

**Review of Clam Bay System Data Collection and Analysis by PBS&J, October, 2009, and Response to Comments RE: Clam Bay System Data Collection & Analysis Report (October 2009) by PBS&J on November 17, 2009.**

Harold R. Wanless, Ph.D., Registered Florida Professional Geologist #985.  
Coral Gables, Florida 33134

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Having reviewed the report and response, I find the efforts misleading and many of the conclusions unwarranted.

**Sand versus mud; high versus low oxygen**

Although the 'response' says it is not so, the executive summary paints a picture of Clam Bay being bad and Moorings Bay as being better.

Sand and gravel may have better pore water oxygen levels and have less oxygen demand on the overlying water, but they provide little to eat for deposit feeders. Sand and gravel, having much less surface area, will always have less pollutants, less contaminants, less organic matter, and less food value than mud. Grainier, cleaner and more oxygenated does not make it better. This was well established back in the Marco/Rookery Bay years and should be restudied now. Dr. Bernard Yokel pointed out that the black mangroves were a fermenting ground for organic decay and high spring and seasonal tides would reach into the black mangrove forests and release this rich nutrient soup to the coastal waters. These releases would trigger blooms and a dispersing food pyramid bonanza that a hierarchy from fish to mammals would time their reproduction around. What is to us this black, rotting disgusting muck is, to many other organisms, the essence of life. These benefitting organisms may not be living right there, but in adjacent waters waiting for the dispersal.

In evaluating the water and bottom nutrients, texture, redox and such, there is no assessment of the role of nutrient drainage input from the adjacent developed upland. It is also important to know the amount of historical erosion (or growth) of mangrove swamps and release (or uptake) of organic detritus and sediment as the result of the accelerated rise in sea level since 1930 or in response to recent hurricanes or recent human activity (such as dredging).

The report implies it is bad when muddy sediment has come in to an area that was artificially dredged to deeper depth. This is a severely poor conclusion.

There is lots of fine grained particulate material in the natural system and it will fill in any area where there is insufficient energy to move it on. This results in shallowing and usually an improvement in desirable ecological functionality.

The whole section on redox and anoxia in the sediment seems most meaningless. The muddy sediment beneath the clear, well-oxygenated waters of Biscayne Bay and Florida Bay is normally anoxic within a centimeter of the surface. This will always be the case for muds which contain organic matter which produce significant oxygen demand.

And most striking are the mud deltas forming in Lake Ingraham, in Cape Sable. They are building at as much as 15 centimeters a year, contain as much as 35 per cent organic matter, have only a few millimeters of oxidized sediment at the top – and are intensely burrowed by an abundant benthic community, covered by a dense algal mat, and used by a great diversity of wading and water birds for feeding and resting (Wanless and Vlaswinkel, 2005).

### **Mangroves and Seagrasses**

The fundamental value of the Clam Bay systems is the abundant mangrove wetland community and the seagrass and algal mat estuarine community and the immense service that these provide to the benthic and bird communities within the system and in the adjacent nearshore marine.

A pre-development report by Lugo (1976) stressed the need to preserve majority of Clam Pass system in its natural state, highlighting the mature and valuable black mangrove basin forest of this system. Even in a setting with ephemeral connection with the sea through Clam Pass, the mangrove forest had found a way to thrive using groundwater flow through the barrier island to maintain flushing and drainage of elevated flood waters. There is no comparison between a bulkheaded sea wall and a mangrove wetland with respect to environmental value, yet this report seems to ignore the uselessness of seawalls, and fails to mention that there have been ongoing attempts to rim or replace them with rip rap as an improvement.

I should point out that the mangrove systems on the Vanderbilt Bay area was doing fine until the flow through the sandy island barrier was cut off. The mangrove die off then produced accelerating decay products that overwhelmed the system forcing a need for stronger flushing via surface flow.

In my occasional visits to the Clam Bay system, I recall much more sea grass than described in this report. In fact there is a 2007 PBSJ report of "Clam Bay Seagrass Assessment" which found 43 per cent occurrence of seagrass in random sample sites in Outer Clam Bay (probably the same report that is referenced as PBS&J, 2008, in the 'report'. Since that report, there was further documentation of more species and coverage of seagrass in the Clam Pass estuarine system along transects done in 2007 for the annual biologic monitoring done by Turrell, Hall & Assoc. The apparent resurgence of seagrasses continued to be reported in the 2008 Biologic Monitoring Report of the Clam Pass System by Turrell, Hall & Assoc. Why are these recent results not mentioned in this report, and why is the amount of seagrass observed in this report so diminished? The report notes that the sea grass cover is even diminished over observations in a '2008' PBS&J report (Is this the same as the 2007 draft report of observations made in 2007?) . It is irresponsible science to ignore important literature results such as these. The current report paints a very different picture of the Clam Bay system than is documented in previous reports. That difference is cursorily dismissed as something to do with the ephemeral nature or reproductive problems of the main species (*Halophila*). Other reports document a fairly widespread occurrence of *Halidule* and a persistence of *Thalassia* in some areas. It is wrong to so casually dismiss these other more rigorous reports.

If these changes are real, then it is critical to assess the timing of loss so as to determine the causes (I am aware that there have been recent dredging events). If these changes are not real but the result of too 'general' field observations, then the quality of this research project should be called into question.

## **Ecology**

This report presents data on aspects of the environment (the physical and chemical characteristics of the coastal bay system). It provides no information of substance on the organisms in these environments and no information of substance on the ecology (the relation of the organisms to the environment). Yet the report is constantly evaluating what is good and bad for the organism communities. All of this undocumented speculation should be deleted. It would be better to do a responsible literature evaluation of the ecological relationships that have been established and published from the abundance of research that has been done over the years in The Rookery Bay - Marco area.

The vibrance of the Clam Bay system is the rich mangrove–seagrass–algal base which feeds a variety of small organisms which nurture a great abundance and diversity of juvenile to adult fish. These relations were not recognized or addressed in this report. The authors of this report have no business making value comments on the ecology of the system as they have not documented the biological components or the important relationships.

### **Circulation and Models**

A report in Collier County's files by this author in the early 1990s documents that the mangrove die off in northern Clam/Vanderbilt Bay was caused by the road into the houses which cutoff an active drainage, flushing, and water exchange through the pore waters in sand of the narrow beach. This was well established with monitoring wells in which tidal fluctuation would move through the island with a time lag but nearly undampened in amplitude (except where blocked by the road structure which extended down through the sand and into the underlying less permeable mangrove soil). It is impossible to recreate a healthy environment when the causes for historical problems are not properly identified

Additionally, as a major portion of the drainage, flushing, exchange and water exchange of the coastal bays along this stretch of coast is through the narrow barrier islands, any present or future modeling will be useless unless this important component of coastal circulation is accurately empirically documented so it can be properly incorporated into the models. This concern also applies to the sandy landward margin to the bays and to the underlying limestone (where its groundwater interfaces with surface flow of the bays).

### **Adequate Associated Information of Sampling Period**

Only in the 'response' was some information provided as to the nature of the condition during the 2 day and 8 day sampling period in August, 2009. What was the weather and hydrographic conditions (rainfall, winds, tides, air and water temperatures, etc) for the several weeks prior to the sampling as well as during sampling? This is critical for evaluating water levels, flow, circulation, nutrient levels, and such. The 'response' that certain things are not important or were essentially normal is not for those writing the report to decide. Provide all the information so those using the report can fully evaluate the study.

August can be a time of high temperatures, intense local rainfall, unique winds, and higher than normal seasonal tides that do not represent conditions at other times of the year. It is important for the reports sampling to be put in proper perspective. For example, as mentioned earlier, the higher high tides of the year reach into the black mangrove wetland soil and withdraw intensely rich organic suspensions which circulate through the coastal bays and into the nearshore marine waters. How do the tide elevations and ranges of the sampling period compare with the rest of the year? A NOAA report documents exceptional tides along a portion of the Atlantic coast during the summer of 2009 (as much as 60 centimeters above projected levels because of slowing of Gulf Stream flow) and southeast Florida had tide levels running over 30 centimeters above projected levels into October. Was any of this elevated tide occurring along the Collier County coast prior to or during the sampling interval? These kinds of information are critical to put this study's data collection interval into a meaningful perspective.

### **Description of Field Observations**

The bottom of page 7 of the report says: "At each site, observations were made of the general biological community structure and health." Exactly what does this mean? Was some type of quadrants or profile lines used? How extensive an area was surveyed? How did the methods in this report compare with that in the reports mentioned in the mangrove and seagrasses section above? How was 'health' measured? How was 'community structure' measured? My copy of the report did not have anything but an algae map and sea grass map in terms of data? Where is the data? I am concerned that there is not much that is real biological information here, just fancy words.

### **Water Quality Locations and Implications**

The report suggests that Moorings Bay is better than the natural Clam Bay system (Page V of Executive Summary). The logic of the report is ridiculous. The writing implies that this problem is because of a variety of things in the natural system including the decline in tidal amplitude and increased tidal lag because of 'channel meandering, constrictions and friction losses in the system.' Ridiculous logic. Then the Executive Summary states that 'Moorings Bay, although subjected to extensive urban stormwater runoff, appears to have water ecology conditions better than those found in Clam bay; this is supported by the results of the Redox layer investigation.' What are those better water

ecologic conditions? Explain how Moorings Bay is better in providing a functional habitat, environment, and nutrient release of this mangrove fringed estuary system?

It looks as though the sampling sites in Moorings Bay are primarily channel sites with strong flow. Why are there no sample sites in the more stagnant backwater corners of the Moorings Bay maze? What is the water depth of Moorings Bay?

## Summary

I find that this report is at best a weak data set that is surrounded by too much environmental and ecological speculation that is not tied to the pertinent and thorough literature of southwest Florida estuarine dynamics and, ecology. At worst, it has the tone that it was written for developers to give the green light to have more sand and concrete. Since the early 1970s, southwest Florida has seen too many reports like this that attempt to diminish the value of the natural environment and put dramatically modified dredge and fill environments on an equal footing.

Is it possible that this report is trying to set the stage for expanded future dredging activities to 'improve' the natural areas? It reads that way. I would recommend that the County take a reverse approach. Moorings Bay is an artificially deepened system to provide fill for bordering lots. The bottom is too deep over most of the dredged area for sea grasses to live. The quality of that Bay could be dramatically improved if those deeper areas not necessary for navigation were shallowed either with blanket fill or with localized artificial reefs. Shallowing the bays would provide conditions for increased sea grass cover (more light to the bottom and higher oxygen levels); the artificial reefs would provide habitat for oysters, sponges and such which further filter the water and improve water clarity and light penetration. Complement that with rip rap in front of seawalls, including some intertidal areas for re-establishment of mangroves and you will have greatly enhanced the desired ecological functionality of Moorings Bay. In the early 1980s, I did a study on the causes for elevated turbidity in northern Biscayne Bay in Miami-Dade County. This bay had been similarly modified by dredging and bulkheading. The recommendations were as described above (Wanless et al., 1984). Since that

time the County has been persistently following a program of installing rip rap and mangrove intertidal areas in front of sea walls and fill shorelines, shallowing up deep dredge areas so seagrass can recolonize and, installing numerous artificial reefs from clean construction debris. The Bay has persistently improved in water clarity and ecological functionality, and the artificial reefs have proved great fishing sites.

Many of these recommendations were put forth in a 1981 Diagnostic/Feasibility Study for Moorings Bay which I believe was included as an appendix of the 1991 Coastal Zone Management Plan. Why is this not acknowledged and discussed here?

In fact, there is a serious disregard for earlier research and recommendations on this Vanderbilt/Clam Bay/ Moorings Bay system and on similar systems of southwest Florida. The failure of this report to do a thorough literature review would save the County from redundant studies or erroneous conclusions due to missed historic data and missed scientific documentation and evaluation of ecosystem dynamics. This absence further suggests that this report is not a scientific report but more of a political-economic positioning paper.

#### **References** (not cited in 'Report')

Florida Department of Environmental Regulation, 1981. Diagnostic/feasibility study for Moorings Bay, Collier County, Florida, 12 p.

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Wanless, H.R., and Vlaswinkel, B.M., 2005. Coastal Landscape and Channel Evolution Affecting Critical Habitats at Cape Sable, Everglades National Park, Florida. Final Report of Research Project to Everglades National Park, 197 p. (available online: <http://www.nps.gov/ever/naturescience/cesires02-1.htm> )