



WORLDWIDE NETWORK OF VOLUNTEERS AND CONTRACTORS



22 years of Worldwide
Reef Ball® Coastal Restoration



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- 1) Reef Ball Foundation
- 2) Background
- 3) Product
- 4) Process
- 5) Locations
- 6) Habitats
- 7) Living shorelines

- 7) Breakwater
- 8) Oysters
- 9) Coral
- 10) Mangrove
- 11) Micro-Habitats
- 12) Eternal Reefs
- 13) Results



Worldwide Loss of Marine Habitat

- Natural Disasters
- Human Impacts
 - On coastline
 - On watershed



THE QUESTION

What can be done to counter the impact on marine ecosystems?

Research has shown

a need to **INCREASE:**

- 1) juvenile fish habitats
- 2) oysters in estuaries
- 3) shoreline protection
- 4) sediments in marshes
- 5) survivability of imperiled corals

Why select Reef Balls®

The design and testing of Reef Balls® demonstrated the quality and characteristics to meet project needs:

- 1) designed to mimic natural ecosystems
- 2) no environmental toxins
- 3) pH balanced, marine-grade concrete
- 4) a textured surface
- 5) hydrodynamic testing; waves & currents
- 6) product quality control standards
- 7) modifications and sizes for various needs
- 8) a history of staying where they are placed.

Products

Reef Balls
Layer Cakes
Custom









The Process:

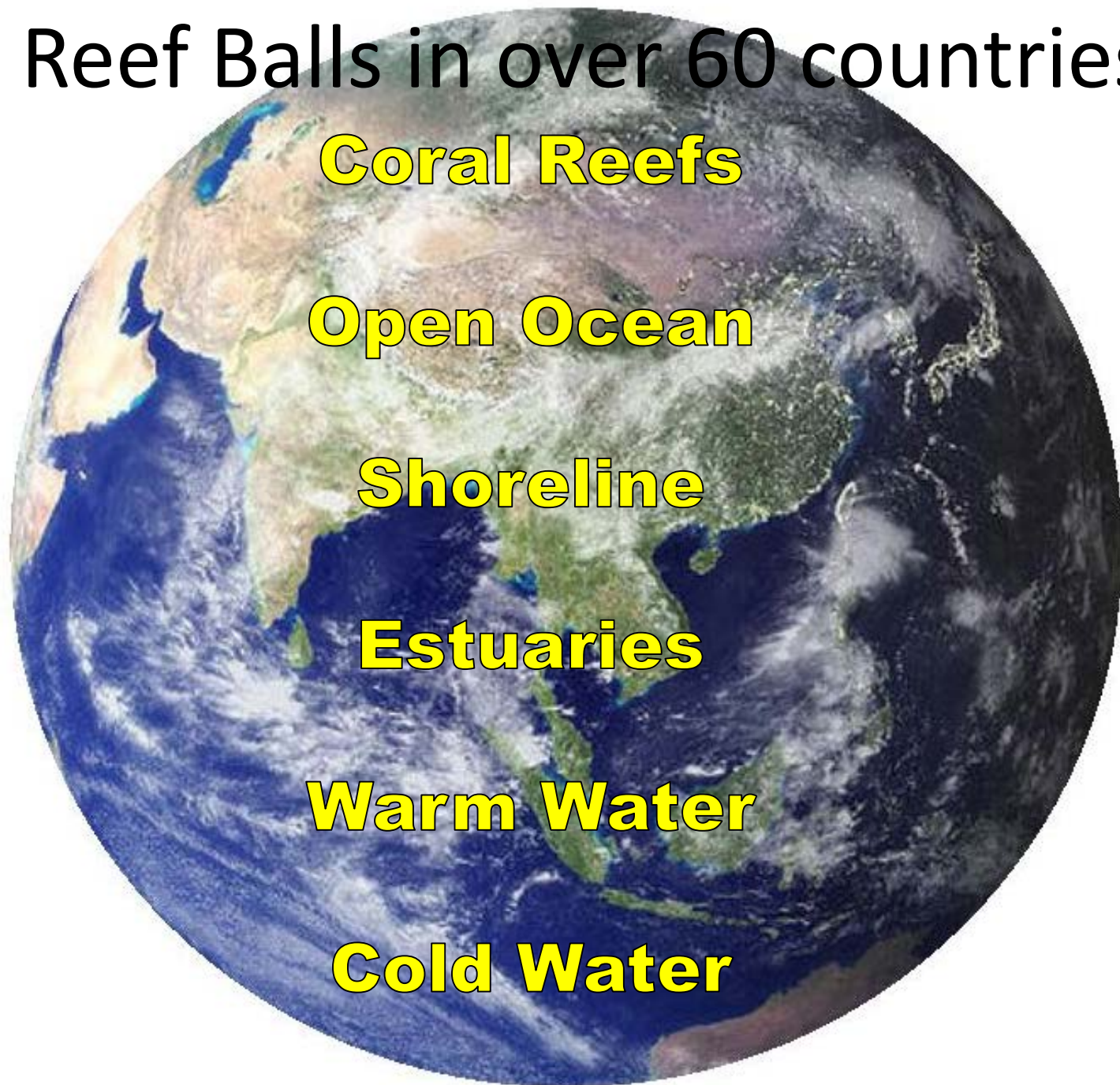
1. Evaluation of the proposed site
 1. Site survey (above and below the surface)
 2. Assessment of environmental impact
2. Site design and selection of modules
3. Permitting
4. Secure funding
5. Construction of Reef Ball modules
6. Deployment
7. Monitoring the outcome

Data:

- Over 22 years of observations and collection
- Published Research by:
 - Governmental Agencies
 - Higher Education Research
 - NGO Research
 - Independent studies
 - Volunteer monitoring groups

- @ 600,000 Reef Balls deployed
- @ 60,000 Coral Transplants
- @ 400 Breakwater and/or
Living Shoreline Projects
- @ 1200 Red Mangrove plantings, 850 in
Caymans
- EFH
- Educational Programs

Reef Balls in over 60 countries



Coral Reefs

Open Ocean

Shoreline

Estuaries

Warm Water

Cold Water

Construction → Deployment



Habitats







CBF's Oyster Restoration/ Oyster Gardening



Reef Ball ... return to surface







A large school of yellow-striped snappers (Lutjanus fulvifasciatus) is shown swimming in a reef ball. The fish are densely packed, with many individuals visible in the foreground and background. They have a yellowish-brown body with dark vertical stripes. The background is a dark, textured surface, likely the interior of the reef ball, with some light-colored patches. The overall scene is underwater, with a blueish-green tint.

Inside a Reef Ball

Breakwater

for stabilization and nourishment







NO LANDING
HERE
SANCTUARY
BANDUNG
MANGROVE
RESERVE
P. O. BOX 1000
BANDUNG



Richard T. Paul Alafia Bank Bird Sanctuary



Phase I 2011

Phase II proposal 2014

This project is an addition to the successful breakwater oyster reef habitat installed in Spring 2011 to protect the shoreline from further erosion.

Reef Balls have provided oyster habitat and lead to accretion deposits of sand landward of the Reef Balls.



Stabalizing Seawalls



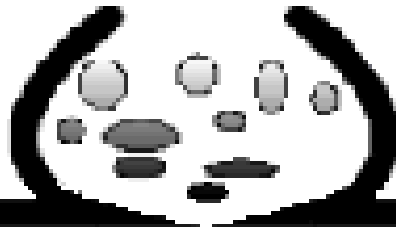




Results from Reef Ball Breakwater



Increased beach width in the Dominican Republic Project from 1998 to 2001 at center of project - looking west, this was the result of natural accretion of sand by the Reef Ball submerged breakwater and not a sand renourishment project.



Reef Beach

Company, Ltd.

Reef Balls & Environmental Solutions for Erosion Control

- <http://www.reefbeach.com/#Fence>

Iberostar Resort



Oyster Bed Development





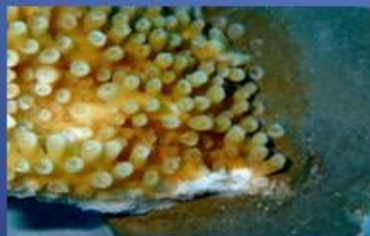


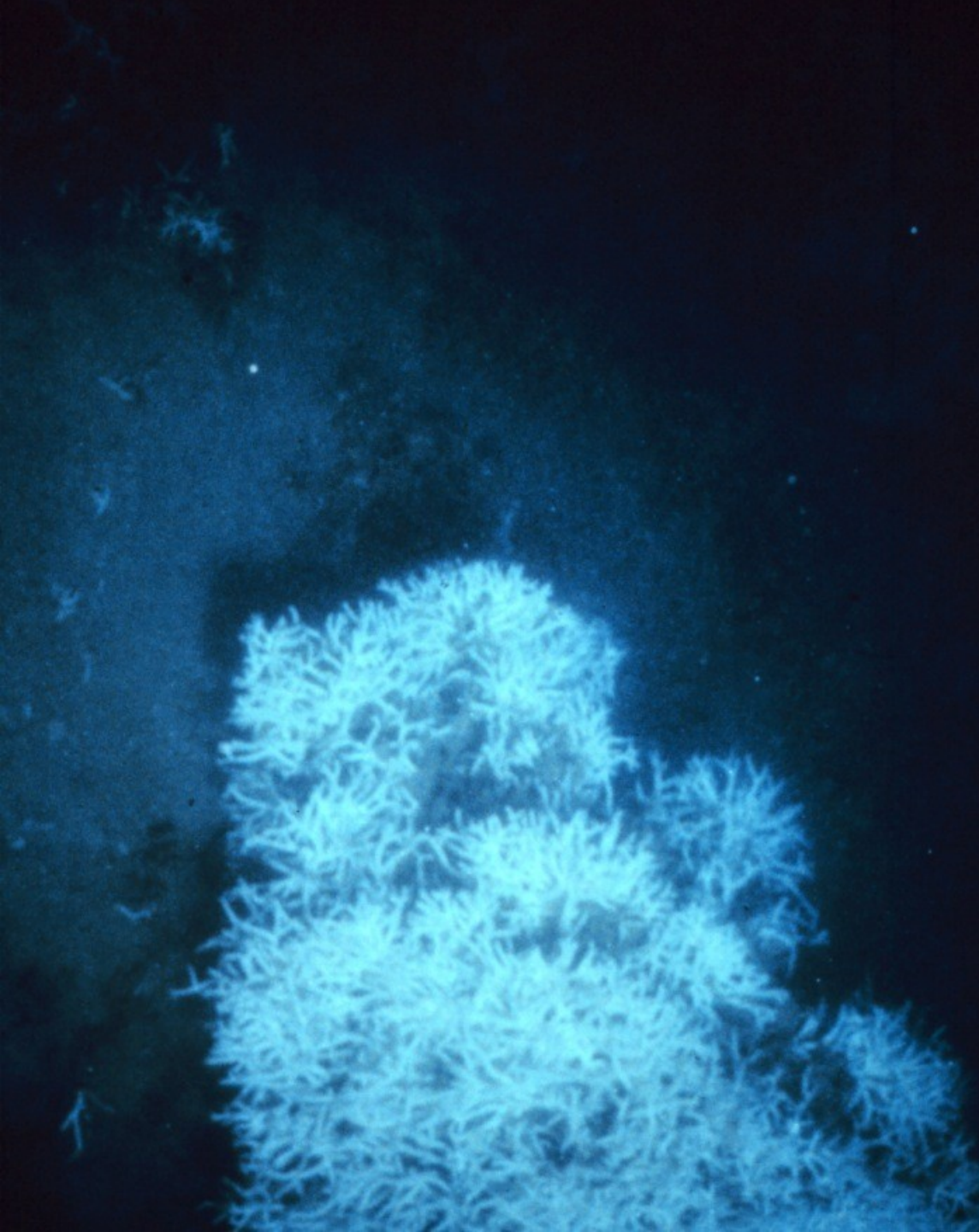




Transplanting and Preservation

Coral





***Picture of
Reef Ball
with Oculina
Coral 800
Feet Below
Sea Level***



Pelestarian Terumbu Karang

2004



2006



2008



2010





Reef Ball placed on Coral rubble

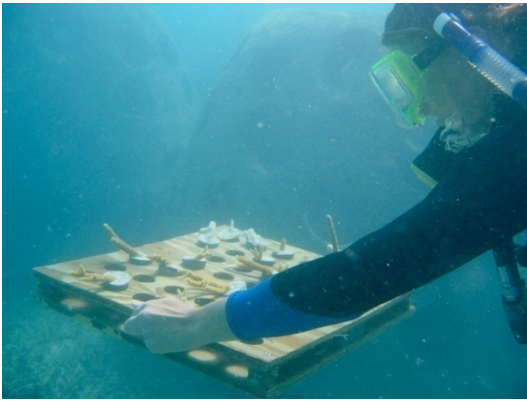
Coral Rescue Project

- 1. Steps in A Coral Rescue Project Make every effort to avoid the corals being damaged in the first place.***
- 2. Survey the area and document existing species and relative abundances.***
- 3. Determine if you have enough resources for a complete rescue, or just a preservation of coral genetics***
- 4. Locate a suitable new location(s) for the corals to be moved to that has similar water quality and parameters***
- 5. Determine need for prefabricated bases or if existing hard bottom can be used for re-attachement.***
- 6. Build and deploy prefabricated bases if needed.***
- 7. Develop a rescue plan that minimizes damages to coral colonies.***
- 8. Conduct a [Coral Propagation](#) "backup" taking a few cuttings from each adult colony before rescue work as a way to preserve genetics in case of loss. If there is time, give adult colonies time to heal after cuttings are taken.***
- 9. Build a temporary nursery area to hold adult colonies until there is time to plant them.***
- 10. Perform the rescue and remove as many corals as is practical from the area that will be destroyed.***
- 11. Transport corals to the temporary nursery.***
- 12. As quickly as is practical, begin planting corals (Hydrostatic [Movie showing how the Hydrostatic/Microsilica attachment method works](#) or [Reef Ball Attachment System Method](#))***

Coral Plugs

ready for cementing to Reef Balls





The above Staghorn coral from the Curacao project is just 20 months old starting with a fragment of less than one inch.

Mangrove



Cayman Mangrove Nursery March

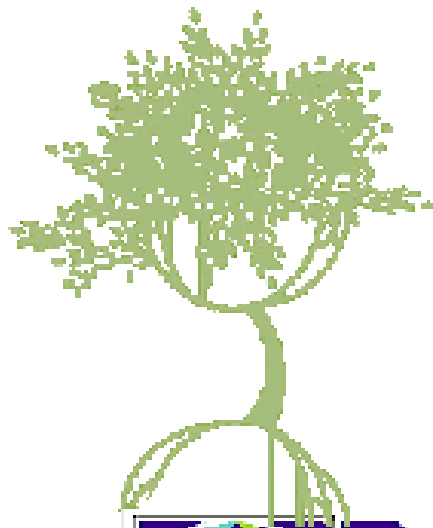


Cayman Mangrove Nursery May

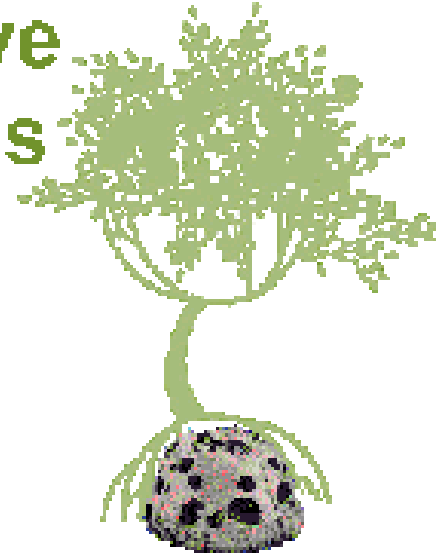






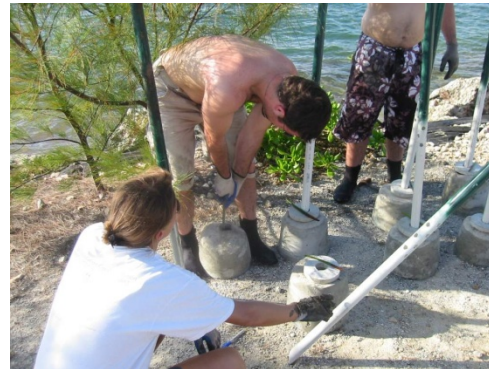
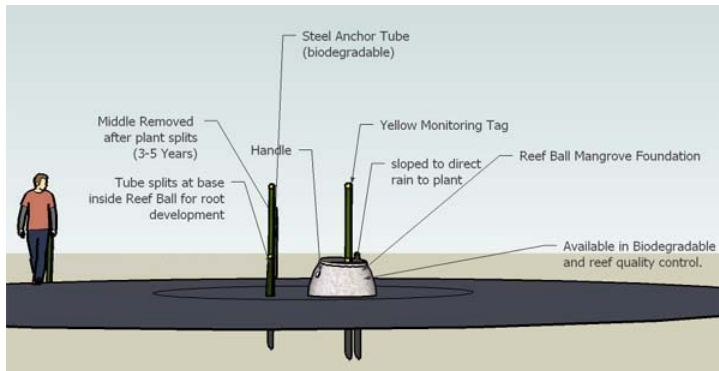


Reef Ball Mangrove Solutions Division



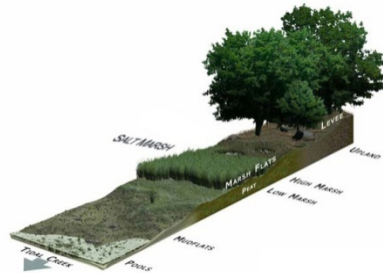
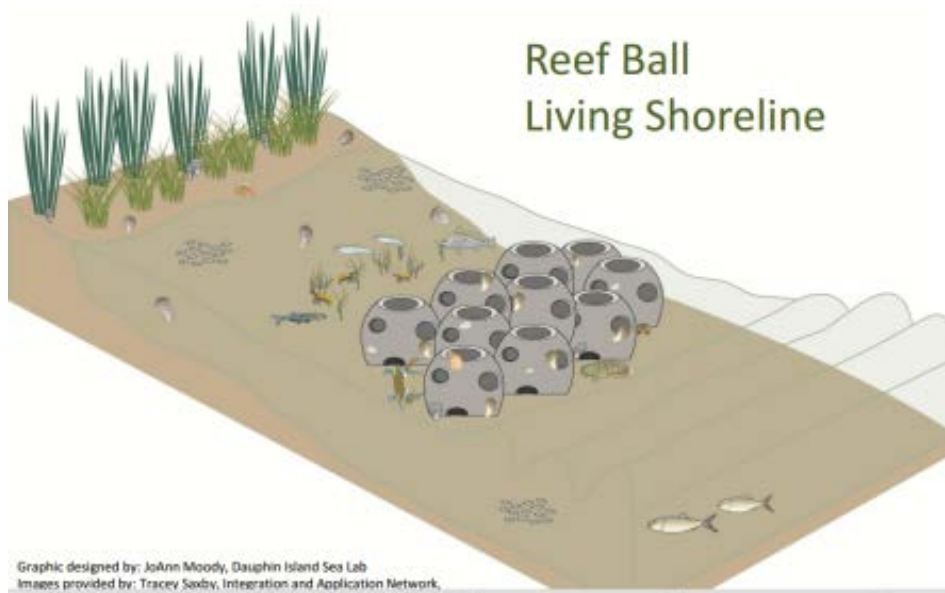
<http://www.mangrovesolutions.com/whyimportant.php>

<http://reefinnovations.com/products-specs/new-modules/160-2/>



Living Shorelines

Combining Reef Balls with natural vegetation.





Reef Ball Living Shoreline



Graphic designed by: JoAnn Moody, Dauphin Island Sea Lab
Images provided by: Tracey Saxby, Integration and Application Network,







Micro-habitats

Channel Marker



Under Dock
Habitat



Under Dock Habitat







Memorializing a loved one

→ another means for the public to invest in reef restoration





Results

- **Reef Balls have been successful**
 - over 22 years
 - over 60 different countries
 - adapting to various ecosystems
- Many groups
 - large and small,
 - public and private
 - with minimal funds or larger budgets

have participated in protecting or restoring their and many others marine ecosystems.





<http://www.reefbeach.com/>



A step-by-step guide for grassroots efforts to Reef Rehabilitation

<http://www.reefball.org/stepbystepguidetoreefrehabilitation/DraftGiude.pdf>