

Debris Tracker Citizen Science to Local Action Guide

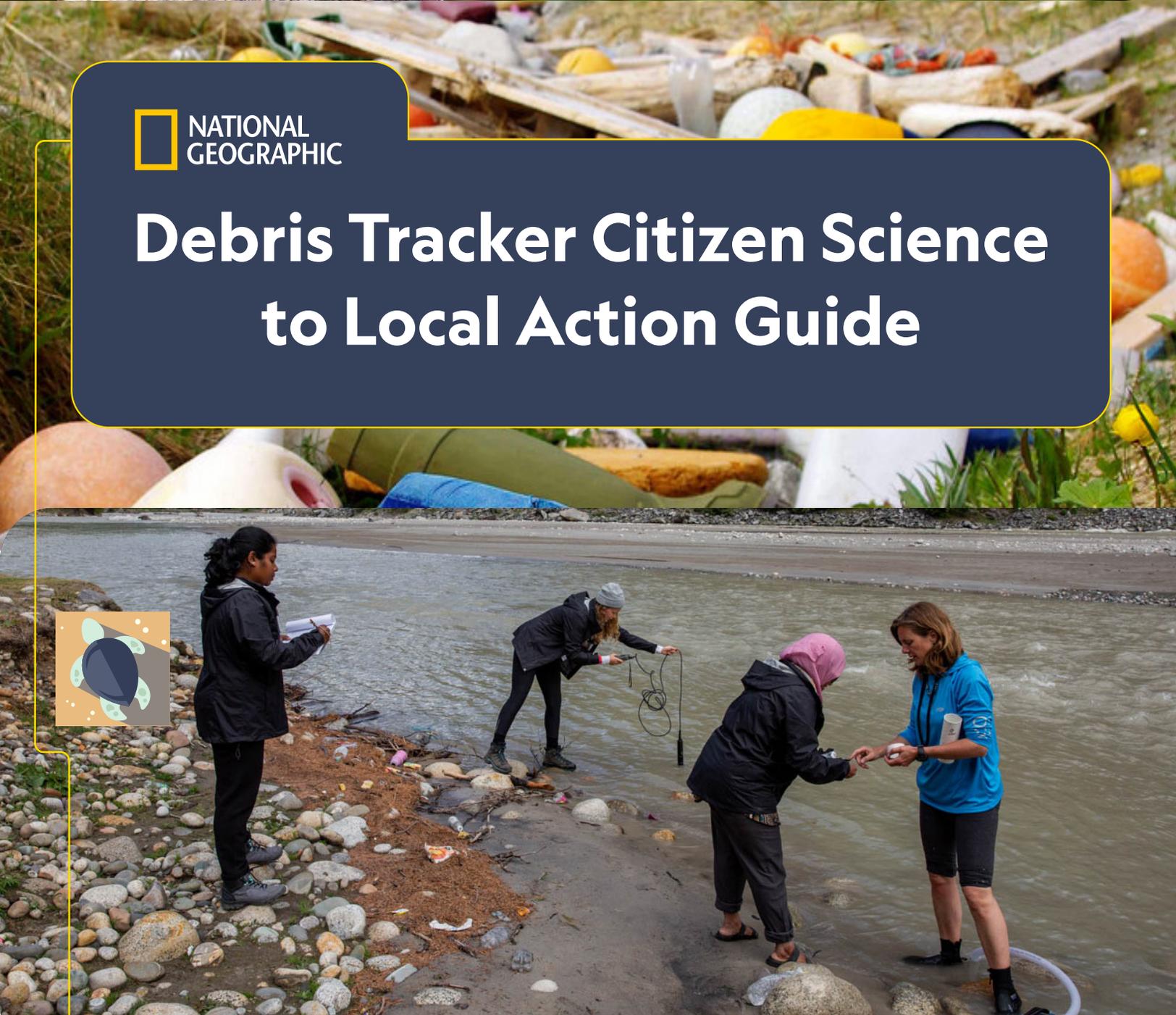


TABLE OF CONTENTS

Pg. 3

Introduction Letter

Pg. 4

The Science of Plastic Pollution

Pg. 7

Designing Debris Tracker Projects for Local Impact

Pg. 10

1. Define the Project Goal and Research Question

Pg. 12

2. Design the Data Collection Strategy

Pg. 15

3. Plan for Volunteer Participation

Pg. 18

4. View and Analyze the Data

Pg. 23

5. Move From Data to Community Action

Pg. 26

Debris Tracker Community Project Planner

Committed to illuminating and protecting the wonder of our world, the National Geographic Society and its community of Explorers and educators continuously seek ways to build awareness and take action toward a sustainable planet.

Plastic is a miracle material that has revolutionized medicine and eased space travel—it also extends the shelf life of fresh food, allows for the delivery of clean drinking water to those without it, and is used in airbags and helmets to save lives. It has, in all its uses, made modern life possible.

Despite its utility and convenience, we are increasingly seeing the negative and long-lasting impact of plastic pollution—it has become one of our planet’s most pervasive challenges. The problem may seem insurmountable, with 9 million tons of plastic entering our ocean every year—roughly a garbage truck worth, every minute.

This Debris Tracker Citizen Science to Local Action Guide is designed to inspire community-based efforts that can be part of the solution. Local data on plastic pollution can be used to help design context-sensitive solutions that take into account the particular circumstances of a given community.

[Marine Debris Tracker](#), also called Debris Tracker, is a free, mobile application that enables users and local organizations to collect and share geospatial data on litter to an open data platform. Since most plastics found in the ocean started as land-based waste, land-based data are needed to better understand the flow from source to sea. By sharing data across many organizations and projects, Debris Tracker is helping to build a foundation for global research on plastic litter and other debris in different environments around the world. Additionally, through its customizable platform, Debris Tracker empowers communities to create data sets that are specifically relevant to them and their goals of reducing plastic pollution in their neighborhoods.

As leaders and role models in your communities, you can inspire people to see the world in new ways, take action through citizen science, and find solutions to problems. Throughout this guide, you will find examples of Debris Tracker projects already making an impact. We hope this guide inspires and enables your communities to take action.

Towards a sustainable Earth,

*Citizen Science Team, National Geographic Society,
and Marine Debris Tracker Team, University of Georgia*

The Science of Plastic Pollution

With models projecting that, in a “business as usual” scenario, plastic entering the ocean will increase by an order of magnitude by 2025, the need for both global research and local data are urgent. Scientists have found plastic in our oceans for decades, with reports on impacts to wildlife coming as early as the 1960s¹. As plastic production continues to expand exponentially, we’ve learned that once plastic finds its way into the environment, it breaks down into smaller and smaller pieces, eventually becoming microplastics. It is estimated that there are tens of trillions of these particles floating in the ocean today². Scientists have also found microplastics in the air, traveling on the wind from our cities to remote mountain ranges³.

Plastic pollution is everywhere, so collecting data on the growing and evolving plastic problem relies on a global community of citizen scientists. We’re discovering new things about plastics and their impacts every day, and there’s a lot left to learn. Scientists are still working to understand critical questions about plastic pollution, including how it moves and breaks down in the environment and where it is originating.

The short answer is that plastic comes from us. Take a look at a map of your watershed: Plastic pollution that starts in your community might travel through stormwater systems or streams and end up in the Mississippi River, the English Channel, the Caribbean Sea, or the Indian Ocean. Land-based sources of plastic are estimated to account for 80 percent of the plastic input to our oceans⁴, with rivers moving up to 2.41 metric tons of plastic from inland communities to the ocean every year.⁵



¹Ryan P.G. (2015) A Brief History of Marine Litter Research. In: Bergmann M., Gutow L., Klages M. (eds) Marine Anthropogenic Litter. Springer, Cham. https://doi.org/10.1007/978-3-319-16510-3_1

²Erik van Sebille et al 2015. A global inventory of small floating plastic debris. Environ. Res. Lett. 10 124006

³Allen, S., Allen, D., Phoenix, V.R. et al. Atmospheric transport and deposition of microplastics in a remote mountain catchment. Nat. Geosci. 12, 339–344 (2019). <https://doi.org/10.1038/s41561-019-0335-5>

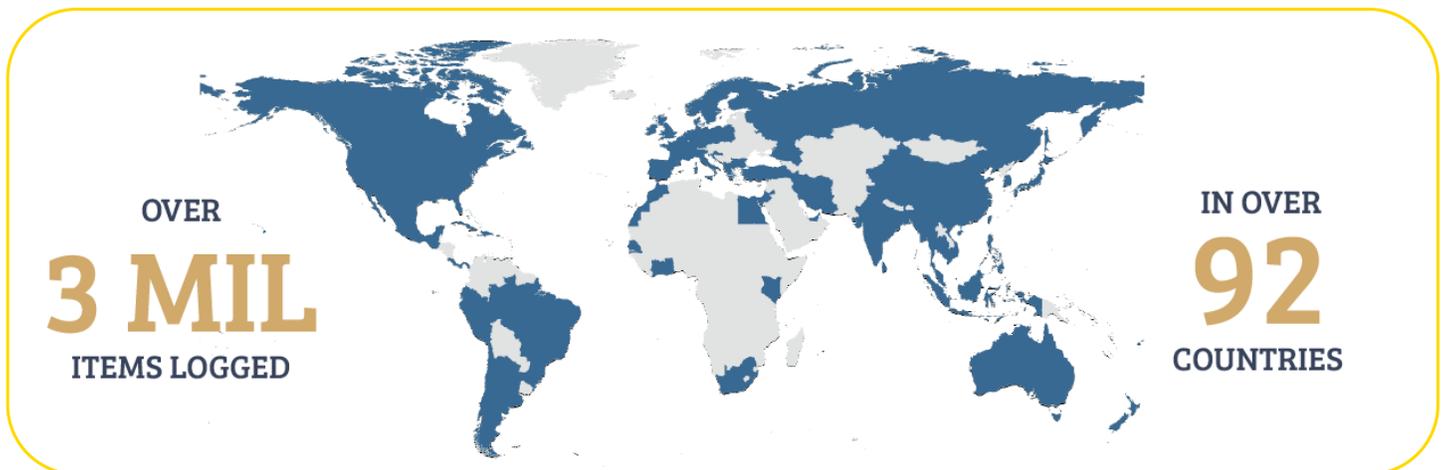
⁴<https://www.epa.gov/trash-free-waters/sources-aquatic-trash>

⁵Lebreton, L., van der Zwet, J., Damsteeg, J.W. et al. River plastic emissions to the world’s oceans. Nat Commun 8, 15611 (2017). <https://doi.org/10.1038/ncomms15611>

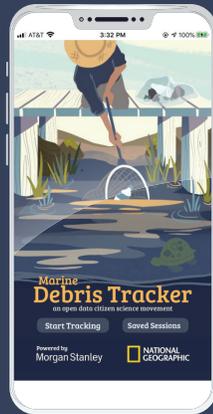
But the full story of why plastic ends up in our environment is more complex, evolving, and nuanced. Painting that picture requires a comprehensive global dataset that is as large as the problem of plastic pollution itself. Building that dataset starts city by city, relying on dedicated citizen scientists from around the world sharing what plastic pollution looks like close to home.

Patterns of plastic use, disposal, and leakage into the environment can vary greatly across communities. As a result, we need location-specific data so we can generate context-sensitive solutions. Context-sensitive design is a collaborative approach to problem solving that recognizes community members as a critical part of the design team. You are an expert on your community, and you can use data on plastic pollution to catalyze local action that makes sense for your context.

DEBRIS TRACKER USE AROUND THE WORLD



Get Started with Debris Tracker



Debris Tracker is designed to be simple. The free Debris Tracker app, available for both Android and iPhone, lets anyone record data for a variety of litter items and upload it to our open database. The data can then be viewed by researchers and other citizen scientists from around the world. Learn more about the app and view Debris Tracker data already collected by visiting DebristTracker.org or NatGeo.org/DebrisTracker.

FAQs about Debris Tracker

The app is also called Marine Debris Tracker. Do I have to be near the ocean to track?

Nope. Marine Debris Tracker started as an effort to look at coastal litter, but now we understand that most plastic pollution is coming from inland sources. You can use the app to record plastic and other litter data anywhere.

I'm interested in plastic pollution. Do I have to track other non-plastic items like glass or metal?

Depending on your study design, you may choose to focus on only one type of litter. However, recording all litter items can provide a helpful baseline to understand if plastic is more common than other material types.

What should I photograph while tracking?

We recommend you take a summary photo of all the items you've collected, and photograph any unusual litter items you see along your walk. It's not necessary to photograph every item you collect. Uploading many photos requires a strong internet connection.

I'm getting an error that my GPS signal isn't good enough. What can I do?

Ensure you're allowing Debris Tracker to access your location. In your settings, turn on "Precise Location" for iPhone or "High Accuracy" location mode for Android. If the error persists, open up your maps app and refresh your location, or wait a few moments for your phone's location to refresh.

What if I don't have cell service?

As long as you've opened up the app and loaded the default list or an organization list, you can track in offline mode as long as you still have GPS location signal. Save your tracking session and upload your data when you have internet access.

Why are there different organization lists on Debris Tracker? Which one should I select?

Debris Tracker supports local data collection with researchers, nonprofits, schools, and other organizations around the world by hosting customized data collection lists. These litter item lists are in different languages and include different items based on what project leaders are seeing in their own communities. If you are tracking with an organization that has a list you should select that list. If your organization does not have a list, we generally recommend using the National Oceanographic and Atmospheric Administration (NOAA) list, based on the protocols included in the NOAA Shoreline Assessment Methodology, which works for most organizations in most contexts worldwide. This is more detailed than the Debris Tracker's Quick Track list, a succinct list for collecting opportunistic litter data that can be used with younger volunteers. If existing lists are insufficient for your purposes, please get in touch with Debris Tracker at DebrisTracker101@gmail.com to discuss creation of a custom list. See the list descriptions on the app for more information about a specific organization list and tracking protocols.

How do I access my data?

Open data is a key value of Debris Tracker. All data tracked with the app is available on debristracker.org. You can view and download your own data, and explore and download data collected by others, by logging onto the website: www.debristracker.org/data.

Designing Debris Tracker projects for local impact

Scientists around the world are trying to build a global picture of plastic pollution, aiming to answer three key questions: **What is ending up in the environment? Why is it here? And what can we do about it?**

These questions can guide your local plastic research effort. Today, Debris Tracker projects are happening all around the world, with organizations working to drive local action through a combination of science, education, and advocacy.

Throughout this guide, for each of the five steps, you will see examples and case studies from projects across the globe, each collecting data on litter and developing solutions in their own cultural context. **At the end of the guide is a planning document (page 26) to help you design community Debris Tracker projects that can inform or inspire local action.**

The following sections provide guidance for community-based Debris Tracker projects that generally follow these steps:

1. **Define the Project Goal and Research Question**
2. **Design the Data Collection Strategy**
3. **Plan for Volunteer Participation**
4. **Review and Analyze the Data**
5. **Move From Data to Community Action**

Tips for Engaging Stakeholders, Decision Makers, and Potential Partners

In seeking to inform local action, it's important to engage with community decision-makers early in the project development process if possible.

A FEW TIPS:

- First, think carefully about whose behavior or decisions you are trying to influence. Who are the key stakeholders?
- Consider what information the targeted population or decision-maker will need, and what may be barriers to them changing their behavior.
- If you are focused on an especially targeted audience, such as a local government, they may be more receptive to hearing about your data if it is discussed in advance. They may have substantive points that could inform your data collection process (e.g. they might encourage data collection from a particular place or indicate a time frame during which the data would be most useful).
- Who are potential allies in your efforts to monitor and reduce debris? Is there a particular organization that is responsible for the place you are focused on? Are there other people or groups who care about or use the place? If you can identify allies with which to partner, your efforts may be more successful.
- If you are more broadly focused on shaping the behavior of individuals or businesses in your community, also consider looking for opportunities to collaborate with local role models or community leaders.

FOR EXAMPLE:

Before starting your project you should consider what people or groups you can potentially influence to drive change, what data you can collect to inform and hopefully influence them, and what other organizations might have shared interests and be effective partners for your work. For instance, National Geographic Education Fellow Peg Keiner's elementary students discovered that cigarettes were the number one trash item in the park where they collected data. This litter was centered around a few specific benches in the park. Students found out that the Chicago Park District and a private company share the responsibility for managing the park. In the future, her students hope to share their data and ideas for signage about park stewardship with the company that owns the park. In this case, the visitors to the park were causing the pollution, but the company had the authority to manage the park, making it the most effective target for the student's presentation.

Peg further explained: "If we walked along the Chicago River and engaged our local river nonprofits and businesses, we could amplify the monitoring and maintenance of the space at the start of the project. As a leader, it is important to be sensitive to possible barriers stakeholders face that could impede their willingness to listen to your message and partner with you."

National Geographic “Sea to Source: Ganges” Expedition

Science, education and outreach
for local impact along the Ganges

From May to December 2019, an international, interdisciplinary team of researchers traveled along the Ganges to collect plastic pollution data as part of the National Geographic “Sea to Source: Ganges” river expedition. The Ganges is a river of both great religious and economic importance in India and Bangladesh, so local and national organizations in India and Bangladesh have recognized an urgent need to address a persistent plastic pollution problem affecting the Ganges River Basin and the Bay of Bengal. In collaboration with local organizations, the Sea to Source Expedition traveled from the Bay of Bengal to the source of the river in the Himalayas, stopping in eleven communities

along the way to collect data on macro- and micro-plastic pollution in communities and in water, air, and soil.

As part of community visits, the team recorded more than 89,000 litter items on the Debris Tracker app during the pre- and post-monsoon expeditions. These data are critical for understanding the problem in a way that can inform solutions.

The Debris Tracker data from the expedition showed that litter landscapes looked different across the communities along the river. For example, rural communities often lacked access to waste management systems, and everyday plastics like single-use shampoo packets appeared in the litter. While plastic beverage bottles are prominent litter items in many parts of the world, in this study bottles were present only in low quantities because informal recycling workers collect high-value plastics to sell.

The expedition research focused on social science, microplastic sampling, and land-based litter sampling, and across these areas worked with communities to integrate local knowledge to understand how plastic pollution moves from sea to source. As the [results](#) are analyzed, published, and disseminated, the team hopes to continue to work through collaborations developed in the field to empower communities with data.



Photo: Sara Hylton.

1. Define the Project Goal and Research Question

Before developing a detailed plan or reaching out to prospective volunteers, you should ensure you have clearly defined your goal and research question. All Debris Tracker projects contribute to science as users are contributing to a global open database. Your specific projects, however, may have a primary focus on science, education, or advocacy—all of which are critical to advancing solutions to plastic pollution. In defining your goal(s), consider what is most relevant for your local context, as well as your skill set and what will best resonate with your community and volunteers. For instance, citizen science data collection might be a way to teach others about plastic pollution by getting them to look at the litter in their area. Alternatively, you might want to create a specific local change in your community and need data on the problem to back up your efforts.

ORGANIZING PROJECT GOALS

ORGANIZATION & LOCATION	PRIMARY CATEGORY	GOALS
Te Tai Tokerau Debris Monitoring Project New Zealand	Research	<ol style="list-style-type: none"> 1) Compile baseline data on litter, especially marine litter, in Northland. 2) Address the knowledge gap by collecting quantitative data on the presence, abundance, composition, and spatial distribution of litter at specific sites within the region.
Tobacco Caye Marine Station Belize	Education	<ol style="list-style-type: none"> 1) Educate Belizean and international students on the significance of ocean plastic pollution, including its harm to the local marine environment, and actively engage in potential solutions. 2) Engage students and citizen scientists to work with TCMS to repurpose, reuse, and safely dispose of trash washing up on the Belize Barrier Reef.
Northcoast Environmental Center USA	Advocacy	<ol style="list-style-type: none"> 1) Use data to inform decisions about where to focus energy for waste reduction. The data already collected has spurred on a cigarette butt receptacle program. 2) Make data readily available to the community.

Debris Tracker projects start with deciding which questions are most important to tackle in your community based on your science, education, and advocacy goals. Some questions might include:

- What litter is ending up in our local environment, such as waterways or parks?
- What human activities are contributing to litter? Which areas of our urban environment have the most dense concentrations of litter?
- Do litter levels in our community increase in seasons with more tourism, and if so, to what extent?
- How does the prevalence of infrastructure such as public waste and recycling bins affect litter?
- How does litter change with different land uses? How is it affected by the proximity to plastic input areas such as stores or restaurants?
- How does litter change over time, after policy changes or educational campaigns are implemented?
- What is the relationship between socio-economic status and access to waste management? Is there a correlation? Does everyone in your community have access to waste management services?

The primary focus of this guide is supporting projects that intend to foster local action or local advocacy. If your project goals include science and/or education components, we suggest you additionally review the scientific approaches outlined in the National Geographic Sea to Source Methods Toolkit and/or education-focused resources on [NatGeo.org/DebrisTracker](https://www.natgeo.org/debris-tracker). More generally, the Sea to Source Methods [Toolkit](#) is a great resource to look at as you plan your data collection and analysis.



2. Design the Data Collection Strategy

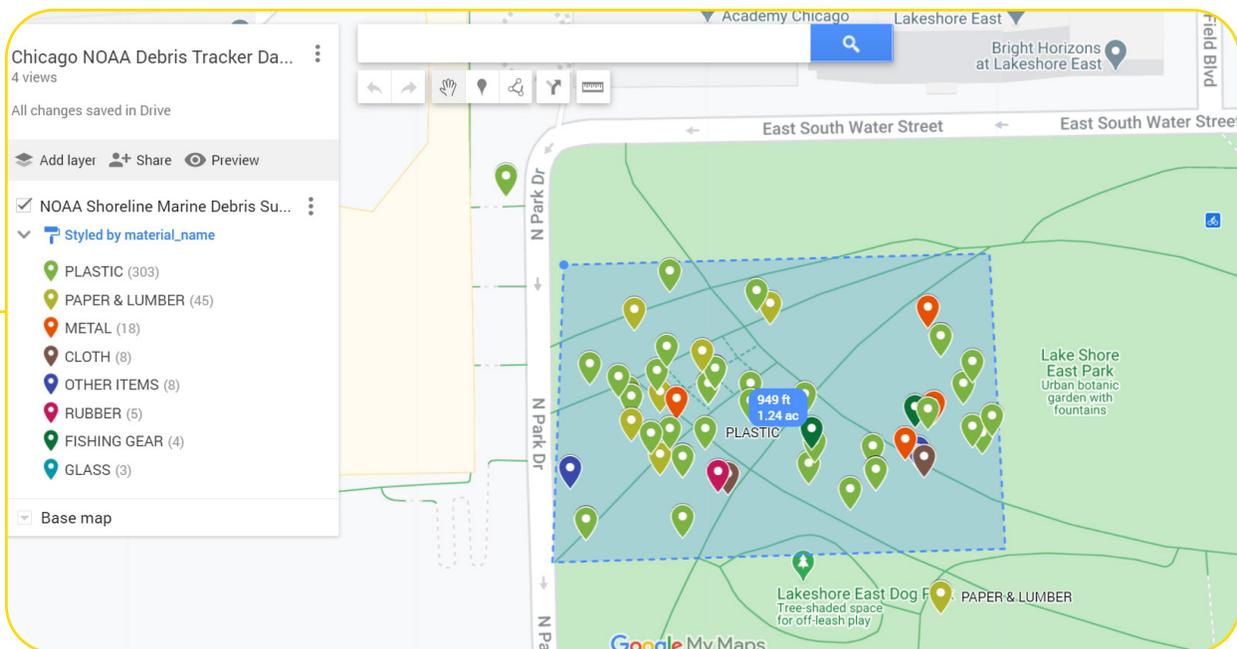
Your next step is to design a data collection approach that will address the project goals, key questions, and stakeholders needs that you've identified: The data collection approach with Debris Tracker will vary depending on which questions you decide are important to inform local decision-making and create change in your community. For example, you might monitor your local park across different seasons and propose a cleanup schedule with local partners based on analysis of the data. Or you might monitor the commercial district of your city, which leads to a workshop with local businesses to share the data and discuss alternatives to plastic.

Regardless of your approach, there are some variables to consider in your sampling design.

- 1. Time of day:** Litter concentrations can change throughout the day, especially in urban areas where litter is being added regularly through human activity. For example, some communities might have street sweeping on a certain day of your week, so you might design your litter sampling to occur before this weekly cleaning.
- 2. Repetition:** How many times do you need to repeat this sampling event in the same location to answer your question? If you're interested in change over seasons, you might consider monthly sampling for a year. If you're interested in litter created by one event, you might only need to sample once.
- 3. Litter Density:** If you want to compare litter concentrations across different sites to identify hotspots or areas for future interventions, you will need to have a way to ensure consistency between the sites so you can compare the number of items found in each area. Standardizing by area or by effort are two approaches that allow for comparison:
 - **Area:** Litter density can be calculated in terms of area, such as number of items per square meter. If you choose this method, ensure your volunteers have access to measurement tools or apps to apply the method. Options for measuring or estimating area include:
 - Visually estimating or using a measuring wheel or tape to delineate a square area for sampling, such as estimating an open area in a park where you are collecting litter to be 25 × 25 meter.
 - Conducting a linear transect by estimating one meter wide (about three feet)

and using a measuring wheel or a walking app on your phone to record length. For example, you might conduct a 1 × 100-meter transect along a roadside.

- You could also measure an area once and use visual landmarks to ensure consistency if you plan to sample the same area multiple times.
- Sampling area can be calculated after the fact by using the geospatial litter data from Debris Tracker and a GIS tool to define and measure an area. For instance, in the figure below the Debris Tracker data has been imported into Google My Maps. The area in which plastic has been collected is marked with a dotted line, and has been calculated to be 1.24 acres in this example.



- **Effort:** If the sampling area is difficult to record for your volunteer group, you can also determine litter density with an effort index. This shows the number of litter items in terms of volunteers and time, such as items per person per minute. To calculate this metric, record the number of volunteers and the time spent tracking. Report litter densities as items / (volunteers x minutes)⁶.
 - Note: Time can also be calculated after the fact by downloading the litter data from Debris Tracker and looking at the time between the first and last timestamps in a tracking session found in the .CSV file in the timestamps column.

⁶ Sarah E. Nelms, Lauren Eyles, Brendan J. Godley, Peter B. Richardson, Hazel Selley, Jean-Luc Solandt, Matthew J. Witt, Investigating the distribution and regional occurrence of anthropogenic litter in English marine protected areas using 25 years of citizen-science beach clean data, *Environmental Pollution*, Volume 263, Part B, 2020, 114365, ISSN 0269-7491, <https://doi.org/10.1016/j.envpol.2020.114365>.

4. Other Factors: Many other factors, such as infrastructure, human activity, or even weather can affect litter concentrations seen on the ground. Some considerations:

- A plan for documenting these influencing factors might include having volunteers take photos of each sampling area, writing down the number of trash cans or stores near the sampling area, or referencing the Debris Tracker data timestamp and checking a weather report after data submission. Depending on the volunteer audience, you might ask volunteers to record this information in the field or you might consider documenting this information yourself during a cleanup event. Some things, like land use, can be determined after the fact based on litter coordinates and satellite imagery (as a GIS layer or in Google Maps/Google Earth).
- All litter lists - including the recommended NOAA list - include a flexible description box for each litter item. This can be used to record additional details depending on the project goals, such as size, color, or brand of items. The description field is available in the .CSV file when you download data from Debris Tracker.

There are a variety of existing debris monitoring protocols that you can adapt to your local context and goals, such as long-term monitoring or baseline litter data in your local environment or community. We recommend the [NOAA Marine Debris Shoreline Survey Field Guide](#), designed for sampling in coastal communities, or the [Sea to Source Methods Toolkit](#) Litter Transects section which is targeted to sampling in communities.

For most projects, creating a new list isn't necessary and we recommend using the NOAA list, based on the protocols in the NOAA Marine Debris Shoreline Survey Field Guide. See the Analyzing Your Data section to understand how to isolate data for a specific project or geography.

Consider your target volunteer group in your sampling design as well. Will you have the opportunity to conduct a training workshop or webinar to explain how to identify each item and implement your sampling design? Are you targeting a more opportunistic audience, such as a one-day cleanup volunteer group or student group? If the volunteers are inexperienced with this type of data collection, you will want to keep the methodology simple so it is easy for your volunteers to apply accurately.

3. Plan for Volunteer Participation

Successful Debris Tracker projects do not require large groups of participants. Independently logging data in a nearby river over the course of a year, for example, could show increasing concentrations of plastic debris and be shared with local policymakers to spark discussions on waste reduction strategies. By educating and engaging volunteers, however, many projects amplify data collection while simultaneously getting more community members involved and invested in keeping the local environment clean. Additionally, having a large number of people involved in the project and invested in the issue may affect how people respond to your data. Policymakers care about what their constituents think, businesses care about what their customers value, and individuals can be influenced by their friends and neighbors.

Debris Tracker projects can involve volunteer efforts from countless groups. Here are a few for inspiration:

- Students* in classroom settings
- Youth clubs* focused on the environment
- University researchers
- Library patrons
- Volunteers from local business give-back programs
- Nonprofit organizations
- Local government officials
- And, as always, community members! You don't have to be associated with any of the above groups to care about protecting our environment from plastic pollution or to get involved with citizen science.

**Note: When involving youth under age 13, create a group account tied to an adult leader's email address.*

For small group efforts, you can create a group account. Everyone can log in with the same username and password. There is no limit to the number of users who can share an account.

However and wherever you choose to sample, ensure your volunteers are aware of general safety procedures while dealing with litter and of any site-specific considerations, such as traffic or nearby waterways. If conducting a group cleanup, have a first-aid kit, sunscreen, and water on hand. Have emergency contact numbers and procedures available in the case of injury. Make volunteers aware of actions necessary to handle an emergency situation.

Stay Safe While Tracking Litter!

1. Wear utility gloves whenever you are touching trash.
2. Avoid dangerous pieces of trash like needles, broken glass, and syringes unless you have been properly trained on how to safely pick them up.
3. During your tracking session, do not touch your face. After your tracking session, wash your hands with soap and water for 20 seconds or use hand sanitizer.
4. Disinfect your phone after each tracking session. Search “how to sanitize your smartphone” for helpful instructions.
5. Recommendation: Have an up-to-date tetanus shot. Remember, you are working with trash.

Tips for Engaging Volunteers:

- Make sure volunteers are aware of the goals of your project. Have a plan for sharing this information before you ask volunteers to start collecting data.
- Ensure your request of volunteers is specific and direct. Volunteers should know where you want them to collect data, how you want them to do it, and the date of the deadline to complete the work.
- Use data collection as an opportunity to discuss plastic pollution. Help volunteers understand how plastic negatively affects our environment, and involve them in conversations about reducing plastic litter.
- If collecting data and conducting a cleanup simultaneously, articulate that both goals are important and set volunteers up for success with the tools they need, whether that’s trash bags or measuring tape. It can be time-consuming to record items while also picking them up, so consider having volunteers work in teams.
- If picking up litter, have a plan for what to do with the trash. Communicate that plan to volunteers so they know they are making a positive impact.
- Take a group photo so you can show the people behind the data in social media and press publications. Ensure you have appropriate release forms.
- Recognize volunteer contributions. That could be a certificate for a school group, a plastic-free item giveaway for a volunteer group, or an acknowledgement in a research paper for citizen scientists. Make sure any press, social media, or website write-ups about the event include a thank you message for volunteers.
- Continue to communicate with volunteers after the cleanup. Share the outcomes of the project, and give them ways to continue to stay involved and share the data with their networks. For example, a project might create a summary report that volunteers could share on social media.

Tips for Working With Youth Participants

- Tracking outdoors allows for experiential learning about the paths of plastic and other litter. Youth can witness examples of plastic breaking down into fragments that can get into soil or flow into waterways.
- As with other open-source data applications, youth must be at least 13 to create a personal Debris Tracker account. Programs with youth under age 13 can create group accounts that multiple participants use, tied to the email address of an adult leader who will steward the account. A group account can also streamline data monitoring and management.
- Help youth focus on the benefits and natural beauty of a clean environment. Moments of appreciation for natural places will lead to caring about them.
- Litter finding is like a treasure hunt for young children. Expect questions about what they find, and ask them what they think. Play on their natural curiosity as young scientists with questions such as “What is it?” and “How do you think it got here?”
- Have younger kids track with a parent who can log litter on the app while they point out items.
- For school groups, try to meet with the teacher ahead of time to plan educational goals. Students of all ages can gain valuable STEM-based experience by recording data, making observations, and mapping and analyzing human impacts on ecosystems using Debris Tracker.
- Find more resources on [NatGeo.org/DebrisTracker](https://www.natgeo.org/debristracker), including a printable Plastic Pollution Action Guide designed for youth.
- Encourage youth participants to share what they learned and their ideas on reducing plastic pollution with their family and friends.

4. View and Analyze the Data

You might not be a plastic pollution researcher, but you and your fellow community members likely have expertise on how plastic is used and disposed of in your community. Local knowledge holds a critical key to solutions, and Debris Tracker is a tool that enables local citizen scientists to unlock that. Collecting and analyzing data allows you to tell the story of plastic pollution in your community. Your methods for analysis will vary depending on your science, education, and advocacy goals, and on the questions about plastic pollution you are trying to address.

The Debris Tracker website is the best place to start with your data. There are a variety of ways to view and display your data on DebrisTracker.org, the best place to start exploring your data. When you log into your account, you'll see a summary of the number of items you've collected, your top items, and locations you've tracked. There's also an option to download a .CSV file containing your data. If you've created an account to share among a group of users, you'll see all data logged under the shared account here.



1192 Plastic Food Wrappers



977 Plastic Film



936 Sachets



562 Paper and Cardboard



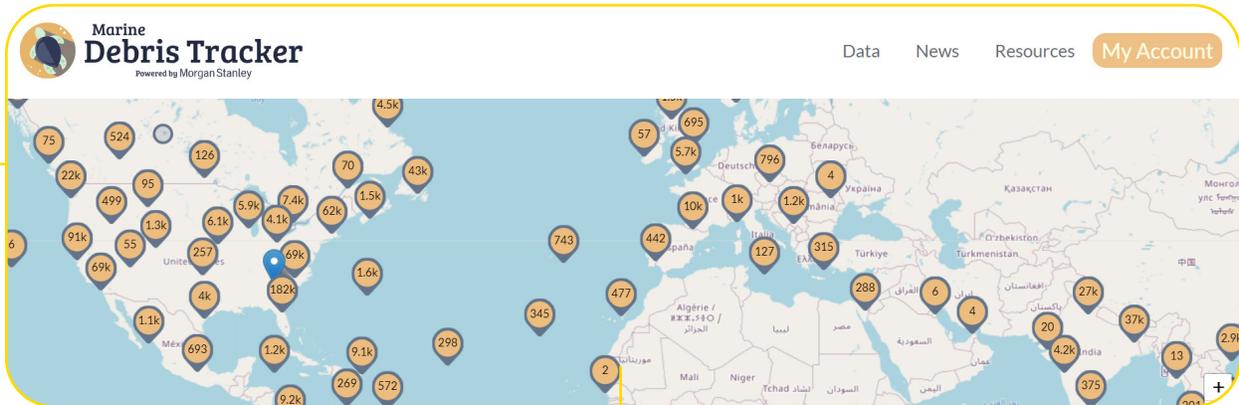
101 Plastic String

Download my data

In addition to viewing your own data, all information collected on Debris Tracker is open access, so you can explore data from other citizen scientists, both on the other side of the globe and in nearby communities. The data platform on DebrisTracker.org/Data has a variety of tools that allow you to look at data in different ways.

- You can select **All Lists** to view an aggregated dataset across all organizations on the app, or you can select a specific list to see only data tracked by volunteers under that organization.

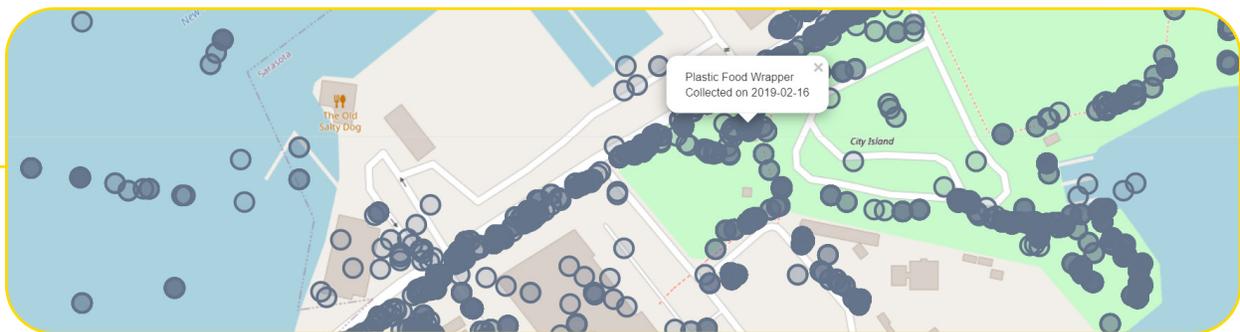
- You can filter by date by selecting all data, a specific date, or a date range.
- All categories on a list are automatically turned on, but you can select a category and turn it off if you're only interested in a particular type of litter. For example, you could select only "plastics" from among the options and then see a breakdown of the top plastic items.
- The pie chart of material types and the bar graph of top items automatically update as you log data. Hover over a material to see the percentage, or hover over an item to see an exact count.
- You can also turn on the "My Data" setting to see only items you've logged, filtered by your selected list, date, and category parameters.



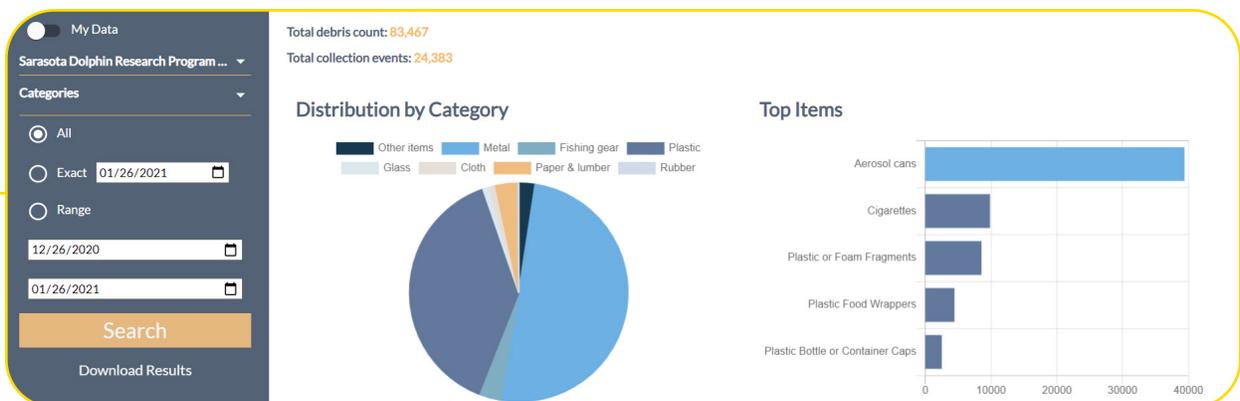
However you've filtered your data, you can then download a .CSV file of that dataset for further visualization and analysis.

For example, the Chicago Zoological Society’s Sarasota Dolphin Research project has collected data on more than 80,000 litter items. A long-term dolphin research program, the program uses Debris Tracker to log trash collected from local waters and shorelines. They also recruit students and community members to join a virtual Debris Team. They use the data to document official and unofficial cleanup numbers at debris hotspots and other areas of frequent human-dolphin interactions, and they hope to be able to use it to identify new hotspots and risks to dolphins from different categories of debris. The team notes: “We have had a number of dolphins suffer injuries from fishing gear and other debris in the marine environment, so using this app helps us connect folks directly to dolphin conservation. Every piece of trash they prevent from getting into local waterways helps protect wildlife.”

Zooming in on data collected by the project, we can look at specific areas where litter has been recorded. You can click on a specific item to identify the item type and date of collection.



The material type breakdown shows the composition of the litter logged on the organization list based on our filter settings. Plastic and metal are the two most common types of debris logged in the list.

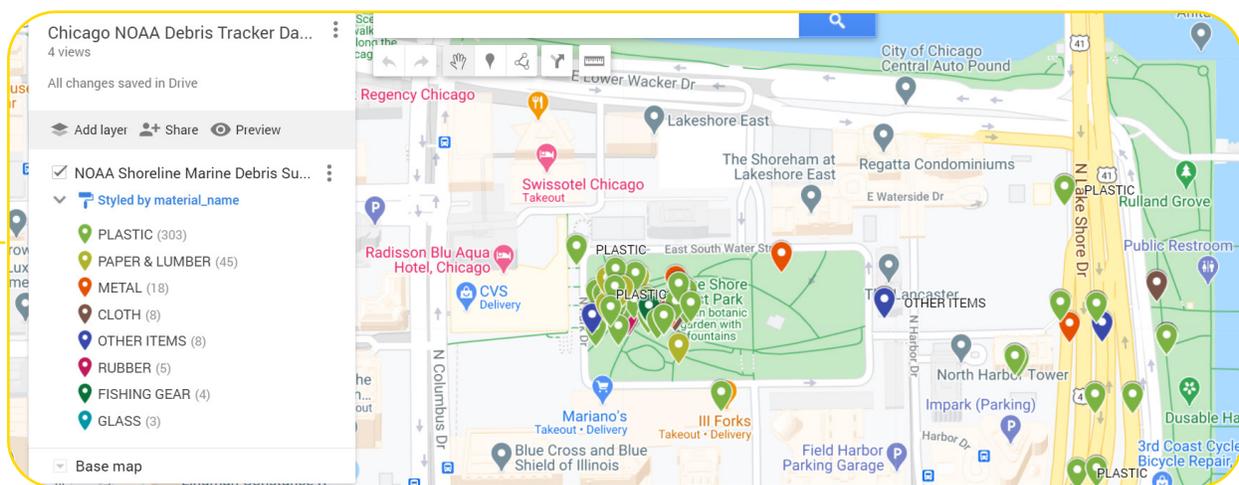


ISOLATING DATA FOR A SPECIFIC GEOGRAPHY OF INTEREST

If you’re tracking on a list where users are collecting data in different locations, you can isolate the data for your specific geography of interest. For example, Chicago-based National Geographic Explorer Peg Keiner wanted to track debris with a fourth grade class at her school. Her goal was to help students to learn how to use the app, analyze data, communicate findings, and create an advocacy campaign to help to find solutions to their neighborhood litter problem.

Peg's students used the NOAA list, which has contributors from all over the world, but they were interested in looking at litter in their own community.

Using a spreadsheet, it's possible to filter Debris Tracker data by location. On the Debris Tracker website, download a .CSV of the data from the organization of interest (or from All Lists), and then use the filter function in Excel to select only the location names you want to include. You can copy the filtered data to a new .CSV, and upload to an online mapping platform, such as Google My Maps. My Maps allows you to represent data by columns in the .CSV, such as displaying different material types in different colors. You can also switch to satellite view. Google Maps tools also allow you to measure distances and draw shapes on your map; you might measure the distance between litter and the nearest waterway, or delineate the border of your sampling area. Excel tools like pivot tables allow you to calculate quantities of litter by material type and item name.



Peg's students made an Earth Day presentation via videoconference to community leaders belonging to the United Nations Association Chicago Chapter. Students created a presentation and showed the data they analyzed in Google Maps. They presented their plan and encouraged people to protect our watersheds by making better choices. Students continued to share their enthusiasm for this experience months later.

ADVANCED GEOSPATIAL ANALYSES TO ANSWER COMPLEX QUESTIONS

If you're trying to answer more complex questions, GIS can be a powerful tool for analyzing Debris Tracker data and incorporating additional geospatial datasets, such as population density, wildlife habitat areas, or watershed delineations.

The Georgia Sea Turtle Center has been monitoring marine debris in coastal Georgia with Debris Tracker since the creation of the app in 2010. In 2019, researchers from the Georgia Sea Turtle center published a paper on the quantity of marine debris in loggerhead sea turtle nesting areas. By overlaying a map of known sea turtle nesting sites and geospatial debris data, they created density maps to show the portions of the coast most at risk for debris and sea turtle interactions⁷. Such risk maps can help target local interventions such as cleanups.

⁷ Jeannie Miller Martin, Jenna R. Jambeck, Breanna L. Ondich, Terry M. Norton, Comparing quantity of marine debris to loggerhead sea turtle (*Caretta caretta*) nesting and non-nesting emergence activity on Jekyll Island, Georgia, USA, *Marine Pollution Bulletin*, Volume 139, 2019, Pages 1-5, <https://doi.org/10.1016/j.marpolbul.2018.11.066>.

A Pandemic Project

Tracking Personal Protective Equipment (PPE) in your own backyard

Jacquelyn Saturno and I are plastic pollution researchers and National Geographic Explorers. Like many others around the world, COVID-19 halted our research travel plans for 2020, grounding us in my hometown of Toronto, Canada. Early in the pandemic, we noticed that COVID-19 was driving up the plastic pollution problem in our neighborhood.

What does pandemic debris look like? Personal protective equipment, or PPE, protects users against contracting and spreading diseases like COVID-19. Gloves, masks, and disinfectant wipes—which have long been used in medical facilities—became everyday items in households around the world as we tried to protect ourselves and others.

As this PPE became part of our plastic diet, it quickly accumulated as debris throughout our neighborhood. We realized that COVID-19 was rapidly altering our plastic pollution landscape, and we needed to record this historic shift. We were driven to answer questions such as: *What types of PPE were being littered? What were the sources of this pollution? What human activity led to the most PPE debris? Where would these items travel in our environment?*

To answer these questions, we diversified our walking routes to not only include our local neighborhood and nature trail, but also grocery store parking lots and even the downtown hospital district. Our field kit was simple: extended garbage picking stick, garbage bag, a ton of hand sanitizer, and phones with Debris Tracker

as a field notebook. Since no one had previously tracked pandemic related debris, we developed methods that worked for our community in our urban Canadian landscape.

We walked at different stages of the pandemic, through spikes and valleys of COVID-19 case numbers in Toronto. Weekly surveys took place from when the flowers were full bloom to when snow began to fall in December.

Unfortunately, we almost always found PPE. After six months, we were shocked to have removed over 4,000 pandemic-related debris items from just a small section of our city! We were able to determine origins of PPE debris and which human activities drove these numbers up. These answers were vital, because now we are reaching out to our local politicians to bring this issue to their attention, and we are demanding action.

PPE wasn't just ending up on the streets of Toronto. It was landing on streets all around the world. When we mentioned our project to friends and colleagues, they wanted to join the effort. We trained teachers, lawyers, and scientists over virtual chats, and they hit the streets. PPE tracking began in Australia, Argentina, France, the U.S., and all over Canada.

Using our protocols, these trackers were spotting different types of PPE specific to their location, while finding similar trends for PPE origins in human activity. Our project grew as they shared their work with others in their networks.

Debris Tracker gave us an opportunity to do science amid a global pandemic and gave us a platform to translate a few simple observations into hard numbers, maps, and [published research](#). With this data, we now have the tools to approach policymakers, to make them aware and invested in finding solutions to this emerging source of plastic pollution.

-Justine Ammendolia,
National Geographic Explorer



Photo: Jackie Saturno

5. Move from Data to Community Action

Plastic pollution data has been successful in motivating local change. The Tobacco Caye Marine Station in Belize turned their litter data into an annual report on item variety, quantity and distribution of litter on the reef crest. The report was shared with business owners on the island and led to lodges making an effort to burn less waste. Clean Ocean Access used their dataset of litter cleanup data, dating back to 2006, to push local governments for a ban on smoking at local beaches and a ban on plastic bags that has been instituted in 17 of the 39 towns in Rhode Island. As a Fulbright researcher studying solutions to solid waste in Vietnam, Jennie Mathis noticed that along some of the streets where she regularly collected data with Debris Tracker, residents gradually started to contain their waste in different ways after she talked with them about her work.

Moving from data to action does not necessarily mean you have to come up with a solution on your own. Bringing diverse community perspectives into the conversation is a key step towards developing context-sensitive solutions. Keep in mind that your understanding of the local causes of plastic pollution and the best data-based actions might evolve as you bring in more community knowledge. For example, you may find that much of the litter in your community is plastic bags and you may consider promoting a plastic bag ban. In talking to a local shop, you learn that few customers bring their own reusable bags, which are for sale for \$5 in the store. You might expand your efforts to include an educational campaign in local schools or a giveaway of reusable bags to shoppers.

Interventions for plastic pollution, such as bans or reuse, exist along the entire life cycle of plastic from production to disposal. Whatever problems involving plastic pollution your community faces, there are likely multiple solutions at different intervention points to address the issue, such as the examples given below.



Modified from Jambeck, ET AL., "Plastic Waste Inputs from Land into the Ocean." Science 347, 2015



Different community members may have more ability to influence action at different intervention points. For example, a business owner could promote alternatives to plastic in their store, and a local government official could help install additional recycling bins in public parks.

So what are some ways you can get your community involved in this conversation?

- **Facilitate a community workshop** with business owners, politicians, and local nonprofit organizations. Share maps tracking where you found the most litter in your area and brainstorm prevention strategies.
- **Create a graphic with key outcomes** of your work to share on social media, and take a poll about which of your solution ideas might work best in your community.
- Have **conversations with leaders** at your favorite restaurant, your place of employment, or your local school about the use of plastic products, and share your data with them. Ask questions about obstacles to change and discuss alternatives together.
- Map litter data in the context of your waterways and watershed, and **challenge students to design new ways** to reuse plastic to prevent it from entering the environment.
- Share what you found as the most common litter item with your friends or family, and **ask them to change one small habit** to reduce their use of plastic.
- **Enlist early adopters** of waste reduction strategies (either individuals or local businesses) to tell others in the community why they think these actions are important, and how they overcame any challenges related to reducing their waste.

The ideas above have some key principles in common: Share your data in a way that is appropriate for your audience; be ready to discuss what the data means and be receptive to questions; and be open to multiple solutions across intervention points you may not have considered.

Once a community sees what is ending up in the environment and why it is ending up there, the next step is coming together to determine what you can do about it. Thank you for working toward local solutions that also make a global impact.

Media & Social Media Tips

- Having your Debris Tracker project carried by traditional print, video, or online news media can help drive home your findings with decision-makers.
- Especially for projects that have public awareness as a goal, social media might be part of your strategy from the start. Consider having a savvy team member or volunteer be responsible for creating a strategy and making it happen.
- When you use social media, tag **#DebrisTracker** on Twitter or Facebook to help your local Debris Tracker story become global. Showing the full process from planning and data collection to analysis and community action can help energize local stakeholders while potentially sparking similar projects in other places.

Thank you for planning a Debris Tracker Project! At any point in the process, tag **@InsideNatGeo** and **@DebrisTracker** to keep us posted and inspire others with your story.

This guide was created by the National Geographic Society. The guide was written by Anne Haywood, National Geographic Explorer, and Kathryn Youngblood, University of Georgia. National Geographic Explorer Jenna Jambeck, and National Geographic staff, including Teresa Leonardo, Mary Ford, and Elisa Hickey, provided significant input and contributions throughout the project. With appreciation to National Geographic Explorers Justine Ammendolia and Peg Keiner, Fulbright Fellow Jennie Mathis, Te Tai Tokerau Debris Monitoring Project, Tobacco Caye Marine Station, Northcoast Environmental Center, Georgia Sea Turtle Center, Clean Ocean Access, and the Sarasota Dolphin Research Program of the Chicago Zoological Society for providing the examples and case studies used throughout the report.

Step 3: Volunteer Participation

(See toolkit pages 15-17)

A. Number of volunteers needed: _____

B. Local organizations, schools, or community groups to be invited to volunteer:

C. Any additional ways you will recruit volunteers?

D. How will you train or communicate tracking and litter pickup protocols to volunteers:

E. How will you organize volunteers during the tracking and cleanup event?

- Individual tracking Small groups of people
 Pairs of two Other:

F. Tracking and cleanup tools checklist

- Cell phone First aid kit
 Trash bags Water
 Gloves Sunscreen
 Measuring wheel or tape, if applicable Other:
 Hand sanitizer

G. How will you dispose of the trash after a cleanup?

Step 4: Data Analysis

(See toolkit pages 18-22)

A. Which tools will you use to analyze data from the project?

- Spreadsheets DebrisTracker.org
 Online mapping tools Other:
 GIS software

B. What do you want to understand through your analysis?

- Top litter items
 Common material types of littered items
 Litter densities in different areas

C. What other datasets could be incorporated in your analysis to tell a more impactful story?

Step 5: Community Action

(See toolkit pages 23-25)

A. What behavior changes would you like to see in your community?

B. How will you engage stakeholders around your data analysis and potential solutions?

AUDIENCE	ENGAGEMENT IDEA

C. What other organizations might be good partners in driving action?

D. List ideas for media/social media outreach:
