

## **Plastics and Transforming Ecosystems Science into Accountability**

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Plastics are essential in our society because they improve safety, reduce costs and often provide environmental benefits. Because of this, plastic production is growing by >12 million tons annually across the globe. Production in North America grew an average of 0.75 million tons between 2000 and 2016 (48 to 60 million tons) but jumped 4.4 million tons in 2017. This is the start of an upward trend on the continent, with many new pellet plants planned in the U.S. Texas with its ports and nearby oil and gas extraction is leading this growth, where the city of Corpus Christi anticipates opening the two largest polyethylene terephthalate plants in the world before 2024. Coastal Texas is already home to numerous plants that ship their product globally. This current production and its transportation have resulted in the ubiquitous presence of pellets in several bays as well as the entire Texas Seashore. Contamination is particularly high in the Matagorda/Lavaca Bay system, which is home to a manufacturer that produces polyethylene, polypropylene, and polyvinyl chloride. A small local citizen group in that community successfully sued the manufacturer under the Clean Water Act, resulting in a \$50 million settlement after they were found guilty. The manufacturer also agreed to re-engineer their stormwater and wastewater systems so that they achieve zero pellet discharge in the future. This promising outcome was only possible due to several years of daily sampling by a small citizen group. They collected >2,000 samples documenting pellets and plastic powder and are still sampling almost daily to ensure the manufacturer does not violate the settlement. The positive outcome, in this case, was possible because plastic pellets are visible with the naked eye, unlike traditional organic and inorganic pollutants. This makes citizen sample collection and documentation cheaper and potentially more legally sound. Therefore, the scientific community must work with citizen groups and lawyers to ensure that the data is collected and documented properly, but also that the "experimental design" will provide data that address key aspects of the case. While each case is unique some of these key questions might be source tracking, material identification, and aging. Researchers already have some of the tools to address these questions, but others must be developed. As more plastics plants begin production globally, the research community must learn from the recent case in Texas and establish tools and approaches to document the presence, identify sources of the discharges and spills and explain their harm to ecosystems.