



## Red Mangrove Restoration Method

Restoring Mangroves in Challenging Environments

The wide ranging benefits of mangrove ecosystems, such as providing essential habitat, absorbing pollutants, and protecting shorelines from coastal erosion have been increasingly evident in recent years. These factors along with other compelling benefits have prompted widespread restoration efforts to re-establish mangrove stands that have been lost. Unfortunately the success of these restoration efforts have varied significantly, particularly in the most challenging (and often most desired) areas.

Low success rates are often attributed to the designated planting area's environmental conditions. Areas that are exposed to high wind, wave action, floating/sunken debris, and/or poor soil threaten the survival of mangroves during their early developmental stages. Any one of these threats can wipe out an entire restoration effort, wasting time and money - often leading to a false conclusion that restoration in the area is not viable.



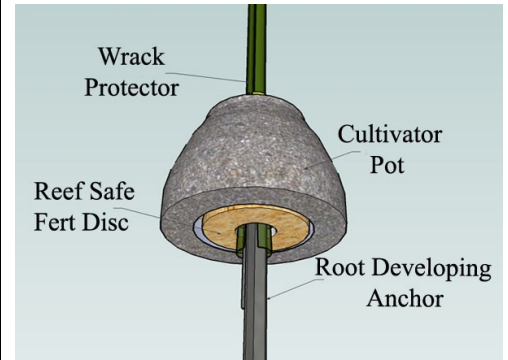
In challenging areas such as these, a restoration method that protects the juvenile mangrove from environmental hazards is needed to minimize failure rates. The Reef Ball Foundation's Mangrove Division has developed a solution specifically designed for these challenging environments, making restoration more efficient and effective.

### The Solution

After over a decade of examining the successes and failures of various restoration projects and techniques, Reef Ball's Mangrove Division has developed a system that addresses the threats that are most commonly associated with failed mangrove plantings. The system is also designed to minimize the timeframe in which the mangroves are in their juvenile stage – the tree's most vulnerable time. By providing a combination of slow release nutrients and a non-competitive environment, optimal growth is promoted.

This innovative restoration method is a four component system made up of a wrack protector, a cultivator pot, a "reef safe" slow release fertilizer disc, and a root-developing anchor. Each component works together to protect and promote optimal growth of the juvenile mangrove.

### Reef Ball Foundation's Restoration Method Components



#### Wrack Protector

The wrack protector shields the juvenile mangrove from floating debris and provides the stem with natural gibberellic acid pathway stimulation (elongating the stem).

#### Cultivator Pot

The cultivator pot protects against sunken debris and provides a non-competitive environment for root development.

#### "Reef Safe" Fert Disc

The "Reef Safe" Fertilizer Disc slowly releases a customized blend of nutrients to the mangrove's root mass while temporarily sealing the cultivator pot to prevent wash out of soil.

#### Root Developing Anchor

The root developing anchor stabilizes the entire unit and splits open the wrack protector to allow roots to escape and develop in the cultivator pot.

### Get Involved

We work with NGO's, government agencies, scientists, teachers, contractors, private landowners and volunteers to promote and accomplish mangrove restoration.

For more information about our restoration methods or to get involved in a project, please visit us at

[www.mangrovesolutions.com](http://www.mangrovesolutions.com)

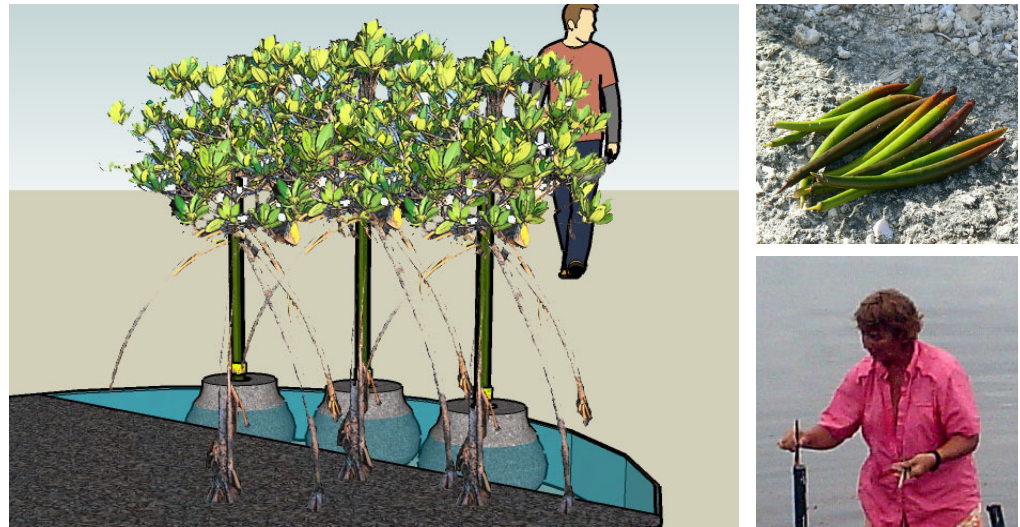


Or contact us directly...

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### How it works

This system is designed for planting propagules (mangrove fruit) directly into challenging environments where traditional planting methods are not suitable. After installing the system, the only required labor is to drop a single propagule down the wack protector component. Once encased in the system, the propagule develops on its own with no further attention necessary. The only maintenance required is to simply remove the wack protector component once it is no longer needed to protect the mangrove stalk.

Shortly after planting, the propagule begins developing by sending its roots downward into the cultivator pot. Once the roots reach the segment of the wack protector that is split open by the root-developing anchor, they escape and expand throughout the cultivator pot - which provides a non-competitive area for the root mass to develop. The slow release fertilizer disc provides essential nutrients to the plant's root mass, optimizing growth. As the disc slowly breaks apart over several months, the roots expand downward into the ground, stabilizing the tree while the biodegradable anchor begins to rust away.

**NOTE:** Allowing a root mass to develop is VERY important for the growth of mangroves. Methods that constrict root development in a narrow wack tube during the early developmental stages have been shown to stunt growth and even bonsai juvenile mangroves, leaving them more susceptible to mortality.

As this root development is taking place, the shaded propagule quickly grows up the wack protector as it searches for light. A few months after planting, the mangrove emerges from the protector and begins to thicken its stalk.

When the mangrove "thickens", and prop roots develop to stabilize the plant, the wack protector splits open and is no longer needed to protect the tree. It can now be easily removed from the environment.

After the wack protector is removed, the only component that remains is the cultivator pot which is designed to erode slowly as the mangrove matures, leaving nothing in the environment except a beautiful mangrove tree.

For more information on Reef Ball Mangrove Division's restoration techniques please visit us at [www.mangrovesolutions.com](http://www.mangrovesolutions.com)