"Tea"-ming up with citizens and students to study carbon sequestration in coastal Manatee County, Florida

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The **Tea Bag Index**[1] is a simple and inexpensive method to measure decay rates of plant material using standardized, commercially-available tea bags.

Citizen scientists around the world implement the method to help researchers model carbon sequestration in diverse habitats.

The method calls for two types of tea bags:

Represents the labile portion of the soil carbon pool

Represents the recalcitrant portion of the soil carbon pool

Citizen scientists bury the bags in soil and leave them to decompose for 60-90 days. Then, citizens unearth the tea bags and measure the mass of tea remaining in each bag. Bags with relatively more tea remaining indicate conditions that likely promote soil carbon storage. Uploading results to a global database[2] enables researchers to compare decomposition rates in many habitat types.

The **goals** of this project were to:

1) pilot implementation of the Tea Bag Index in Southwest Florida coastal habitats, and
2) raise public awareness of wetland soils' essential role in the global carbon cycle.

Blue carbon is stored in coastal and marine ecosystems. Coastal ecosystems, including mangroves, salt marshes, and seagrasses, store carbon at higher rates than many other ecosystems while providing other important services from fisheries production to flood protection.

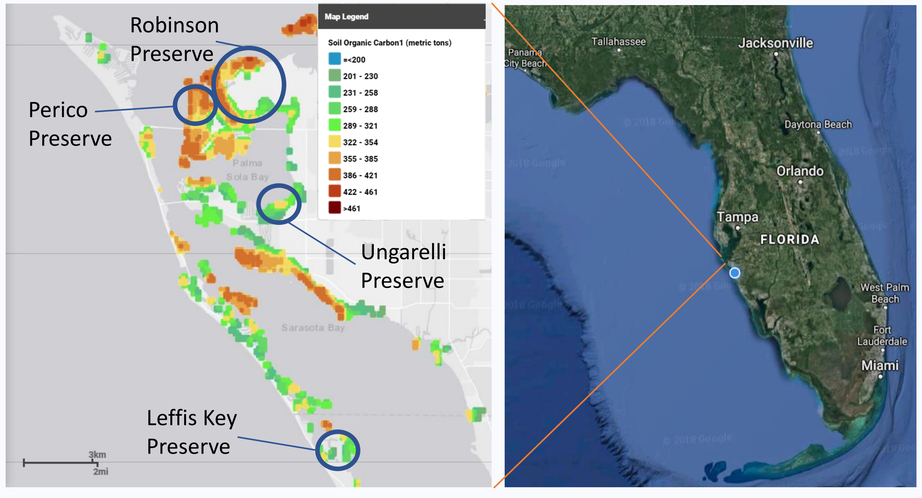


Figure 1: Map (courtesy Mapping Ocean Wealth) shows soil carbon content in mangrove soils in the project area. Circled areas represent tea bag deployment locations.

Sarasota and Tampa Bays are subtropical estuaries with plant communities representing the major types of blue carbon habitats. The Tampa Bay Blue Carbon Assessment (2016) highlights opportunities for investments in coastal habitat restoration to achieve climate mitigation benefits. Realizing these investments will require efforts to improve public understanding of carbon sequestration and blue carbon. The Tea Bag Index provides an interactive method for engaging citizens in carbon cycle science.

We deployed 136 tea bags across three general habitat types (dry, freshwater wetland, and mangrove) in four Manatee County, FL coastal preserves: Perico Preserve, Robinson Preserve, Ungarelli Preserve, and Leffis Key Preserve. The bags were deployed for ten (10) weeks.

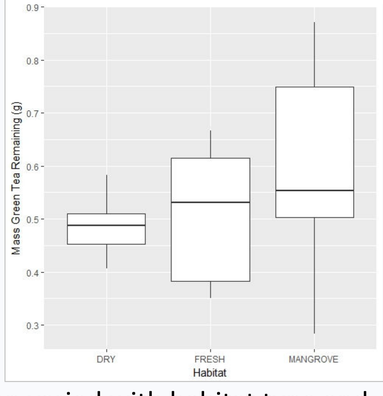
The authors formed a strong **partnership** to implement the Tea Bag Index. Each partner organization contributed unique resources and expertise to the effort.

We engaged over 40 individuals, including citizen volunteers and undergraduate students from New College of Florida, to assist with deploying and harvesting the experiment.

Preliminary **results** indicate that:

1) Green tea decomposed faster than rooibos tea.
2) Green tea decomposed more slowly in wetter soils while rooibos tea decomposition didn't vary with moisture content.

Table 1: Mass of Green Tea Remaining In Coastal Habitats



3) Green tea decomposition varied with habitat type and was slowest in mangrove soils.

The Tea Bag Index method demonstrates the carbon sequestration capacity of wetland soils in coastal Manatee County, Florida and raises public awareness of a little-known ecosystem service.

The authors extend thanks to the New College of Florida students and the volunteer citizen scientists who helped deploy and harvest the experiment.

[1]Keuskamp, J. A., Dingemans, B. J., Lehtinen, T., Sarneel, J. M., & Hefting, M. M. (2013). Tea Bag Index: a novel approach to collect uniform decomposition data across ecosystems. *Methods in Ecology and Evolution*, *4*(11), 1070-1075.

[2]http://www.teatime4science.org/