PALM BEACH COUNTY MICROPLASTIC SURVEY

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It is no secret that the world's oceans and coasts have a plastic pollution problem. This crisis has been widely documented, with 8 to 11 million metric tons of plastic entering the oceans annually, in addition to hundreds of thousands of tons of abandoned plastic fishing gear (at least 640,000 tons), termed "ghost gear", being left in our marine areas each year.

As plastic is exposed to the elements, it breaks down into smaller and smaller pieces. Whether from inland sources or ocean trash, these small pieces called "microplastics" are an emerging issue within the plastic pollution crisis. This year, Surfrider Foundation's Palm Beach County chapter, preformed a microplastic survey at local beaches to help quantify the general abundance of microplastics.

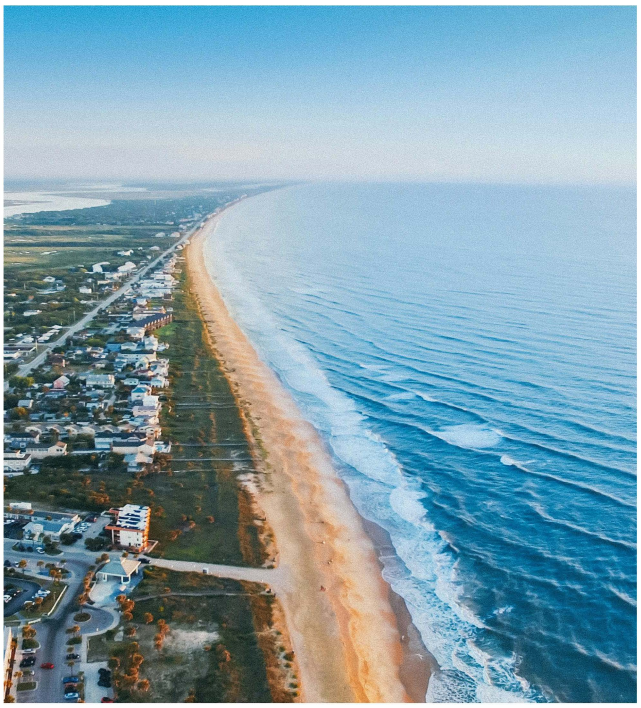
What Are Microplastics?

Microplastics are described as plastic particles or fibers less than 5 mm in size. There are many sources of microplastics. Particles are able to escape wastewater treatment plants and flow with the discharge water straight into our aquatic and marine areas, becoming bioavailable to wildlife, from plankton to top tier predators. Some microplastics, like plastic microbeads, were actually designed to be micro-sized to help with skin exfoliation, while other plastics, like plastic bottles, containers, and most ocean debris start out as larger products but break down overtime into smaller and smaller plastic pieces.

The Problem

Due to the small and even nanoscopic size of microplastics, recent studies have found that these particles are present in the air, ocean, food, and even throughout the human body. While more research and data on ingested microplastics is needed, so far we know that plastics can cause negative human health impacts, including DNA damage, endocrine disruption, cancer, and diabetes. The EPA also found that "in controlled studies, harmful chemicals have been shown to release from plastic after it is ingested by a variety of marine species," [1] meaning that whatever consumes the plastic could also absorb chemicals from the material. These toxins will work their way up the food chain, eventually reaching humans.

[1] Public health impact of plastics: An overview, Indian J Occup Environ Med. 2011 Sep-Dec;15(3):100–103



Surfrider Palm Beach County

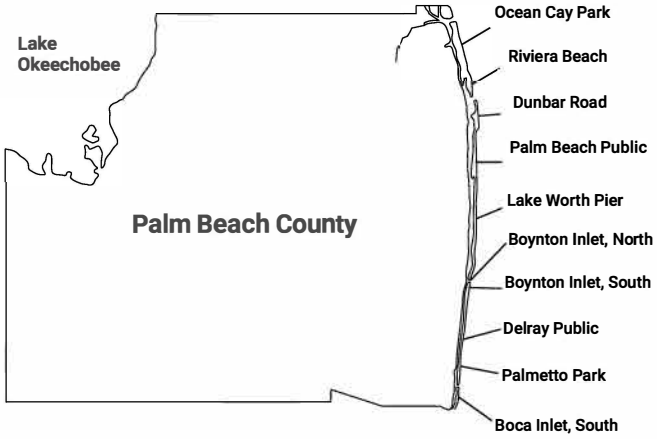
Palm Beach County, as the second largest county in Florida, has a total coastline of about 47 miles. There is a strong chapter presence in this region, as the Palm Beach chapter was the first Surfrider Foundation chapter founded in Florida back in 1996. Boasting a robust beach cleanup program, the chapter cleans up an average of 2000 lbs. of trash a year, and has a dedicated interest in focusing on the emerging microplastic issue. The county itself sits along the western border of the gulfstream, the strongest ocean current in the world, bringing ocean plastics to wash up on local shorelines, in addition to local land sources.

The Microplastic Survey

While it is near impossible to remove all microplastics from the coastline due to the minuscule size and amount, efforts are underway to tackle the problem at the source (production & manufacturing) through advocacy and legislation. To this end, it is crucial to survey local beaches in order to quantify the volume of microplastics and collect data to be able to present to local, state and federal lawmakers. Surfrider Palm Beach, to support these efforts, performed a beach survey at 10 sites from February through October 2024 throughout the county to better understand the distribution, impact and potential sources of microplastics in general.

Survey Sites & Methodology

Since Palm Beach county has a wide area of coastline, the chapter selected sample sites across the region based on a variety factors including public/private beaches, and also inlets/fishing piers, to be able to draw potential conclusions in comparison to microplastic concentrations. Sites selected are as follows:
Ocean Cay Park *(Juno Beach)*, **Riviera Beach** *(Singer Island)*, **Dunbar Road** *(Palm Beach, north)*, **Palm Beach Public** *(Palm Beach, south)*, **Lake Worth Public** *(Lake Worth Pier, south)*, **Boynton Inlet, North** *(Boynton Beach)*, **Boynton Inlet, South** *(Boynton Beach)*, **Delray Public** *(Delray Beach)*, **Palmetto Park** *(Boca Raton)*, **Boca Inlet, south** *(Boca Raton)*.



Samples were collected once at every site with quadrants using guidelines put forth by Surfrider Foundation's science department. Three, half-meter quadrants were used to excavate 12,500 cm^3 of sand [50cm x 50cm x 5cm = 12,500 cm3], which was sifted through a 1mm mesh sieve.

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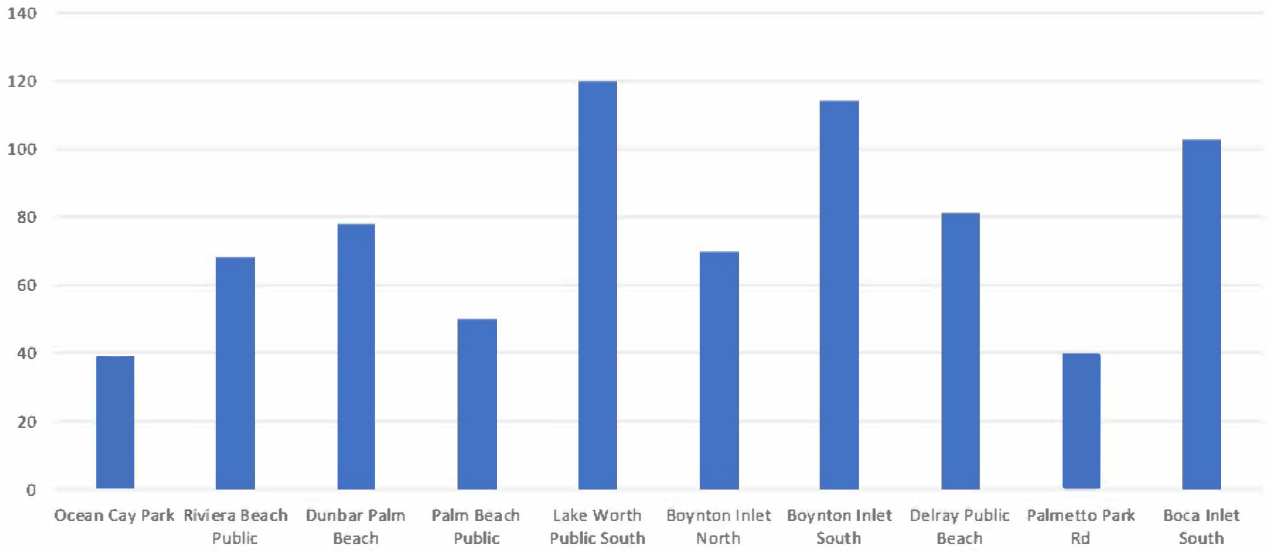
Once the sand was collected from the sites, volunteers used density to seperate plastic material from the sand. Since plastics are less dense than sand and shell pieces, particles float when soaked in saline solution.

Lastly, plastic pieces were sorted and classified by size (1mm-5mm, >5mm), and the data organized into graphs based on amount/12,500 cm^3 (.44 ft^3).

Table 1 Overall Microplastic Pieces (<5mm) / 12,500 cm3



Results & Conclusions

Based on data presented from the survey, it is clear that microplastics are heavily present in coastal beach sand within Palm Beach County. The highest concentration of particles (***Table 1***) was found at Lake Worth Public Beach (just south of the pier), closely followed by both the south-side inlets of Boynton Beach and Boca Raton. Several factors may have contributed to Lake Worth's highest count, in particular, the presence of multiple restaurants directly on the public beach and one even on the pier. Additionally, the shear size of the beach park, which is one of the largest in the county, brings crowds of beachgoers to the shore everyday.

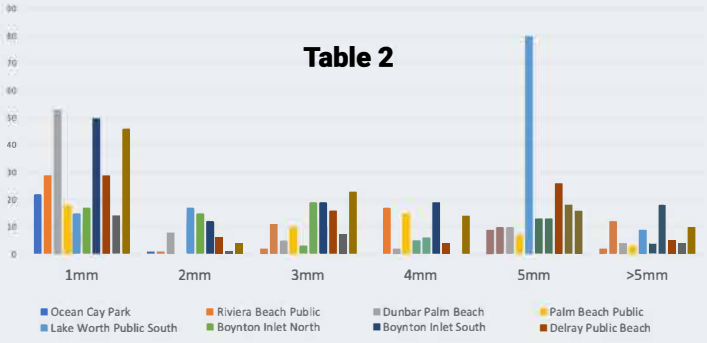
The runner-ups for amount of particles are, Boynton Inlet on the south jetty side (114 pieces/12,500 cm³), and Boca Inlet on the south jetty side (103 pieces/12,500 cm³). This is very likely attributed to the fact that jetties are situated on the east coast of Florida to flow out south with the general southern nearshore currents, bringing additional land based particles from inland community sources. Also during summer months, southeast winds prevail, bringing in large mats of floating sargassum algae that also contain a high concentration of ocean plastic.

One correlation that can be made between all top sites, is their location just south of a structure that extends in the water. This suggests that the concentration of microplastics along the shore can be affected by coastal structures, in this case, accumulating on the more protected south side from sweeping north currents.

Lastly, looking at particle size (***Table 2***), the most abundant microplastic pieces are found between 1-2 mm. We know that plastics become brittle over time exposed to the sun and salt, leading to smaller and smaller pieces that are ingested by plankton and make their way into the food web. The results found in this survey warrent further studies into the source, distribution and abundance of ocean microplastics.

Amount Of Microplastic Based On Size

Table 2



Into The Future

The urgent need to reduce plastic waste in the ocean and environment is a core value of the Surfrider Foundation and our grassroots network of volunteer chapters. The data gathered in this survey will be shared with local, state and federal lawmakers it hopes that it will help support legislation that aims to reduce plastic production, promote education, and bolster Surfriders Ocean Friendly Programs, which seek to reduce plastic waste at local businesses.