

An aerial photograph of a wide river, likely the Mississippi River, showing a massive cleanup operation. The river is filled with a dense layer of plastic debris, appearing as a thick, textured grey and white surface. The surrounding landscape is green and hilly, with some fields and roads visible. The sky is clear and blue.

# Mississippi River Plastic Pollution Initiative

## 2021 SCIENCE REPORT

**University of Georgia**

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# Foreword

The Mississippi River is America's most essential inland waterway, providing hundreds of billions of gallons of water each day to key industries, as well as drinking water to 20 million people in 50 cities in 10 states. The river is rich in biodiversity, supporting a wide range of plant and animal species, but it also hosts a threatening foreign substance – plastic pollution.

Plastic litter that continuously enters the Mississippi River poses a large threat to environmental quality and ecosystem health, and these impacts extend far beyond the river valley. As the drainage system for 40% of the continental United States, plastic waste and other litter travels through storm drains and smaller waterways into the river and its tributaries, ultimately making its way to the Gulf of Mexico and into the ocean.

Approximately 11 million metric tons of plastic enters the oceans each year, so understanding the extent of the plastic pollution problem is key to devising effective solutions that will combat this crisis.

The United Nations Environment Programme North America Office, Mississippi River Cities and Towns Ini-

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tative, National Geographic Society and University of Georgia's Debris Tracker have come together through the Mississippi River Plastic Pollution Initiative to generate a first ever snapshot of plastic pollution along the River.

Using a 'citizen science' approach, this initiative facilitated and supported data collection along the lower, middle, and upper river. The aim was to understand the movement and accumulation of plastic pollution while painting as rich a picture as possible within a small amount of time of the extent, type, and brand of plastic litter along the river.

The intention is for the *Mississippi River Plastic Pollution Initiative 2021 Science Report* to generate information about plastic waste concentrations in specific areas, which all stakeholders – from policy makers, to businesses and citizens - can use to take action within their communities. We hope that this research will not only help cities and towns along the Mississippi, but also provide an example of what can be done collectively to address the plastic pollution crisis around the world.

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**On behalf of:**

The Mississippi River Plastic Pollution Initiative

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## Executive Summary

The United Nations Environment Programme (UNEP) North America Office, the Mississippi River Cities and Towns Initiative (MRCTI), the University of Georgia's Debris Tracker, National Geographic Society, and other local and national partners worked together on a pilot study for the Mississippi River Plastic Pollution Initiative to generate a first-ever snapshot of the state of plastic pollution along the Mississippi River. The data was generated through a 'citizen science' approach, enlisting the participation of hundreds of community volunteers covering targeted areas along the river to understand the movement and accumulation of plastic pollution. Debris Tracker, an open data citizen science movement and free mobile phone app, was used to collect the data. Three cities participated in the pilot study: Baton Rouge, Louisiana; St. Louis, Missouri; and St. Paul, Minnesota. The data gathered in the basin, along the river and in the pilot communities was examined to understand the state of plastic litter in these river cities. The goal was to generate as rich a picture as possible, within a dedicated timeframe, of the extent and type of litter that can make its way to the river.

The project consisted of the scientific strategy development, training and outreach, field data collection and data analysis and reporting. The community training and data collection occurred from March – April, 2021. The initiative was successful in engaging citizen scientists in the three pilot cities and beyond. Data collection along the river corridor, outside of the pilot cities, and continued tracking beyond the defined data collection dates of the initiative show that there is high interest and momentum to further expand data collection along the Mississippi River and in the Basin.

Over 94% of the 75,184 litter items documented in the river basin were located within 50km of the main stem of the Mississippi River, including 69,733 litter items logged on the Debris Tracker app and 5,451 items manually uploaded through the Debris Tracker website. Plastic was the top material found ranging from 74% to 81% of the count of items in the basin and in the cities. While there was some variation as noted in the report for particular differences in items found, the top ten items remained relatively consistent with cigarette butts, food wrappers, beverage bottles, hard/foam/film plastic fragments, plastic bags, aluminum cans, and paper being some of the most common items found. PPE, an emerging contaminant in the environment and waterways, was a consistent 1-2% of the items found (by count).

The pilot cities were each successful in collecting enough data to provide a snapshot of the litter in the city. The litter density calculated by the number of litter items over the area surveyed in (count/m<sup>2</sup>) is similar for Baton Rouge and St. Louis, but appears relatively lower for St. Paul (Table ES-1). Further analysis of data and influencing factors could help to better evaluate both the similarities and the differences in the litter density data.

A small percent of the items logged (about 1.5%) had brands noted. The category of items with brand and most common packaging were noted for each city. St. Louis participants recorded the most brand data, followed by Baton Rouge, and then St. Paul.

**Table 1: Pilot City Litter Summary Data**

City	Items (Count)	Geofence	Transect Area	Overall Density
Baton Rouge, LA	9,546	30 x 33 km <sup>2</sup>	13,800 m <sup>2</sup>	0.61 items/m <sup>2</sup>
St. Louis, MO	28,540	38 x 44 km <sup>2</sup>	40,023 m <sup>2</sup>	0.69 items/m <sup>2</sup>
St. Paul, MN	12,997	21 x 34 km <sup>2</sup>	43,179 m <sup>2</sup>	0.28 items/m <sup>2</sup>

Nearly 80% of the people who were logging litter data for this project also picked up the litter they were documenting. With a total of 75,184 items tracked in the basin, it is estimated that this data collection effort resulted in 60,150 litter items removed from the environment. Assuming an average mass of 5g (0.011lb) per litter item, this results in over a quarter ton (662lb or 300kg) of litter removed from the buffer area near the river during the project period.

After data collection was completed, feedback was solicited from the pilot cities, local organizations, and the core partner team. Components of the project that worked well and are recommended to be sustained or expanded are:

- Many participants collecting data reported they were collecting data along with others. This community-based aspect could be expanded in the messaging around the initiative, encouraging others to share data collection activities with their networks.
- Many users are tracking multiple times, which is an opportunity for individualized volunteer feedback and mobilization. A longer relationship of feedback to the user (e.g., seeing their data and totals) and input of data on their part, could foster extended engagement with the app.
- While the majority of users did choose to pick up the litter they logged, some did use the option to record data without cleaning up, making participation in the initiative more broadly accessible. The framing of data collection as a priority over cleanups, while a different paradigm than is typical for many cleanup groups, was key for the scientific success of the initiative.
- Using an open data and near real-time data collection tool like Debris Tracker had several benefits in that all of the data is freely accessible to anyone at any time, and the researchers could adjust their data collection activities to be complementary with the community-based efforts effectively and efficiently, in real-time.
- Cities and local partners want additional data collection in their communities to understand progress and effectiveness of efforts.

Project components to consider improving in future iterations are:

- Broader outreach, over a longer period of time, perhaps through community organizations not focused on cleanups, could expand the initiative's reach and in-person trainings, where possible, could help to get people tracking faster and more easily than virtual trainings.

- Incentives for data collection and/or stipends for organizations working with underserved communities, like environmental justice organizations could help reach new audiences.
- Further engagement with schools and universities could help with scientific, transect data collection for density analysis.
- The majority of the litter data was not tagged with a brand, speaking to the challenge of identifying upstream sources of common litter items such as cigarette butts, plastic bags and foam and plastic fragments and the time it takes to note this data beyond logging each litter item.
- Developing an automated or streamlined method of noting where data has been collected that can be easily communicated to the participants to satisfy the science requirement.
- While MRCTI is known to city officials, it is not widely known or recognizable as a brand amongst the general population, and thus clearer branding of the Mississippi River Plastic Pollution Initiative on the Debris Tracker app and in other outreach materials could serve to eliminate confusion.
- The timing of this project was shifted because of COVID-19. Further discussions on the time of year for sampling are important. In fall, the river is lower, so some debris may be more visible and accessible. The spring is often the time of community cleanup as the days become warmer, and the river height is good for observing floating debris.
- Organizations reported that training volunteers to collect data following the scientific protocols was challenging. Additional materials, such as training videos and engagement pamphlets made readily available to partner organizations, could remove some of the training burden on organizations. Additionally, a stipend could help offset organizational time and effort to engage new partners without resources to cover staff time to train and engage volunteers.

Essential to the success of this project is the participation by the pilot communities, especially the leadership and engagement of the Mayor and Mayor's offices. Results from this pilot initiative were presented to the Mayors and city officials, as well as city partners, in June 2021. Based upon the project partners and these discussions with the cities and local partners, the following opportunities for reducing plastic pollution in the Mississippi River were identified:

- Stormwater outfalls are moving waste from urban areas into waterways, lakes, and canals. Opportunities to intercept floatable debris exist at stormwater inlets and outfalls. From both mayoral teams and local partner organizations, there is high interest in interventions at stormwater drains and trash traps in waterways, such as canals.

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