

*DRAFT & CONFIDENTIAL Monday, September 11, 2006*

**Post Wilma & Other 2006 Storm Impacts on Cozumel's  
Coral Reef Ecosystem Disturbance Recommendations**

*For*

**Reef Ball Foundation Records  
September 11, 2006**

*Submitted to*

**Dive Paradise & Interested Parties**

**By The**



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## **Introduction**

On October 21<sup>st</sup>, 2005, Wilma struck Cozumel passing over the Island while moving slowly NNW. Extensive damage to nearly the entire island occurred. At this time Wilma had winds of 140mph & was moving very slowly at less than 5mph. Hurricane force winds pounded the island for over 24hrs. and caused extensive disturbances to island ecosystems. This recommendations report was compiled by the Reef Ball Foundation and is limited to hurricane impacts that directly impact coral reef and supporting estuary/wetland ecosystems on Cozumel. The results in this report were based on a survey conducted by Reef Ball Chairman, Todd Barber, at the end of August, 2006 in association with Dive Paradise.

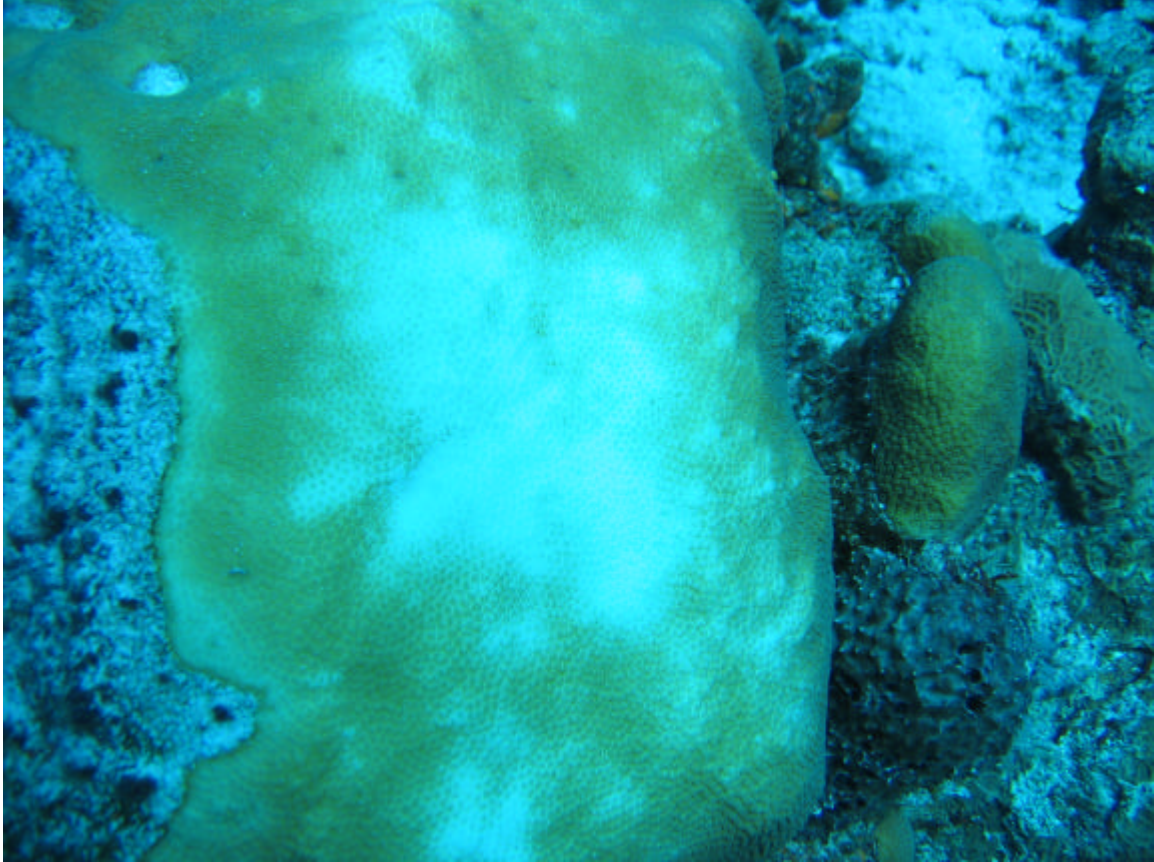
We surveyed a commonly dived reef that had depths ranging from 12 to over 120 feet...ranges commonly used by tourists for scuba diving and snorkeling.

In general, the deep and mid-water reefs were in pretty good shape with some damages from sand chutes and debris falling from shallower waters, however coral diversity and marine life seemed somewhat low compared to dives conducted in prior years. This was not quantified and is just a observation. Shallow reefs and near shore reefs, however, were massively impacted and nearly totally destroyed. In addition, near shore Red Mangrove "root estuary reefs" were deeply impacted and heavily impacted in most areas.

**In general, reef habitats in 18-26 feet or less were severely impacted. Bleaching levels were LOW which is consistent with the lower temperatures in the Caribbean this year. Below 26 feet, there was substantial structure damage (see photo below) but coral life is abundant enough to recover. Coral disease was also LOW, likely from lower coral densities.**



**Typical Post Storm Reef in 15-26 feet depth-SEVERE CORAL LOST TO SHALLOW WATER REEFS**

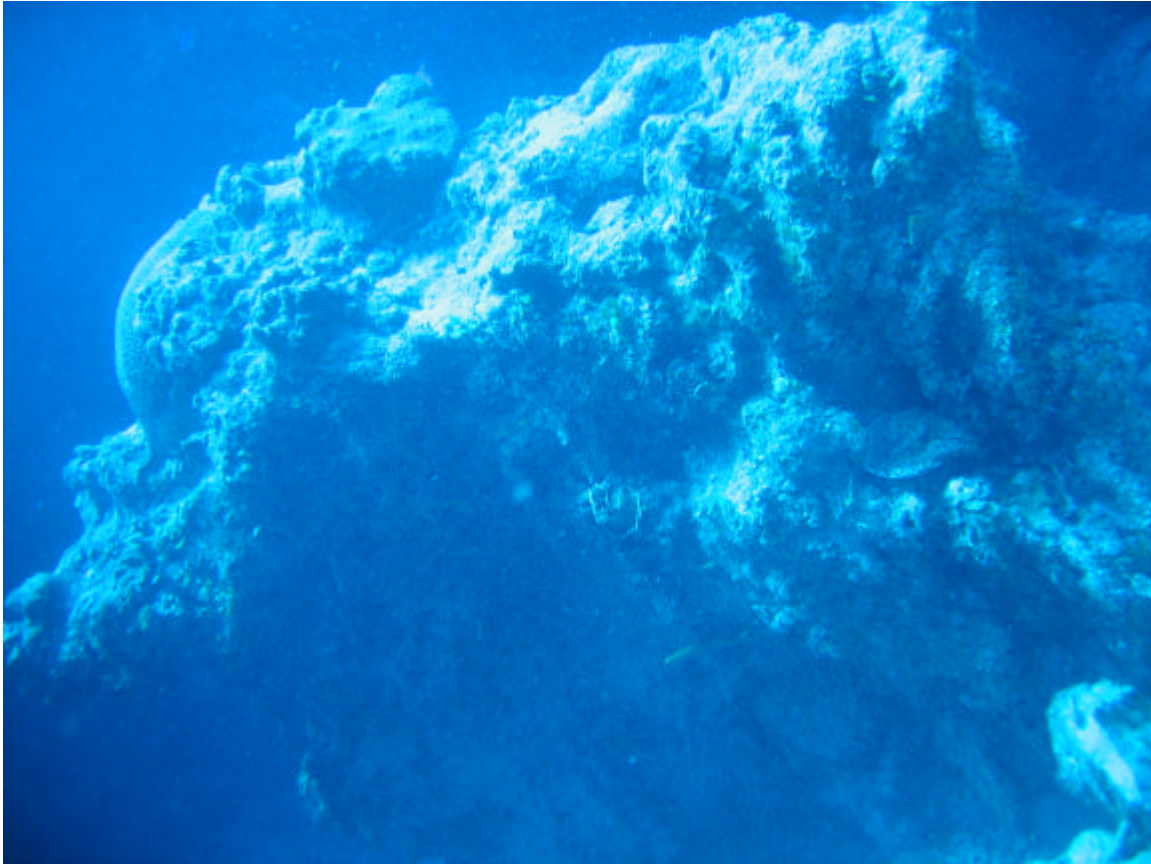


**Minor Bleaching at 27 foot depth.-LOW ABUNDANCE OF BLEACHING**



**Colony being overgrown by sponge/bacterial mat-CORAL DISEASES LOW**

**Snorkeling Reefs: Picture not available.**



**Large Coral Head in 55 feet of water that was overturned by the storm. MIDRANGE AND DEEP REEFS SUFFERED SIGNIFICANT STRUCTURAL DAMAGE BUT CORALS ARE ABUNDANT ENOUGH FOR RECOVER OVER TIME.**

**Snorkeling Reefs [picture not taken] consist of a few relatively bare rock outcrops and the associated fish communities. MASSIVE LOSS OF SNORKELING REEFS.**

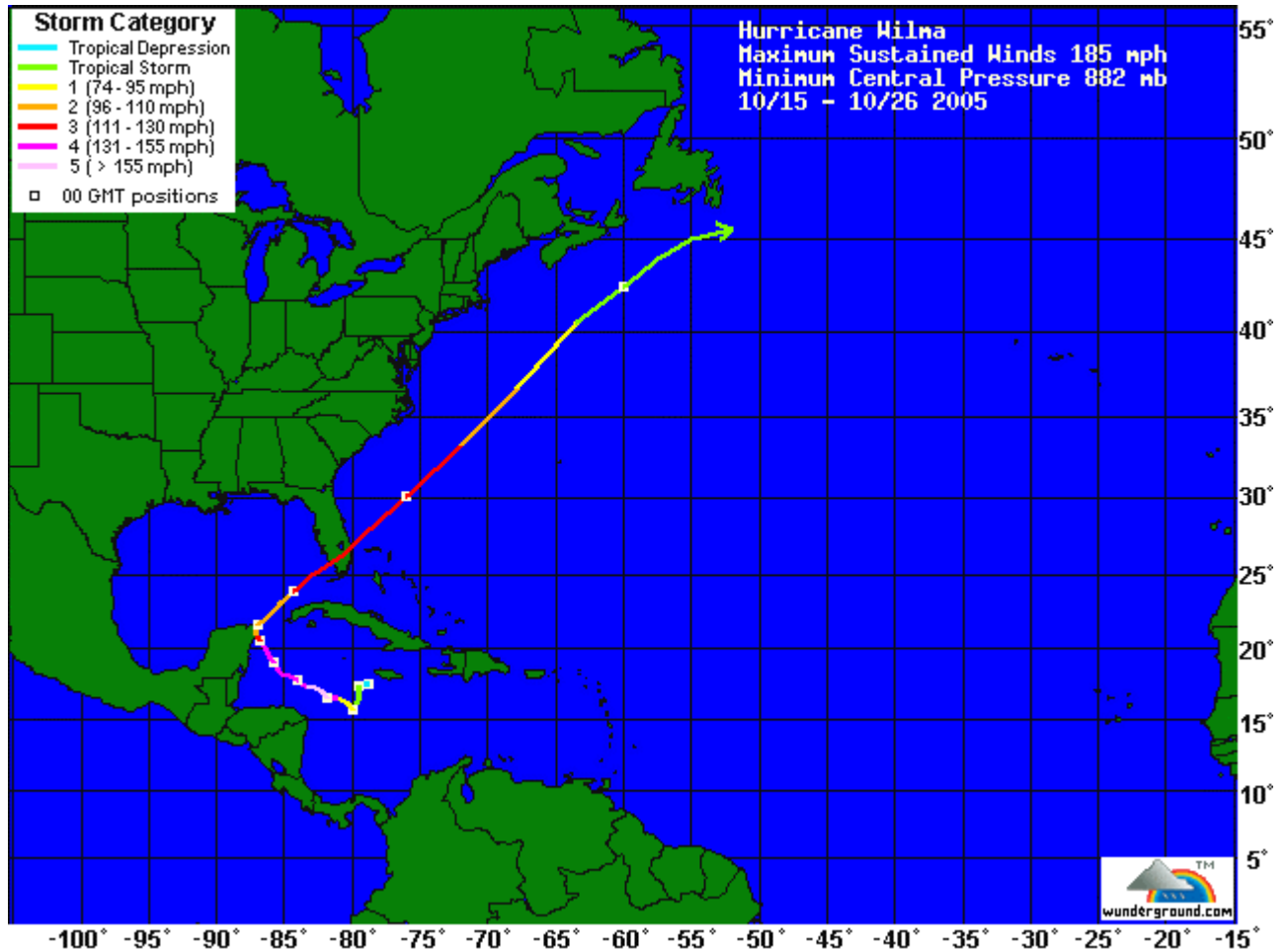
*Although Cozumel reef ecosystems are not totally isolated from the Belizean/Mexican barrier reef system, many of the fish and marine species in the area are highly dependent upon local habitat resources. Completion of some species life cycles requires time in the near shore reef and mangrove estuary habitats. Therefore, a biological bottleneck has been created by Wilma that will slow down some marine life reproduction over the next few years until the near shore ecosystems recover.*

### **KEY FINDING**

Therefore, it is the conclusion of the Reef Ball Foundation's Coral Team that *efforts should be made to restore as much near shore ecosystem habitat as possible...the*

sooner these efforts are made the less impact the biological bottleneck will have on future marine life population stocks.

## The Cause of the Bottleneck: Wilma



At its peak, Wilma winds were reported in excess of 185 mph, and wave heights greater than 70 feet. Storms of this magnitude are usually bad for coral reefs...but when they linger for as long as Wilma did....over 24 hours...the results are devastating.

Additionally, there is an even more compelling consideration for restoring near shore habitats....man's impacts. There is a great deal of trash and debris in the water from the hurricane that contributes to reef decline and copious rebuilding efforts that impact near shore habitats. Without all these additional stressors on the near shore habitats, it could be argued that Wilma was just a natural event and that Mother Nature could cure herself. However, these added stresses may have pushed the system further out of balance than can be recovered from easily. Having witnessed this over the last 30 years, we can

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confidently say that any efforts for near shore ecosystem restoration will be helpful in offsetting this trend and in helping nature to recover.

**What about Economics?**

Cozumel is returning to business. The infrastructure on the island is taking shape and hotels are re-opening for business, but more island-staying tourists are needed to continue the recovery economically. Total tourism to the island is actually rising by head count, but that is from cruise ship landings...not people staying at resorts. People that stay on the island contribute far more to the economy than a cruise ship passenger. So what will attract more island-staying tourists? Healthy reefs.... just like they have always brought people to the Cozumel. And what else is missing? A satisfying snorkeling experience. When visitors have a great snorkeling experience, they are more likely to take up diving as a sport...an activity that will tend to make them return to Cozumel and an activity that benefits Cozumel economically.

To most tourists, the coral reefs immediately come to mind when they think of the Cozumel. Most island-staying tourists come to scuba dive or go snorkeling. Cozumel coral reefs are certainly the greatest natural asset to the island and differentiae the destination from Cancun, or the Maya Riviera.

Not to be dismissed are fish populations. There are some commercial, sustenance and recreational fishing activities on the Cozumel Reefs. Although the reefs are far more economically valuable in terms of diving tourism, fish stock restoration aids these activities as well as aiding in the diving experience.

Divers come to see fish and coral formations. Coral formations are still available to them on the mid to deep-water reefs. But fish populations may fall due to the biological bottleneck of lost near shore habitat. Snorklers also come to see fish and corals, except they are limited to shallow water. Unfortunately, the snorkeling depth coral formations were severely damaged and there is little good snorkeling left on the island. This needs to be addressed.

Erosion may also become more commonplace in Cozumel. This is because when the near shore protective barrier reefs are destroyed, waves penetrate with more energy to the shore. Restoration of these barrier reefs can help reverse this trend. Since erosion control can be accomplished by building near shore reef habitats, this option should be carefully considered for projects during the next few years while near shore habitats are limited.

**ANY EFFORT TO RESTORE NEAR SHORE REEF HABITATS SHOULD BE WELCOMED AT THIS TIME....HERE ARE A FEW REEF BALL FOUNDATION SUGGESTIONS.**



***Recommendations***



**Build new near shore snorkeling reefs** planted with propagated corals for heavily snorkeled areas to provide tourists with good snorkeling experiences and to help reduce the near shore reef biological bottleneck.

-To be really exciting for visitors, it needs to be designed as a snorkeling trail with many different styles and sizes of Reef Balls. Plaques could also augment the trail with information about the reef.



**Plant Corals on the exposed barren rocks in areas where reefs were present before the storm** for snorkeling and biological bottleneck alleviation.

-This goal can be accomplished with VERY little resources with simple training from the Reef Ball Foundation's Coral Team. The process involves drilling small holes into the exposed rocks and using our coral propagation table technology to create coral plugs for rapid planting. Total material cost is less than 25 cents per coral. The investment for the coral propagation table, tools and planting supplies is less than \$3,000. Plantings can be done in a very short period of time with a Reef Ball Coral Team activation (usually about 10 days to do 500 corals) or they can be accomplished by trained local volunteers or divemasters on their days off.

***How is it Actually Accomplished? (this is an abbreviated section, please refer to our manual "Reef Restoration" which is being published next month for a highly detailed explanation).***

-Creation of new coral colonies via [Propagation](#), and attaching coral colonies to Reef Balls or prepared (by drilling a small hole) natural rock already in shallow water habitat. The team uses an efficient and inexpensive [attachment adapter system](#) to create "plugs" for a diverse selection of hard and soft coral species.



[Click to see underwater propagation photos](#)



Plugs for attachment adapter system method for fragments



*Direct Putty Method with sea fan.*  
[Movie showing the Underwater pH neutralized hydraulic cement method](#) (not a preferred method but necessary in some cases)



[Click to see rescue photos](#)



Click photo above to see a reef being planted



**Build a Red Mangrove Nursery** to supply ready to use Red Mangrove plants for governmental and private projects.

- Every Caribbean island needs a good red mangrove nursery.... supplying red mangroves from abroad is just too expensive for most projects and the shipping is very hard on red mangroves making planting even more difficult.

-There are still abundant supplies of red mangrove propagules (seeds) that could be collected and used in the nursery.

-A funding source must be identified to cover the start up costs of this nursery. Longer term, the nursery may provide a revenue stream to reduce or eliminate operating costs by selling the plants.



*Red Mangrove Nursery Built by the Reef Ball Foundation in Antigua for 5000 plants. The Reef Balls in the photos are of the size usually used as "pots" and anchors for the seedlings.*



**Identify and find funding for state sponsored projects. Concentrate on any projects that will provide tangible benefits such as erosion control that also provide near shore habitats.**

Example: Government Project (breakwater aiding in erosion control)

In Cancun, the Government aims to create submerged groin structures to help hold the artificial beach in place. This project will have approximately 2 kilometers long of Reef Balls in about 2 meters of water 3-5 rows wide. As you can imagine, it will also create huge amounts of nearshore reef habitat. Perhaps there are areas in Cozumel that could benefit from the same technology.

## **Conclusion**

The Cozumel has lost a great deal of near shore ecosystem habitats that will create a biological bottleneck limiting the numbers of many marine species. There are a variety of useful projects that can help rebuild near shore ecosystems ranging from providing tourists with better snorkeling opportunities, to erosion control and red mangrove replanting. These projects should be given a high priority by the government and attempts should be made to fund as many of them as possible over the next few years while the near shore ecosystems are recovering.