

Aruba Ports Authority Reef Islands - REM Mangrove Reforestation

October 2014 – Site Survey

Figure 1 - Ecological Engineering to establish depositional nodes on the coral reef



Figure 2 - Mangrove tree growth emerges from REM Encasement Device



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Figure 3 - Mangrove seedling development within REM Encasements



Figure 4 - Surface view of REM Encasements



Figure 5 - Underwater view of REM Encasements



Figure 6 - REM Adaptation Process underwater view

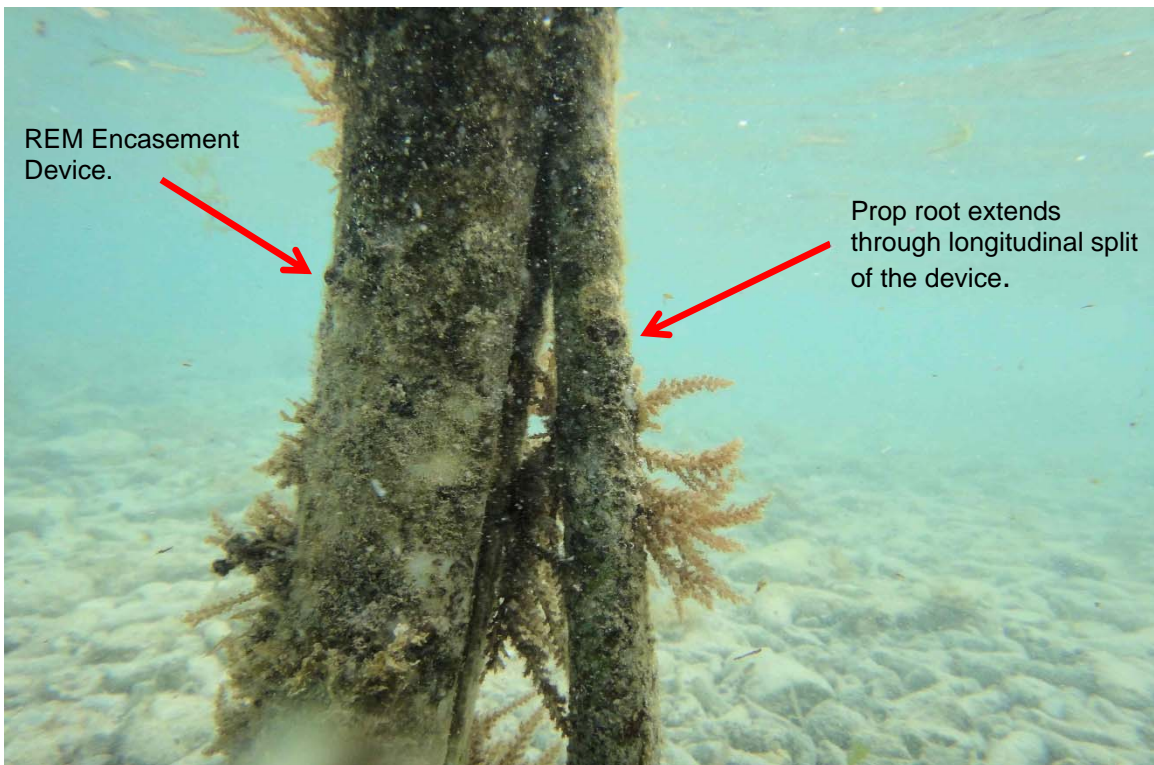


Figure 7 - Shoreline erosion south end of southernmost island



Figure 8 - Sand bar accretion north end of southernmost island



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Figure 9 - REM demonstrates resilience to high wave energy on the coral reef



Figure 10 - Encasements remain stable despite erosion and the dynamic environment



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Site Review - October 2014

This report constitutes the second annual site review and should be evaluated in context with the principles and processes of REM Methodology (<http://mangrove.org/>).

REM encasement devices installed at three sites distributed across the coral reef west of the Port remain stable. The installed outliers also remain stable with the objective of establishing dispositional nodes. Over time these nodes will form small islands or cayes as the reforested mangroves dissipate wave energy, accumulate sediments and build-up the surface of the reef. The accreted sediments will consist of biogenic material and calcified corals from the surrounding ecosystem (Figure 1). Through ecological engineering, the REM Reforestation will increase biodiversity benefiting both the island and marine ecology by creating habitat for native birds, fish and crustaceans (Figure 2).

Findings of this second site survey indicate substantial progress in mangrove seedling development with individual plant heights ranging between 23 and 42 inches (Figures 3). In addition, a few of the seedlings have begun the adaptation process by extending prop roots into sediments outside the body of the encasement through the longitudinal split in the device (Figures 4 thru 6). Completion of the adaptation process is critical in developing reproductively mature trees, which are self-supporting and independent of the encasement.

Topography of the southernmost reef island has continued to change over the past 12 months due to continued erosion. An area of shallow shelf has been created as sediments have eroded from the island's south side (Figure 7). Subsequently, eroded materials have been transported by wind and waves to the leeward side on the north end. The existing island shoreline slows drift as waves pass and wrap around the north side to cross and deposit sediments creating a sand bar in this sheltered area (Figure 8). Thus, the island has continued to slowly migrate north along the reef for the past two years.

Although erosion resulting from wind and wave activity has reduced sediments around the base of some encasements (Figure 9), the devices remain in place and the encased seedlings continue normal development (Figure 10).

Overall the site survey indicated continuing progress toward our reforestation objectives. Anticipate next site survey and maintenance in the August/October 2015 time frame.