

Coral Reef Ecosystem Restoration Work Group:

M/V Wellwood Grounding Site Restoration Case Study

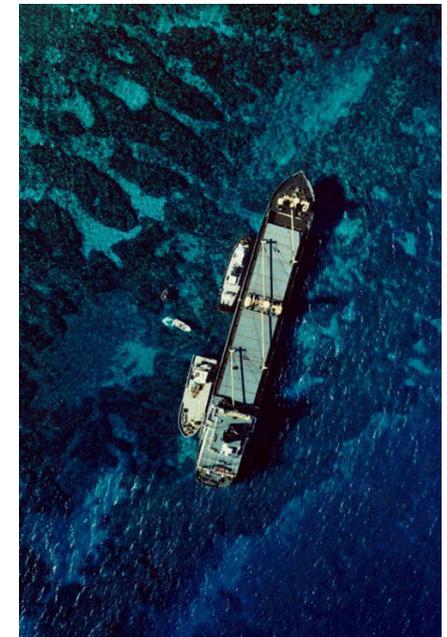
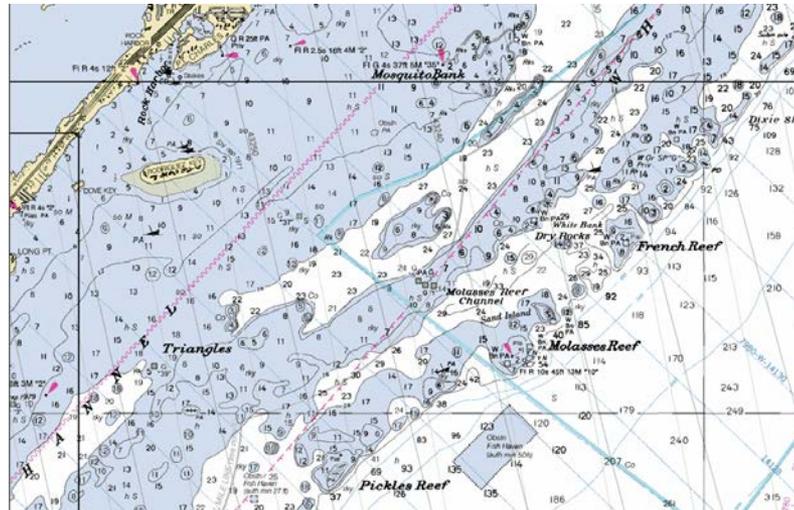


Bill Goodwin
Sanctuary Resources Manager
FKNMS Coral Reef Ecosystem Restoration Work Group
Staff Support Lead

M/V *Wellwood* Restoration Site – Impacts to Molasses Reef



- August 4, 1984 – the *Wellwood*, a 122-meter (400-foot) freighter, ran aground on the upper forereef of Molasses Reef
- Water depth – approximately 6 meters
- Impacted over 75,000 m² of coral reef habitat
- Destroyed 5,805 m² of living corals



M/V *Wellwood* Restoration Site – Impacts to Molasses Reef



Injuries included:

- Breakage/dislodging of coral colonies
- Reef framework fracturing
- Bottom paint smears “burned” into reef substrate



M/V *Wellwood* Restoration Site – Impacts to Molasses Reef



Injuries included:

- “Parking Lots” – areas of complete flattening and scarification of coral reef spur formations



M/V *Wellwood* Restoration Site – Early Restoration Efforts



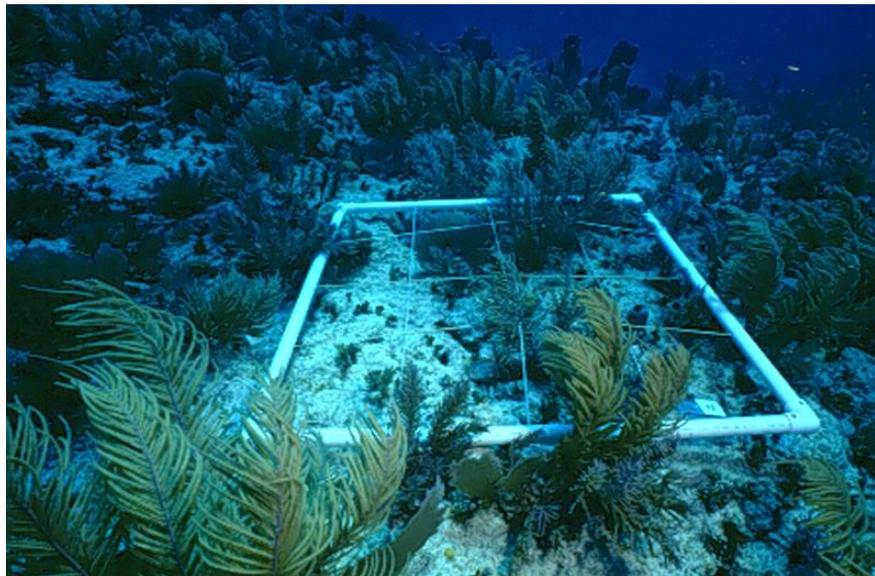
A year after the grounding incident, coral colonies were transplanted onto the flattened coral pavements in an effort to “jumpstart” the recolonization of the area



M/V *Wellwood* Restoration Site – Slow Natural Recovery



- a decade after the grounding incident, the grounding site had become a “prairie” of octocorals, juvenile hard corals, sponges and macro algae
- structurally and ecologically, much more like a livebottom or hardground than a coral reef



M/V *Wellwood* Restoration Site – Slow Natural Recovery

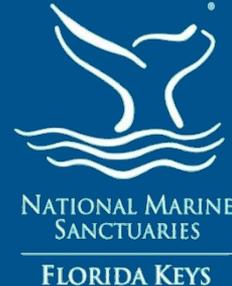


Wellwood site survey - June/July 1994

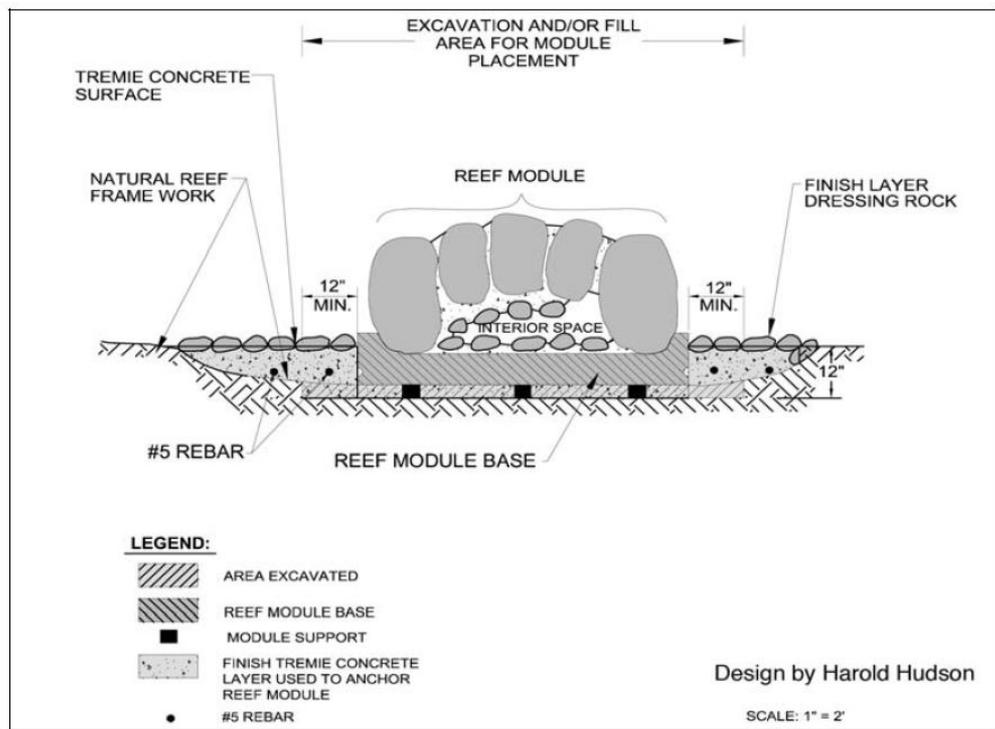
- over 500 natural hard coral recruits, all < 10 cm
- 90% survival of original transplants
- however, Hurricanes Mitch, Georges and Irene ('98/'99) essentially set clock back to zero.



M/V Wellwood Restoration Site – Major Structural Restoration



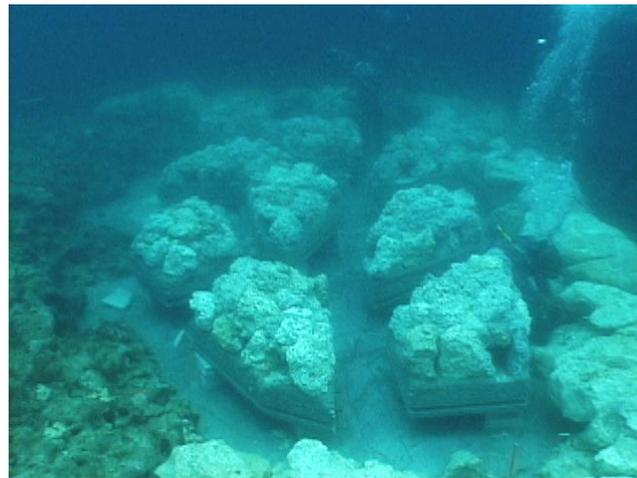
Design and construction of 25 coral reef replacement modules during Summer of 2001



M/V *Wellwood* Restoration Site – Major Structural Restoration



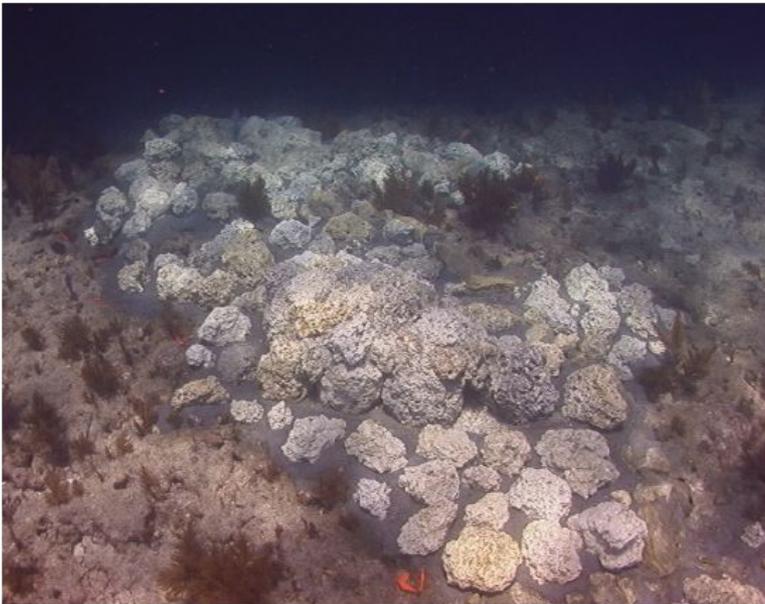
- Summer 2002 – 22 modules as well as numerous limestone boulders and dressing stones installed at *Wellwood* site as per restoration plan
- placed in areas of significant storm excavation/substrate disturbance



M/V *Wellwood* Restoration Site – Major Structural Restoration



Completed restoration with reef restoration modules (left) and “puddle pour” with boulders (right) each surrounded by limestone dressing stones



M/V *Wellwood* Restoration Site – Experimental Manipulation/Active Restoration



Active restoration activities:

- NOAA/NMFS Southeast Fisheries Science Center coral reef restoration program – “seeding” specifically designated reef replacement modules w/ laboratory-reared coral planulae (larvae)
- Coral Restoration Foundation/TNC – outplanting of nursery-propagated Acroporid coral colonies onto specially designated modules as well as some unrestored areas

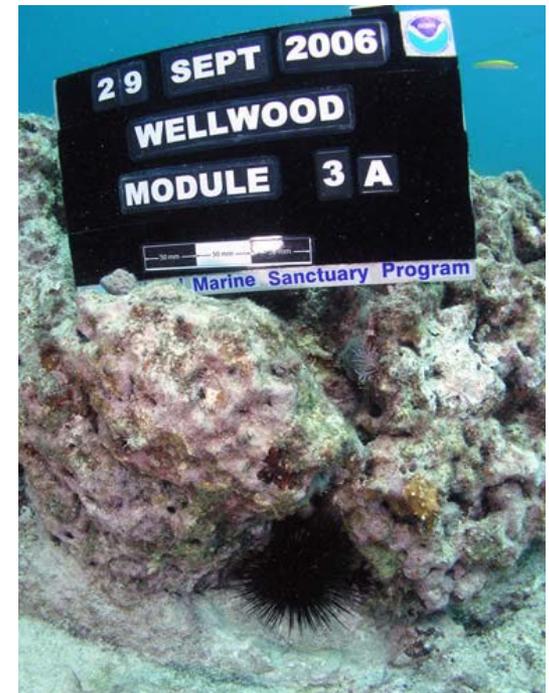


M/V *Wellwood* Restoration Site – Monitoring Program



Restoration monitoring

- visual inspection/survey
- high resolution photo-quadrats
- monitoring included restored, unrestored and adjacent non-impacted reference areas

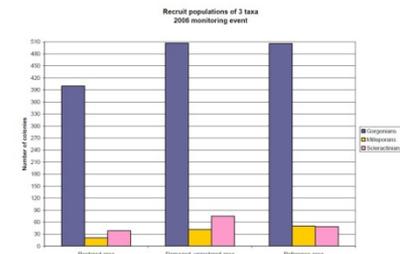
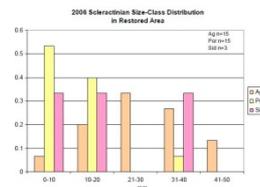
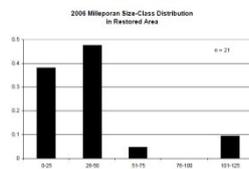
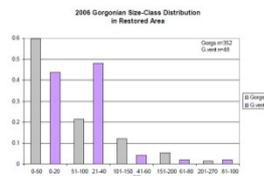


M/V *Wellwood* Restoration Site – Monitoring Program



Conclusions:

- macro algae, coralline algae, soft, and hard corals were all recruiting to the restoration modules and surrounding concrete puddle pour areas
- by 2006, the restored area was converging on the recruitment state of the unrestored and reference areas
- settlers seem to prefer limestone rock, rather than concrete, as substrate
- restored areas had a greater proportion of all taxa populations in the smallest size category



M/V *Wellwood* Restoration Site – Monitoring Program



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M/V *Wellwood* Restoration Site: Fish Population Monitoring



Reef Environmental Education Foundation (REEF) fish assemblage monitoring at the *M/V Wellwood* grounding restoration site

- conducted over 5 year period (May 2002 – August 2007) w/ quarterly events first year and semi-annual monitoring events thereafter
- REEF volunteer divers utilized Roving Diver Technique (RDT) (Schmitt and Sullivan 1996) to perform surveys
- monitored restoration site and two reference areas

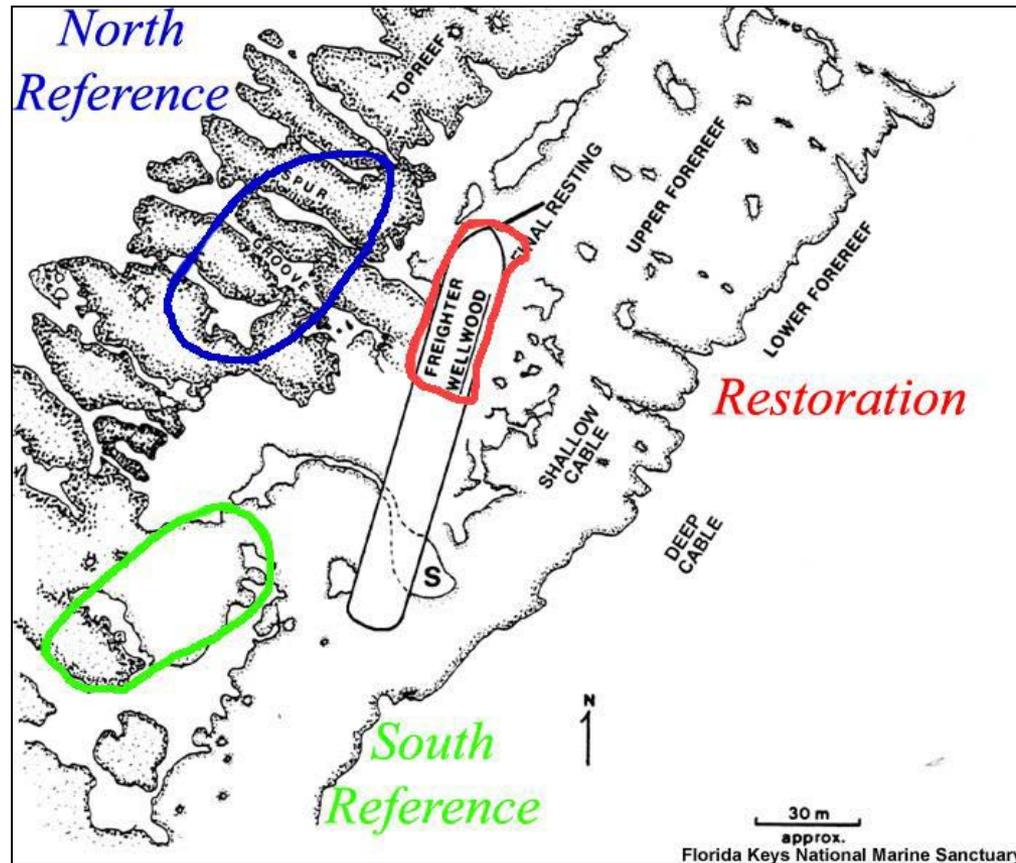


October, 2002



August, 2007

M/V Wellwood Restoration Site: Fish Population Monitoring



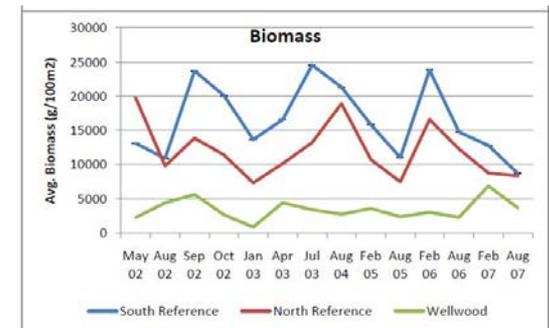
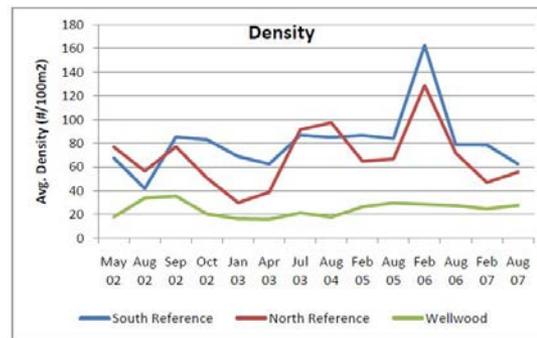
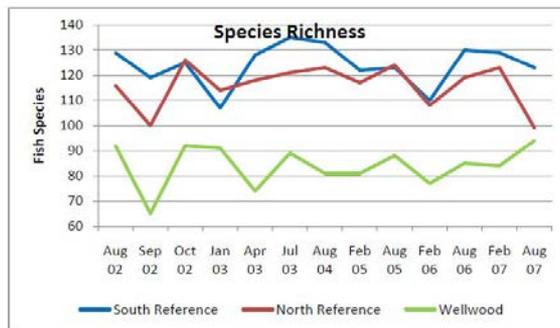
Location map showing areas of fish monitoring effort by REEF

M/V Wellwood Restoration Site: Fish Population Monitoring



Conclusions:

- overall fish diversity as well as density and biomass of most key fish families on restored site continue remained less than that of the two nearby, non-impacted reefs
- parrotfish and surgeonfish population responded the most quickly to restoration efforts
- as CRF-produced Acroporid coral transplants grow on the higher relief modules, apparently so do the numbers of fish species congregating on these modules



M/V *Wellwood* Restoration Site: Fish Population Monitoring

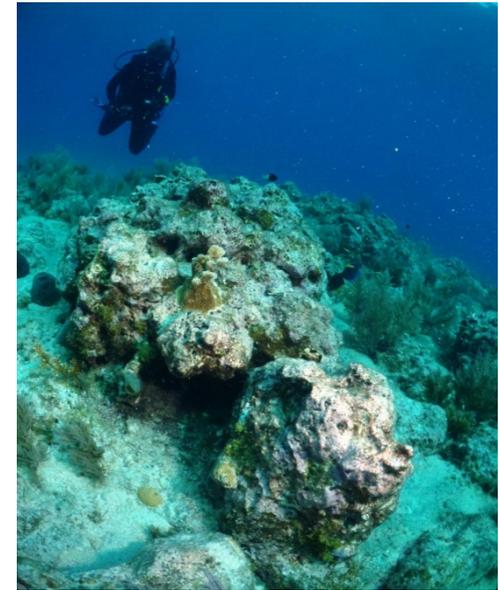


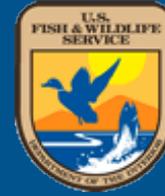
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M/V Wellwood Restoration Site – Recent Images (2/27/13)





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