Mechanisms for Hurricane Sedimentation of Hardbottom Resources

National Conference on Beach Preservation Technology

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February 3, 2016



Hurricane Sedimentation Events

- Donna (1960)
- Andrew (1992)
- [Shinn et al., 1993]

 2004 Hurricanes (Charley, Francis, Jeanne and Ivan)



Burial by sand

Burial by mud









132004 Hurricanes

6.

20 25

see inset

Recorded accumulations of mud after 2004 hurricane season

0 0

Large areas of hardbottom and sandy bottom were covered with mud after 2004



Mud accumulated at the base of ledge, Collier County



Sticky in consistency, and Adhesive



Anoxic within a few mm below the surface



Direct burial – higher relief hardbottom or protruding organisms survive



Biological Impacts

- Direct Smothering of Benthic Habitat
- Lethal to Filter-Feeding Species
- Reduction in Photosynthetic Activity
- Mortality of Corals and Reduction in Coral Recruitment
- Multi-Year Impacts

[Miller and Kosmynin, 2008]



Source Theory 1: Upland Source

Discharge from Upland Sources

Problem -

Deposits not Correlated to Inlets
Sediment Source



Source Theory 2: Deepwater Source

 Onshore Movement of Deepwater Sediments

Problem -

Mechanism for Sediment Movement
Distance from Source



Not a Source: Beach Nourishment

- No Correlation with Nourishment Projects
- Documentation of Borrow Area Material (Sand)



New Theory: Subsurface Deposits

Mobilization of Sub-Surface Deposits

Mechanism -

- Existing layers of Sub-Surface Clays in Vicinity of Sedimentation Events
- Major storm mobilizes normally stable sub surface layers
- Suspended Clays Re-Deposit Post-Storm



Supporting Geotechnical Data

Geologic Models of Continental Margins (Sea Level Variations)
Jet Probe 'Blow-Out' Phenomena
Direct Observation (Sand Searches)
Correlation with Sub-Surface Hardbottom



Unknowns

- Distribution of Sub-Surface Deposits
- Quantities of Sediments in Potentially Active Zone (Depths)
- Micro-Scale Understanding of Mobilization/Deposition Process



Conclusions

- Major Hurricane Sedimentation of Hardbottom Resources will Occur Again
- Despite Being a Naturally Occurring Phenomena, Someone will Attribute Impacts to Beach Nourishment
- Represents Yet Another Hardbottom
 Impact Mechanism
- Suggests Another Limitation to Viable Sand Resources in the Vicinity of Hardbottom

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