Using Citizen Science to Investigate Marine Debris Motion in the Lake Worth Lagoon Region

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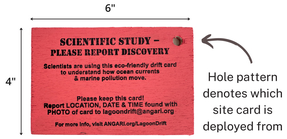
INTRODUCTION TO THE *LAGOON DRIFT CARD STUDY*

- The Lake Worth Lagoon is an estuary that receives runoff from an expansive watershed on its way to the Atlantic Ocean. This water can carry pollutants such as plastic, petroleum, sediment, bacteria, fertilizer, pesticides, pharmaceuticals and personal care products that affect humans and marine life.
- The *Lagoon Drift Card Study* was initiated by ANGARI Foundation and its local partners to investigate the motion of water and pollutants in the Lake Worth Lagoon and surrounding waterways. This citizen science study relies on public participation in the creation, decoration, deployment, recovery and reporting of a series of small eco-friendly wooden drift cards during coordinated experiments. While this cost-effective research method has been used around the world for decades, *Lagoon Drift* is the first study of this nature in the Lake Worth Lagoon region.
- *Lagoon Drift* is an extension of the *Biscayne Bay Drift Card Study*, designed and led by the University of Miami's Consortium for Advanced Research on Transport of Hydrocarbon in the Environment.

CARD MATERIALS

- untreated 3/16" thick plywood
- non-toxic, zero-VOC paint
- non-toxic ink and markers



Drift Card

METHODS

1. For every experiment, 40 drift cards are simultaneously deployed from each site on a falling tide. Deployment sites have been selected based on regional history, partner recommendation and accessibility.
2. Drift cards float on surface of the water and are transported by surface water currents, waves and tides.
3. Citizen scientists recover the drift cards and report the location, date and time found with a photo of the drift card to the email address designated on the card.
4. Data is compiled and trends identified, offering new insights into how marine debris moves in regional coastal waterways.

STUDY AREA

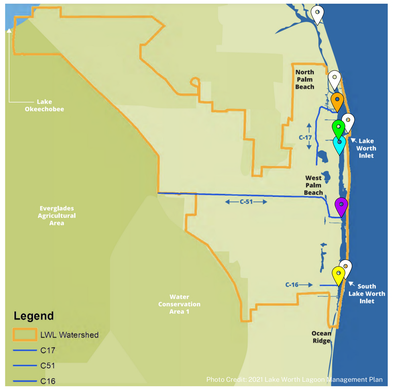


Figure 1: Map of Lake Worth Lagoon watershed. Marker bubbles indicate nine drift card deployment sites used since study began.

RESULTS SUMMARY

7 Experiments

24% Average drift card recovery rate

29% Reported cards found on Atlantic beaches

2100+ Citizen scientists

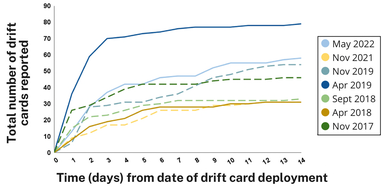
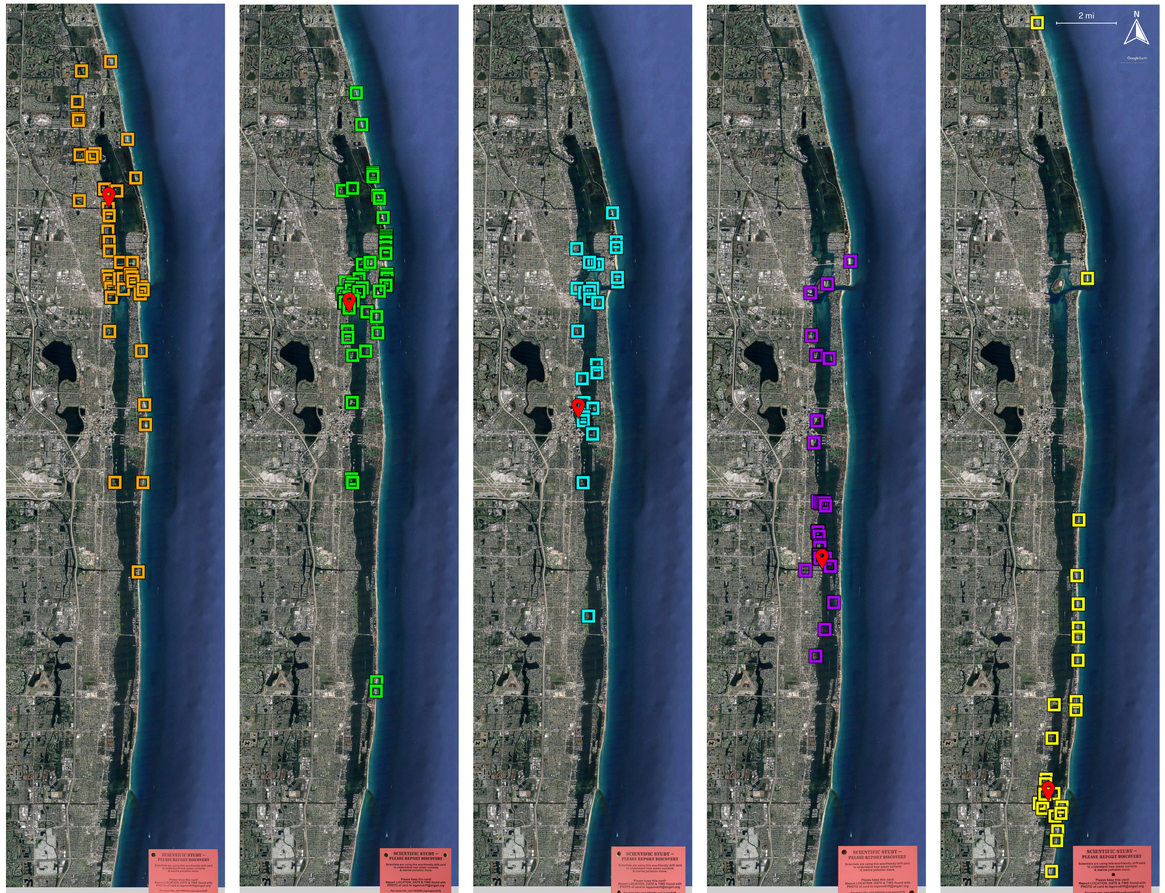


Figure 2: Total number of drift cards reported by day over 14 days across the seven experiments completed to date.

DRIFT CARD REPORTS FROM SELECT DEPLOYMENT SITES IN THE LAKE WORTH LAGOON



C-17 Canal
Average Recovery Rate: 18%

Manatee Lagoon
Average Recovery Rate: 39%

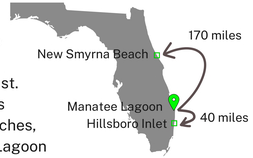
WPB Public Dock
Average Recovery Rate: 18%

C-51 Canal
Average Recovery Rate: 15%

C-16 Canal
Average Recovery Rate: 20%

Figure 3: Summary of local *Lagoon Drift* card reports for experiments in May 2022, November 2021, November 2019, April 2019, September 2018, April 2018 and November 2017. Marker bubbles indicate drift card deployment sites and open squares show locations where drift cards were recovered. Drift cards from each deployment site are drilled with unique hole patterns as shown above.

STUDY SYNOPSIS



- Drift cards are transported notable distances, exiting the Lagoon and traveling both north and south along the coast.
- A substantial number of cards are recovered on Atlantic beaches, most often from Lake Worth Lagoon deployment sites located near inlets.
- High recovery rates are likely due to a combination of factors, including the Lagoon's enclosed nature, high population density in the area and active public engagement.
- Drift card recovery locations suggest a bias towards publicly accessible waterfront areas, and particularly those with relatively natural (as opposed to hard infrastructure-oriented) shorelines where cards are more likely to strand.
- Weather, tides and day of the week that cards are deployed appear to impact drift card recovery.
- Community engagement in the study is strong with citizen scientists participating in the decoration, deployment and recovery of drift cards, as well as related educational sessions, outreach events, beach cleanups and extension activities like the creation of sculptures out of marine debris for public display.

FUTURE PLANS

- Continue to execute two Lake Worth *Lagoon Drift* experiments per year with area partners
- Support Florida Department of Environmental Protection - Indian River Lagoon Aquatic Preserves and partners in extension of *Lagoon Drift* into the Indian River Lagoon
- Grow community engagement and educational offerings
- Seek partnerships to facilitate addition of GPS-equipped drifter technology, expanding available quantitative data and ability to relate results to regional environmental data and models

ACKNOWLEDGEMENTS

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