2015

# Muck Thickness and Distribution in the Indian River Lagoon 2014

Christopher Hoey

# Muck Thickness and Distribution in the Indian River Lagoon 2014

**Christopher Hoey**

**Department of Marine and Environmental Systems, Florida Tech, Melbourne, Florida USA**

## Abstract

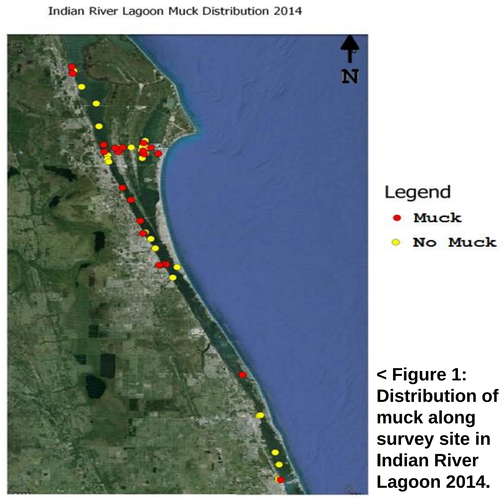
Occurrence and thickness of anoxic organic sediments (“muck”) in the Indian River Lagoon (IRL), a 90 mile survey from Ft. Pierce to Titusville which also incorporated adjoining tributaries. Muck accumulation causes the depletion of sea grass directly through anoxia and smothering, and indirectly by fueling harmful algal blooms. Smothering and blooms shade grasses and prevent them from receiving sufficient light for photosynthesis. 49 percent of the stations surveyed exhibited muck. Comparing muck thickness in navigation channels from 2008 to 2014 showed an average increase of 0.5 feet.

## Introduction

The Indian River Lagoon (IRL) is a well-mixed estuary, home to diverse populations of fish, plants, and mammals. The IRL exhibits a muddy to sandy benthos and is home to vegetation such as sea grass. In recent years the health of the lagoon has declined due to pollution, over fishing, invasive species, harmful algal blooms, and muck accumulation.

Muck is mostly fine clay sediments with a high organic content. It accumulates in the IRL as a result of excess nutrients (nitrogen and phosphorus) runoff, and organic matter input. Muck is easily suspended in the water column, increasing turbidity. Settled muck rapidly goes anoxic and most benthic life cannot survive in muck impacted areas. Finally, muck can contribute excess nutrients to the water column and promote harmful algal blooms.

Current muck maps are based on old data and lack verification. Muck can by relocated by weather events such as hurricanes, thus rendering muck maps inaccurate. By conducting a study to directly verify muck distributions and thicknesses, muck maps will be validated and updated. This will assist mitigation and management efforts.




< Figure 1: Distribution of muck along survey site in Indian River Lagoon 2014.

| cruise | # of stations | # stations with muck | percentage |
|---|---|---|---|
| 1 | 13 | 2 | 15 |
| 2 | 29 | 14 | 48 |
| 3 | 28 | 18 | 64 |
| total | 70 | 34 | 49 |

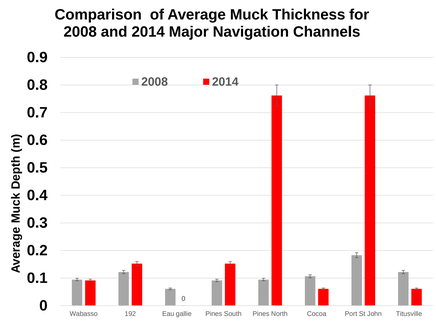



Figure 2: comparison of acoustic measurements (2008) and probe measurements (2014)

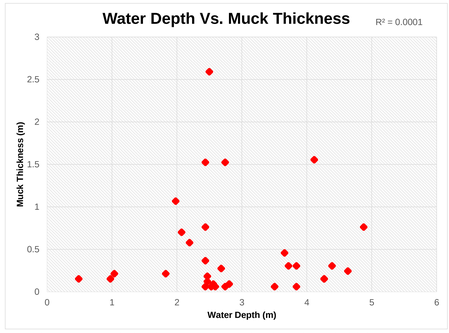



Figure 3: correlation between water depth and muck thickness.

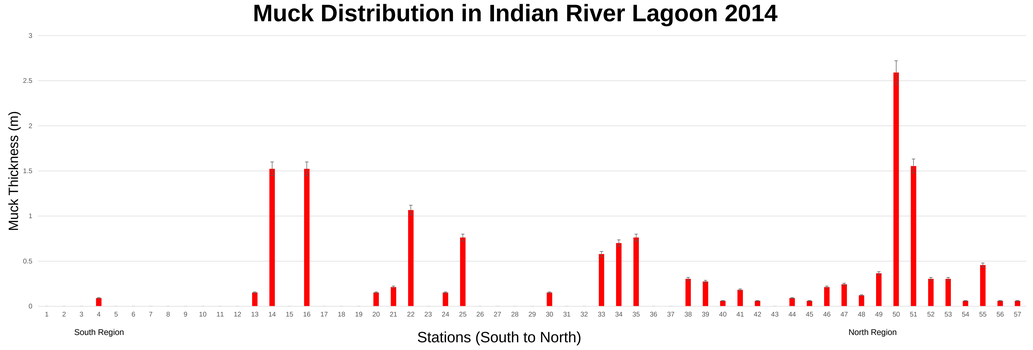



Figure 4: distribution of muck along survey site in the Indian River Lagoon

## Methods

The primary methods for confirming muck and measuring depth involved examining the benthos *in situ* with a muck “T Probe”, the Hummingbird acoustic sonar, and a sediment grab. The acoustic sonar was used to determine potential locations of muck by measuring porosity. The T probe was then pressed gently into sediment to determine the thickness of the muck. If muck was not present on the probe after retrieval, yet a thickness was recorded, the sediment grab was used to verify the presence of muck.

## Results

In this study’s 90 mile IRL transect, 49% of stations (n=70) showed muck present. The presence and thicknesses of muck were not consistent with maps 6 years old, suggesting either lack of map verification or a change in muck distributions during that time. Muck thickness does not correlate with water depth (Fig. 3) however muck can accumulate in deep navigation channels. Probe data (2014) is significantly different from acoustic data (2008) (Fig. 2) due to time and uncertainties about the interpretation of acoustic data. Less muck was observed at the more southerly stations (Figs. 1 and 4), likely due to the proximity of a coastal inlet and greater flushing of nutrients and sediments.

## Conclusion

Current muck maps lack verification as they are based on old data and uncertain interpretations of acoustic data. Acoustic data requires validation as the acoustic sonar measures porosity. Muck thickness does not correlate with water depth and muck can accumulate in shallow tributaries. Data from this study suggest mitigation processes should begin in the northern region of the lagoon due to higher presence of muck.

## References

Riegl, Bernhard. "Mapping the Distribution and Vertical Extent Of Muck in the Indian River Lagoon." Nova Southeastern University Oceanographic Center, (2009): n. page. St. Johns Water Management District. Web.

Trefry, John H., and Robert P. Trocine. "METALS IN SEDIMENTS AND CLAMS FROM THE INDIAN RIVER LAGOON, FLORIDA: 2006–7 VERSUS 1992." Florida Scientist 74 (2007): 43-62. Florida Academy of Science. Web.

NORTHROP GRUMMAN

Engineering & Science Student Design Showcase at Florida Institute of Technology