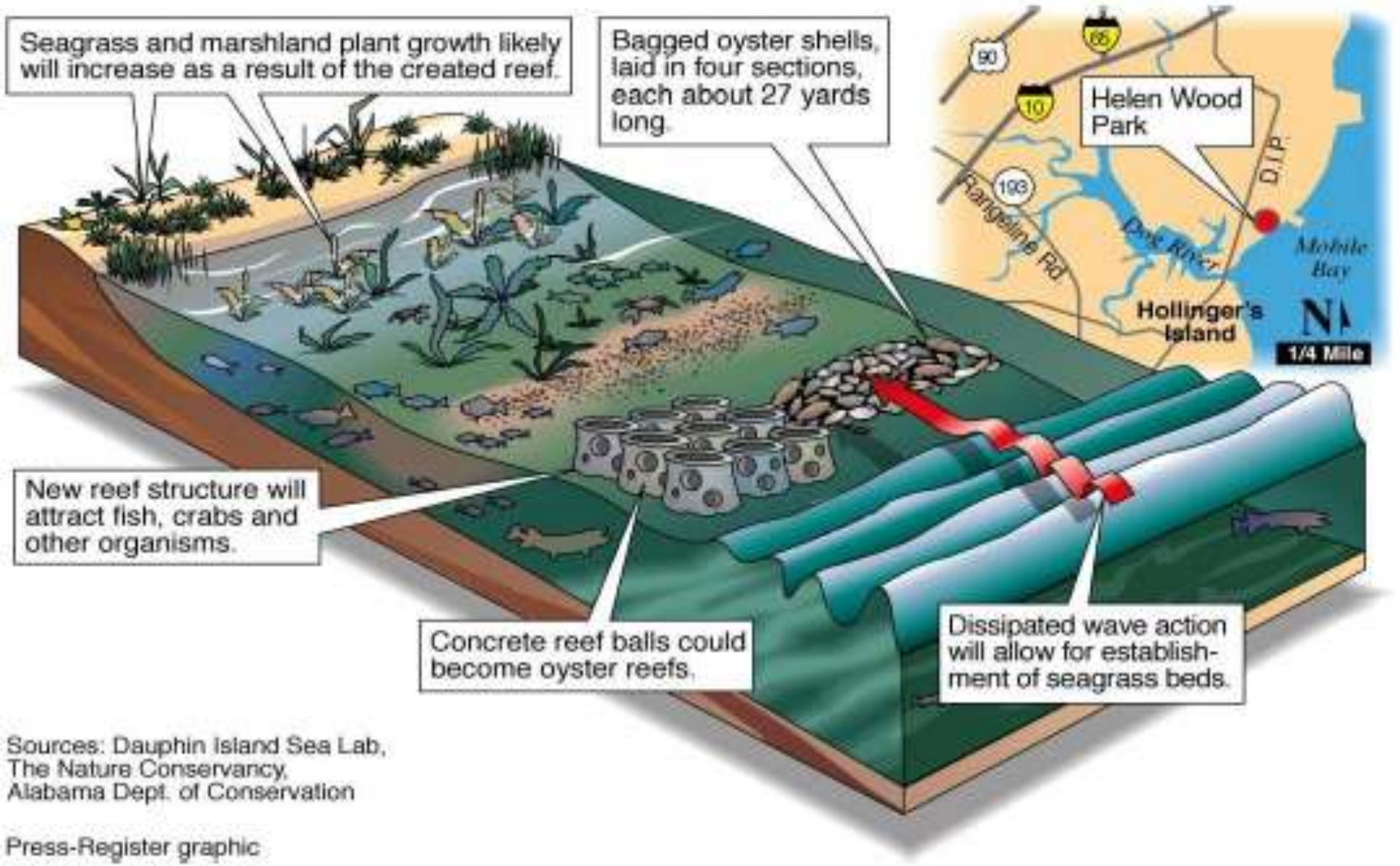
Shoreline Protection & Habitat Restoration



Sources: Dauphin Island Sea Lab, The Nature Conservancy, Alabama Dept. of Conservation

Press-Register graphic

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Alabama Breakwater and Estuary Restoration

Goals:

Restore shoreline habitat

Boost AL economy

Habitat Restoration

1.5 miles of breakwater,

3 acres of oyster reef,

30 acres of seagrass beds.

Jobs: 35 to 40 new jobs

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Solutions: Oyster Reefs Act as Natural Wave Breaks

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Alabama 100/1000- 100 miles of oyster reef, 1000 acres seagrass/saltmarsh

Photos by Erika Nortemann

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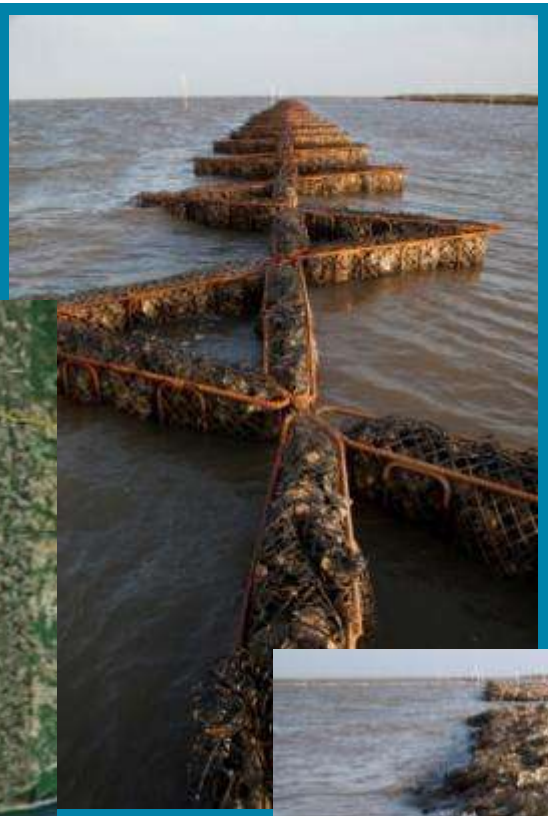
Restoration at Scale

100-1000 RESTORE COASTAL ALABAMA



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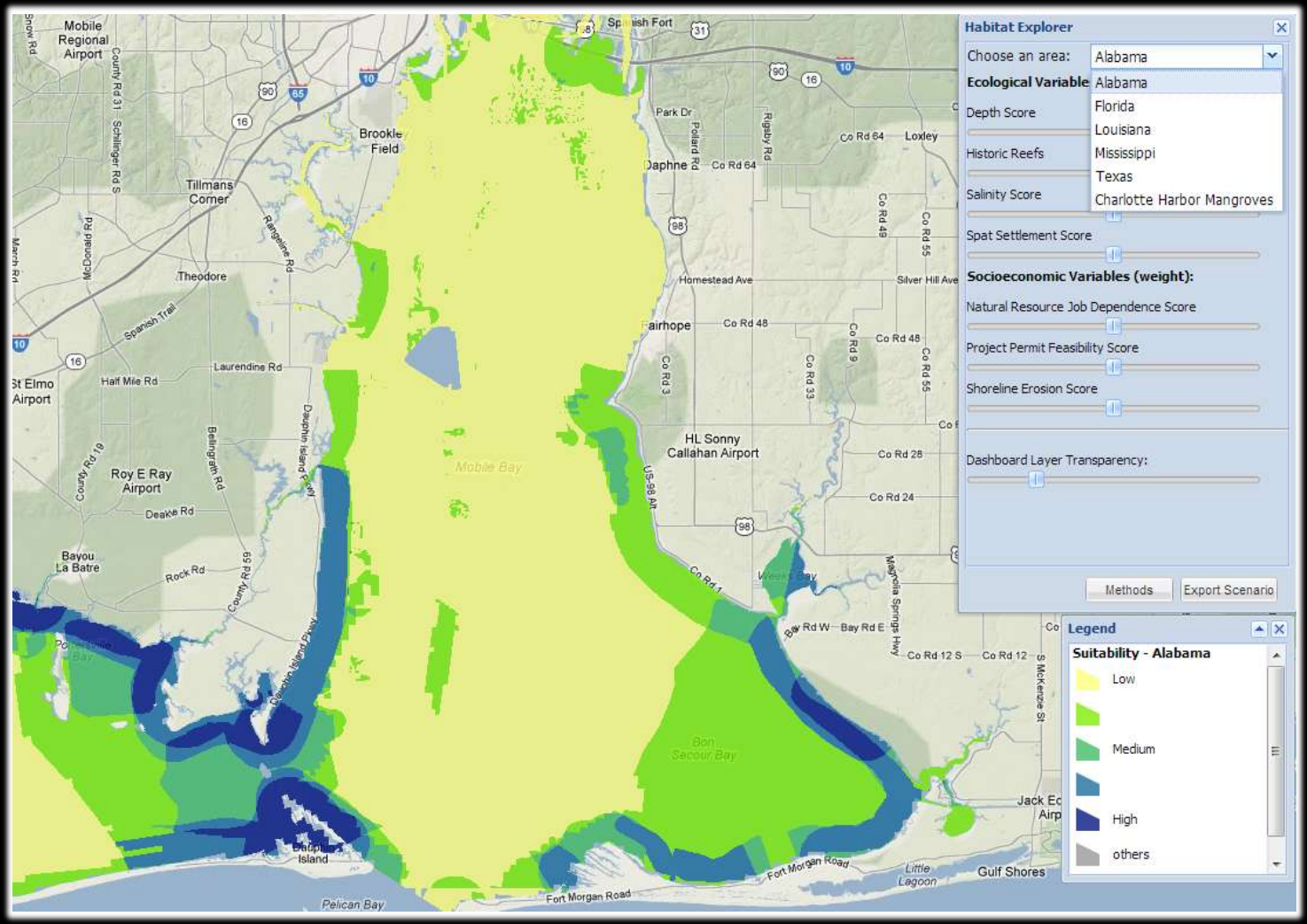
Restoration Tools
CoastalResilience.org



Coastal Defense Tool – Oyster Restoration

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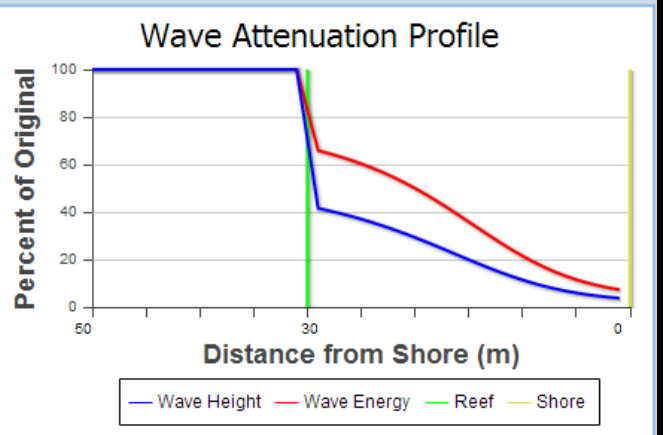
Nearshore Waves Tool

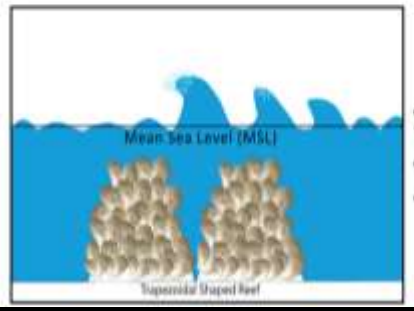


The figure shows the average profiles of percent of wave height and energy attenuation computed from all Reef Points along your reef. Attenuation is defined as the ratio of wave height (energy) in the presence of the reef over wave height (energy) in the absence of the reef.

Layers: Wave Attenuation - (Click a profile point for attenuation detail.)
Fetch Distances
Bathymetry
Choose a New Reef Location (Start Over)

Link to the output (turn off popup blocker): Results Link

Reef Characteristics

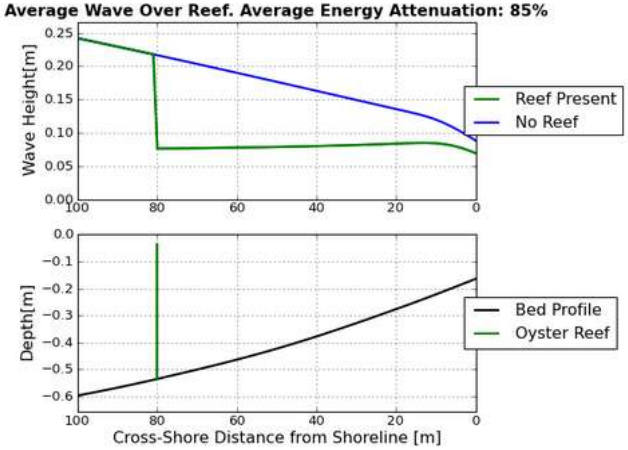


- Your oyster reef is 80.0m from the shoreline, with a base width of 10.0m, and a crest width of 4.0m.
- It is 0.3m tall, and the water depth is 0.53m: it is submerged.
- Offshore wave input conditions are: Ho=0.31m, and To=3.04s.

Model Outputs

Below are close-ups of average wave height and depth profiles near your reef - they were created by running our wave model over 7 bathymetry of profiles that

Average Wave Over Reef. Average Energy Attenuation: 85%



- On average, wave heights in the region protected by your oyster reef were reduced by 52% (max=80%; min=23%).
- Wave energy was reduced, on average, by 71% (max=91%; min=41%).

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Application

DOW Chemical plant, Freeport, TX

Demonstrating the value of habitat for coastal protection

Translating results to other facilities

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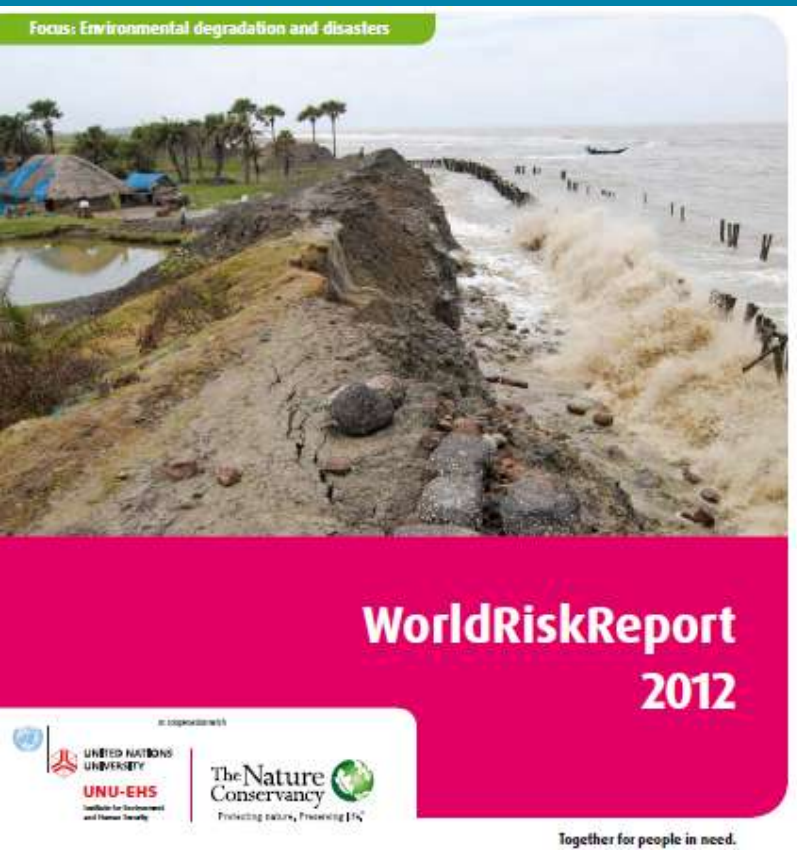
Valuing Ecosystem Services

Swiss Re
Valuing Habitat When Assessing Risk
Coastal Communities and Property



Quantifying and Adding Values to Ecosystem Services, e.g.,

Oysters

Filtration
zuErmgassen et al 2012 & 2013

Denitrification
Kellogg et al. 2013

Fish Production
Powers et al. in prep

Ecosystem service values
Grabowski et al 2013

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TNC & Restoration – History and future

- Restoration Works
- Restoration Pays
- Restoration is not a luxury just for rich nations

Synergies?


Thank you!
Dr. Boze Hancock
TNC Global Marine Team
bhancock@tnc.org

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Unexpected Results: Community Ownership

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Economic analysis

Timm Kroeger

AL 100/1000 reefs

3.6 mi (5,850m) length

$4.28M total cost (est.)

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Economic Value of Ecosystem Services

Enhancement est. based on academic studies

Commercially or recreationally fished species

3.6 miles of reef: >6,900 pounds of additional catch/yr

39% commercial

61% recreational

Top 10% of waves- Reduce height 53-91%, energy 76-99%

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Economic *Impacts* from **Fisheries Enhancement**

Fishery enhancement dominate benefits

$217,000 - $225,000 annually

Net Present Value > restoration cost ($4.3M) in 34 yrs

For 50 and 100 yr lifetimes, fishery only,

social Return On Investment 1.3 & 1.8

NPV of $1.17M & $2.23M

Fish and Crab Enhancement

Total increase in seafood sector value-added: >$20,000/yr

Total effects in local economy:

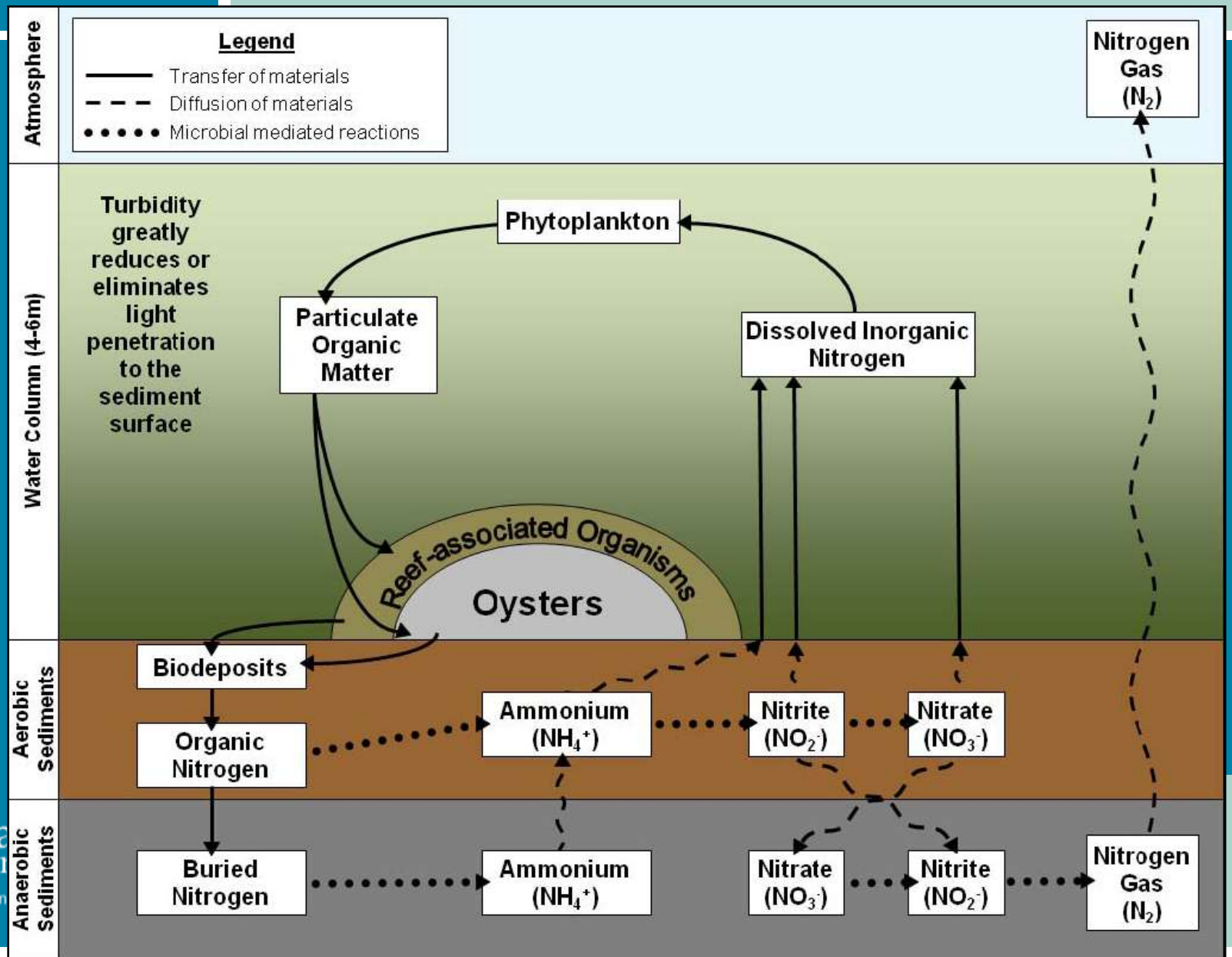
Output	$35,000 per year
Earnings	$9,800 per year
Jobs	1 part-time

Note: Does not include impacts from local oyster enhancement

Source: T. Kroeger, TNC 2012

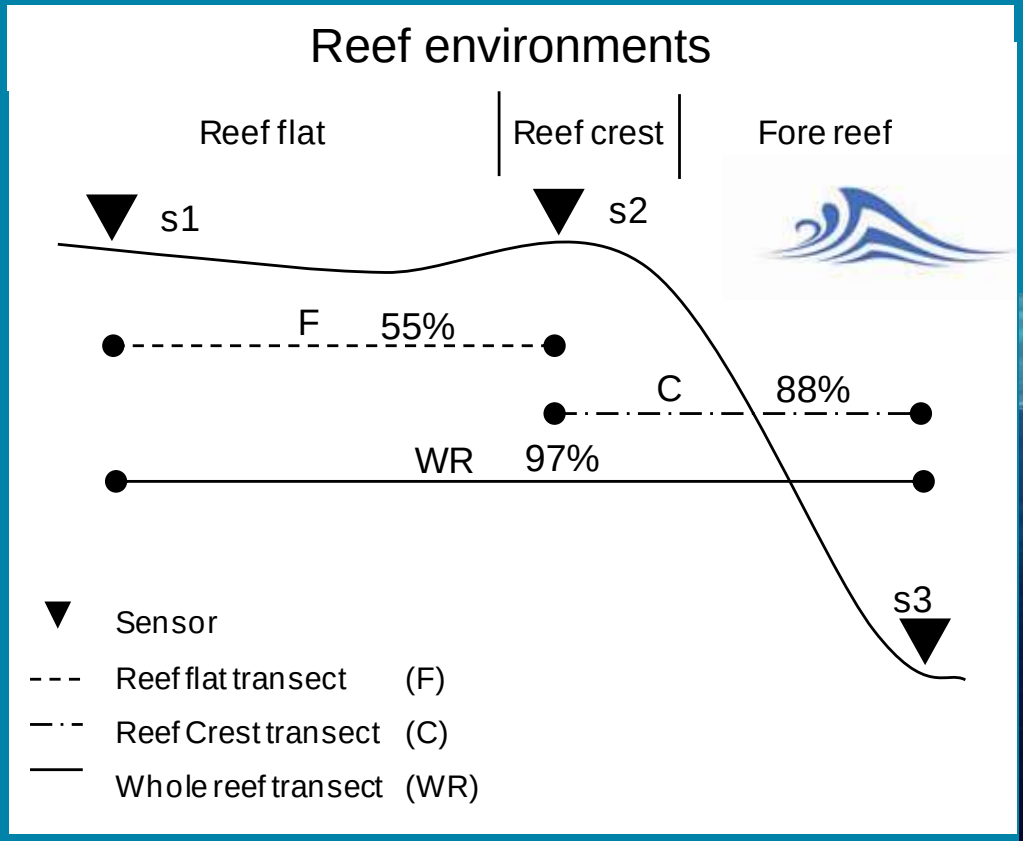
Nitrogen cycling on oyster reefs

Denitrification, after Kellogg et al. VIMS & Horn Pt Lab, MD



Coral reef & shoreline protection

Wave attenuation reduction in wave height or wave energy as waves interact with coral reefs



We evaluated the effect of:

- the reef crest (C)
- the reef flat (F)
- the whole coral reef (WR)

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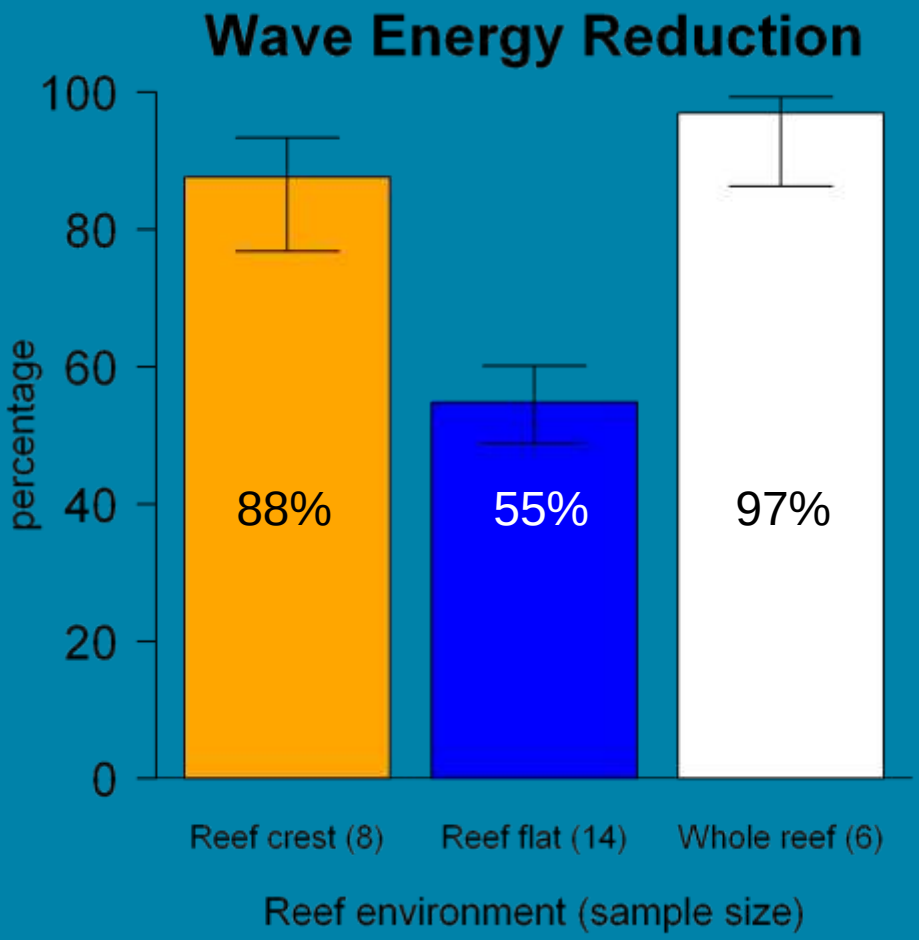
Coral Reef



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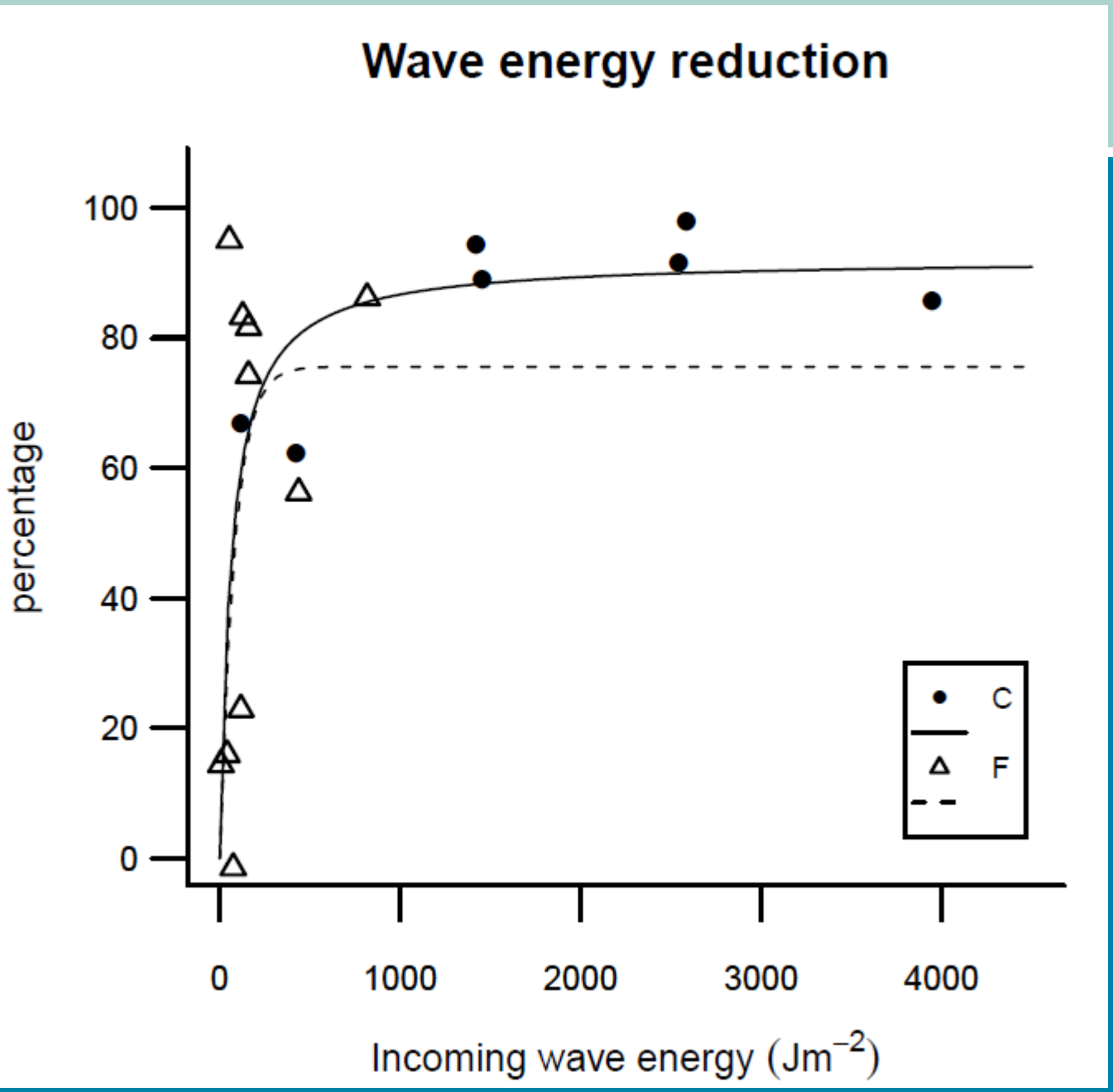
Fringing Coral Reef

Wave energy reduction over the width of a reef



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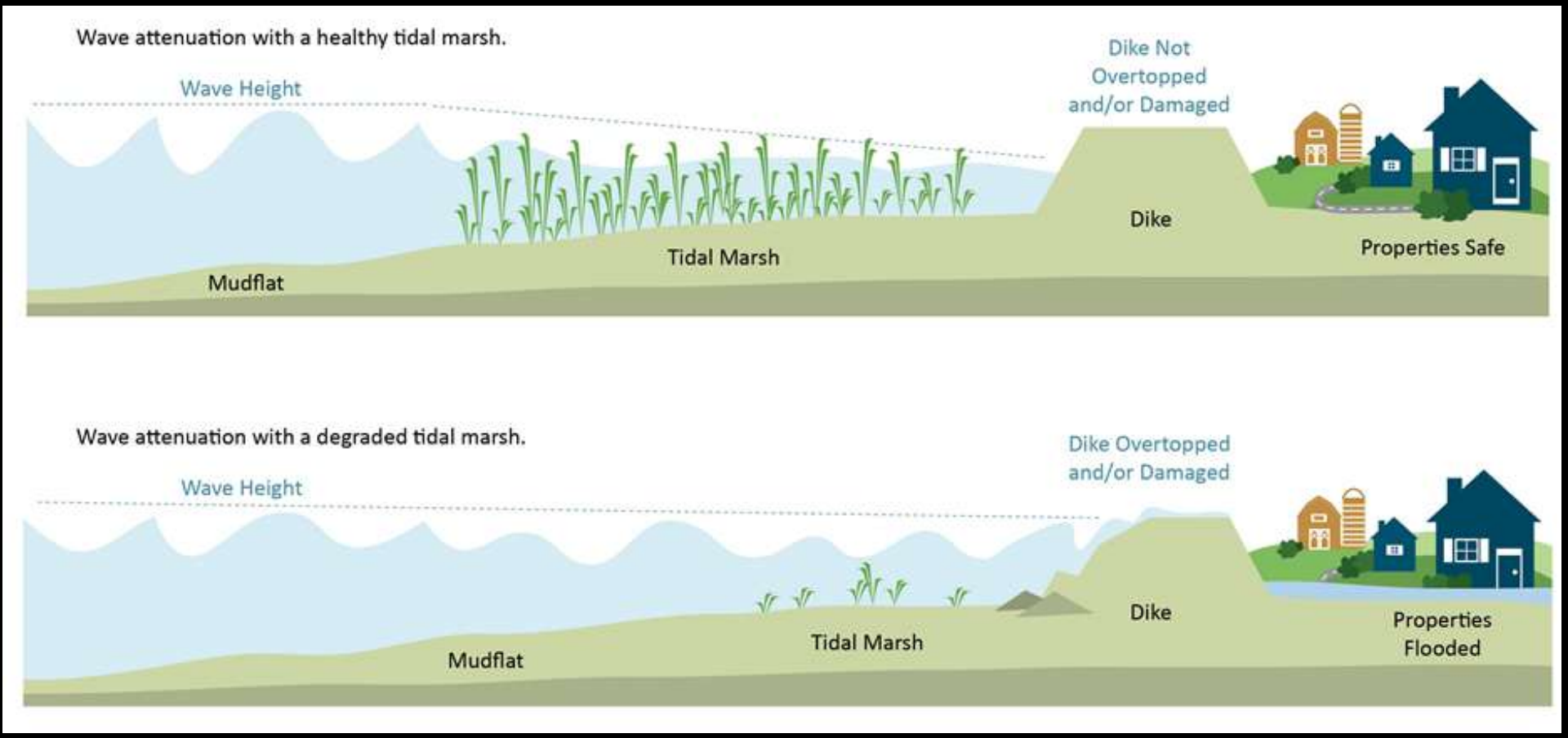
Marsh Ecosystem Services



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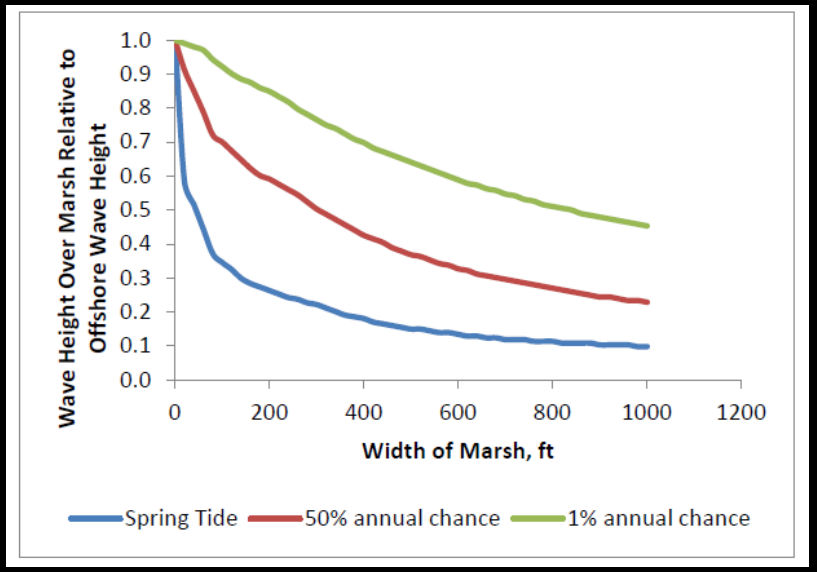
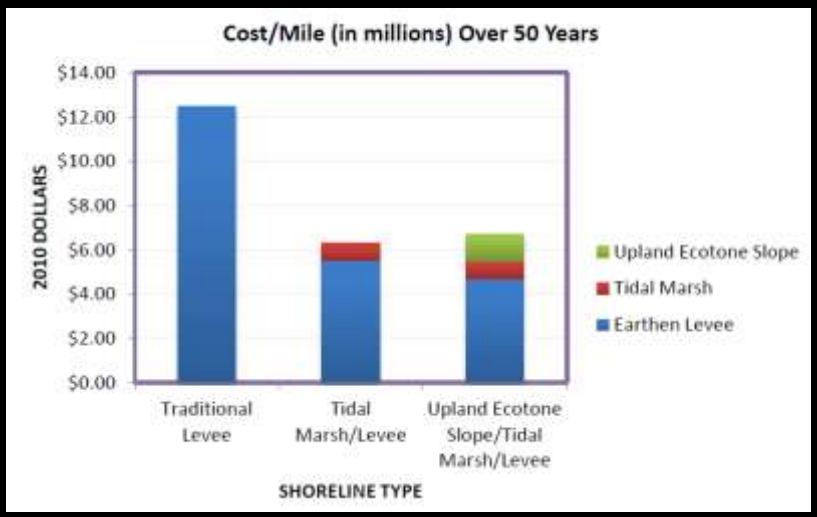
Marshes = Coastal Protection Services





(ESA PWA, 2013)

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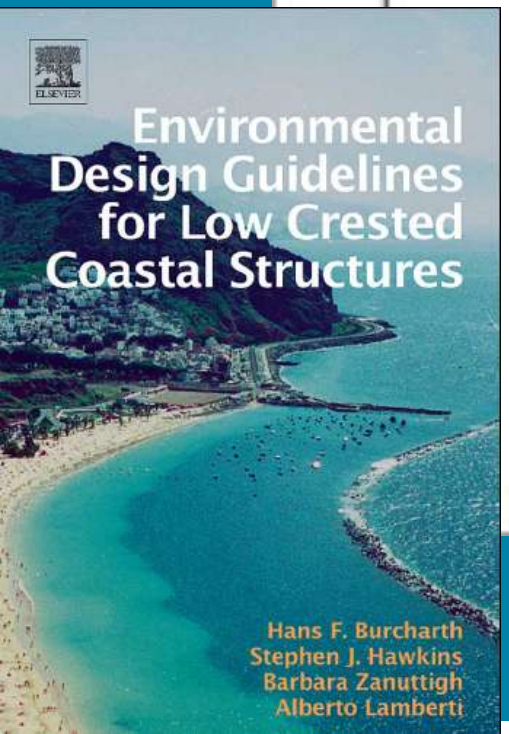
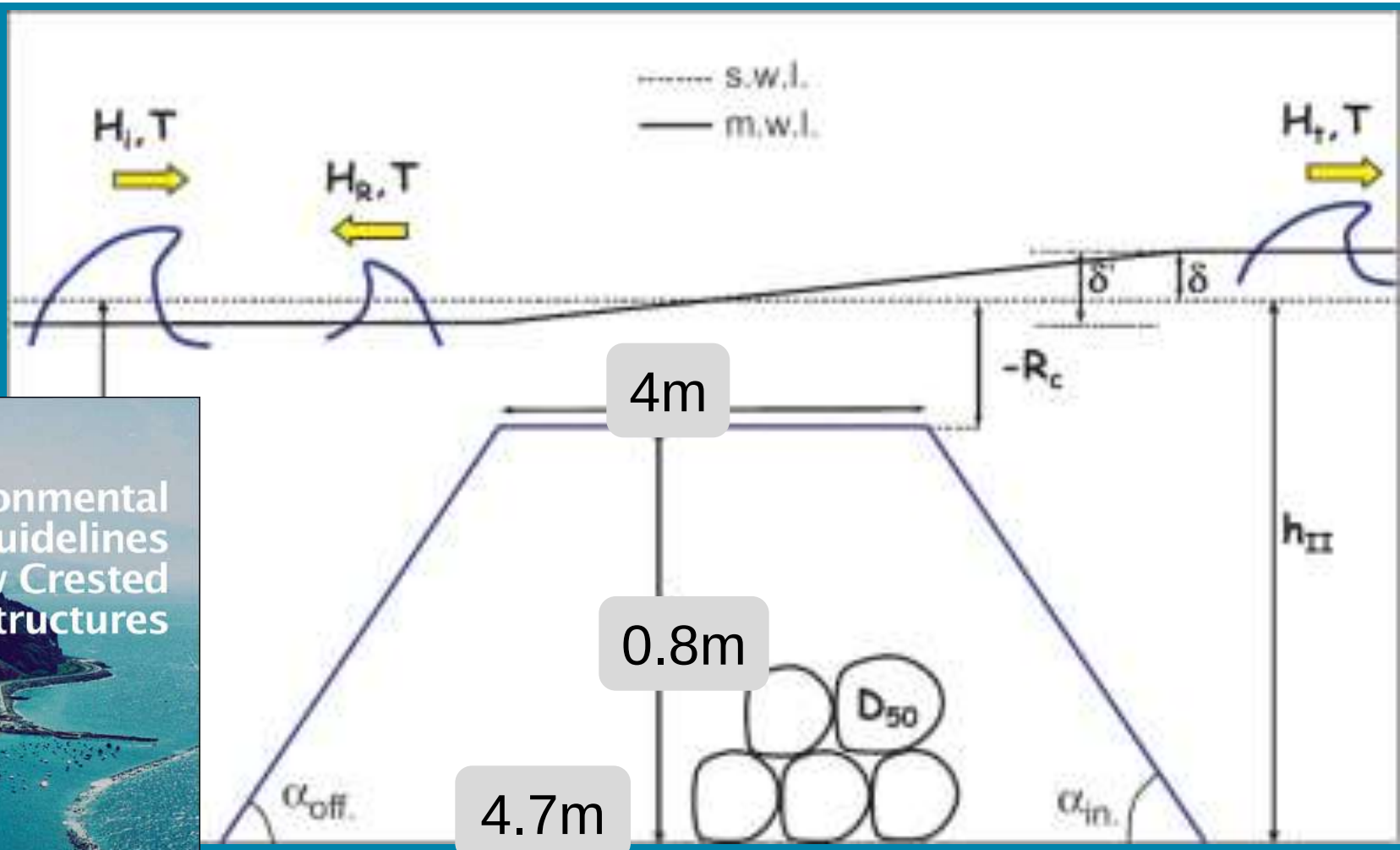
Engineering Reefs





natural capital PROJECT

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Sediment Deposition - Marsh Expansion