



PANDEMIC POLLUTION

THE RISING TIDE OF PLASTIC

PPE



MARCH 2021



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About Ocean Conservancy

Ocean Conservancy is working to protect the ocean from today's greatest global challenges. Together with our partners, we create science-based solutions for a healthy ocean and the wildlife and communities that depend on it.

Ocean Conservancy has led the fight for a clean, healthy ocean free of trash since 1986, when the U.S.-based nonprofit launched its annual International Coastal Cleanup (ICC). Since then, Ocean Conservancy has mobilized millions of ICC volunteers to remove trash from beaches and waterways around the world while pioneering upstream solutions to the growing ocean plastics crisis. Ocean Conservancy invests in cutting-edge scientific research, implements on-the-ground projects, and works with conservationists, scientists, governments, the private sector and members of the public to change the plastics paradigm. To learn more about our Trash Free Seas® program visit oceanconservancy.org/trashfreeseas.

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A Message from the CEO

In the past year, the COVID-19 pandemic has taken an unfathomable toll on people around the world. At this point, approximately 12 months since the World Health Organization first declared COVID-19 a pandemic and then-President Trump declared it a national emergency here in the U.S., there have been nearly 120 million coronavirus cases and over 2.6 million deaths worldwide. As we reach this somber milestone, our thoughts are with everyone who has lost someone to the virus, as well as with everyone whose lives have been completely upended.

At the same time, the impact of the pandemic is not limited to human health alone. The pandemic has dramatically increased the use of certain types of plastic products, notably personal protective equipment or PPE but also single-use plastic bags, food and beverage containers, and other single-use plastics that can harm our communities and the ocean and result in significant waste management challenges.

Early in the pandemic, many retail stores and restaurants quickly shifted their business models to focus on delivery and curbside pickup options while pausing indoor operations. Grocery stores that had previously encouraged customers to bring their own reusable bags temporarily reverted back to disposable paper or plastic options—despite research later indicating that surface transmission of the virus is rare. And essential workers in transportation, food and agriculture, and critical manufacturing started to use, out of necessity, the same kind of PPE in the workplace that has always been common in healthcare.

The rest of us became quickly familiar with PPE as well. At some point in the past year, 39 states plus the District of Columbia and Puerto Rico have required people to wear face coverings in public to limit the spread of COVID-19.¹ In states without a mandate, such as Arizona and Florida, many city and county governments established their own mask rules. While not required by any official PPE mandate, many employers and individuals are using disposable

gloves and face shields as an added layer of protection against the virus. Most people now have their own supplies of face coverings, many of which are disposable and not intended for extended reuse.

As we know from decades of experience tracking the problem of plastic pollution, increased use of single-use plastics translates into more plastics in our ocean. Ocean Conservancy partners started tracking PPE found during cleanups using our Clean Swell mobile app in late July 2020. We are grateful that so many volunteers were able to safely conduct cleanups during the pandemic by practicing social distancing and using PPE. Their incredible efforts have supplied us with data that demonstrate how the pandemic is contributing to the problem of plastic pollution.

Ocean Conservancy always starts with data because the most effective solutions are rooted in the best available information. While the numbers alone don't tell us if the cause is ineffective waste management systems, littering or a combination of these plus other factors, we do know this: as long as we produce disposable plastics, some of these plastics are going to end up in the ocean. Over the past year, we've produced and used a lot more PPE, so we're seeing PPE in the ocean and our communities.

This report is intended to shed light on the growing presence of PPE pollution since the start of the pandemic. It includes recommendations for how all of us can help prevent plastics from entering the environment in the first place while focusing efforts to ensure PPE and other plastics are responsibly managed. As we protect our communities and each other in the face of this invisible threat, we can also do more to protect our communities and our ocean from the impacts of the pandemic. Once the need for PPE subsides as the pandemic recedes, we have a real opportunity to reduce our overall plastics footprint and to ensure that the plastics that we use are recyclable, made of recycled content, and stay out of the ocean and our environment.

Janis Searles Jones, CEO

¹ <https://www.aarp.org/health/healthy-living/info-2020/states-mask-mandates-coronavirus.html>



What is PPE?

Personal protective equipment or PPE are wearable items that are designed to keep individuals and the people around them safe from COVID-19. Common types of PPE that volunteers find during cleanups include:



FACE MASKS

Reusable or disposable face coverings are recommended by the CDC in public settings and required on public transportation. Single-use disposable face masks are commonly made from polypropylene, polyurethane, polyacrylonitrile, polystyrene, polycarbonate, polyethylene, or polyester.



GLOVES

Reusable or disposable gloves are recommended by the CDC when cleaning or caring for someone who is sick. Disposable gloves are made from latex, nitrile, or polyvinyl chloride.



FACE SHIELDS

A reusable shield that protects the face and is not currently recommended by the CDC. Face shields are made from polycarbonate.



SANITIZING WIPES

Disposable cloths that contain a chemical solution designed to kill viruses and bacteria. Sanitizing wipes are commonly made from polyethylene terephthalate, polyester, or polypropylene.

Measuring PPE Pollution Worldwide

Health officials in nearly every country in the world are advising residents to wear a face covering to prevent transmission of COVID-19 in certain or all public spaces.²

The demand for personal protective equipment (PPE) during the pandemic caused shortages of masks and gloves early in the outbreak and has fueled tremendous growth in the PPE industry. Consequently, with this increased demand and use we've also seen PPE pollution become ubiquitous in the environment.

PPE is predominantly made of the same kinds of plastic polymers as other familiar plastic products, including single-use products such as bags and bottles. When lost in waterways or the ocean, PPE will likely behave like other forms of plastic pollution with similar characteristics, traveling in ocean currents, washing up on shorelines, and breaking down into microplastics. And like other forms of plastic pollution, PPE is a threat to ocean wildlife. News media have already documented the entanglement threat of ear loops on face masks, and conservation groups have cited animal deaths from ingesting PPE items as well.³

In response to the pandemic, Ocean Conservancy added PPE as a discrete category of trash to its Clean Swell mobile app in late July 2020, ahead of the 2020 International Coastal Cleanup (ICC). The app allows users to report items of trash collected and uploads those data to Ocean Conservancy's global ocean trash database. In a survey of ICC volunteers and coordinators conducted in early 2021, Ocean Conservancy found that 94% of respondents observed PPE pollution at a cleanup in 2020.

Besides reporting PPE found during cleanups (Figure 1), volunteers and coordinators also saw PPE in their communities on a regular basis. Half of the survey respondents reported seeing PPE pollution on a daily basis and another 42% saw PPE in their communities on a weekly or monthly basis (Figure 2). When asked to describe where they observed PPE pollution, a number of

FIGURE 1. Did you see PPE at an ICC cleanup in 2020?

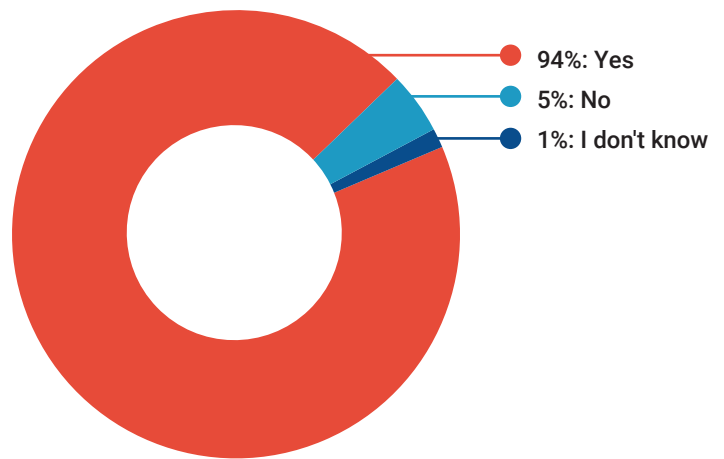
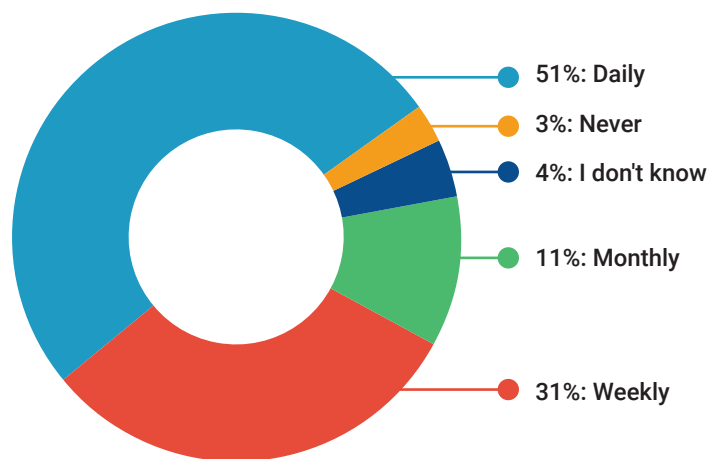


FIGURE 2. How often do you see PPE in your community?

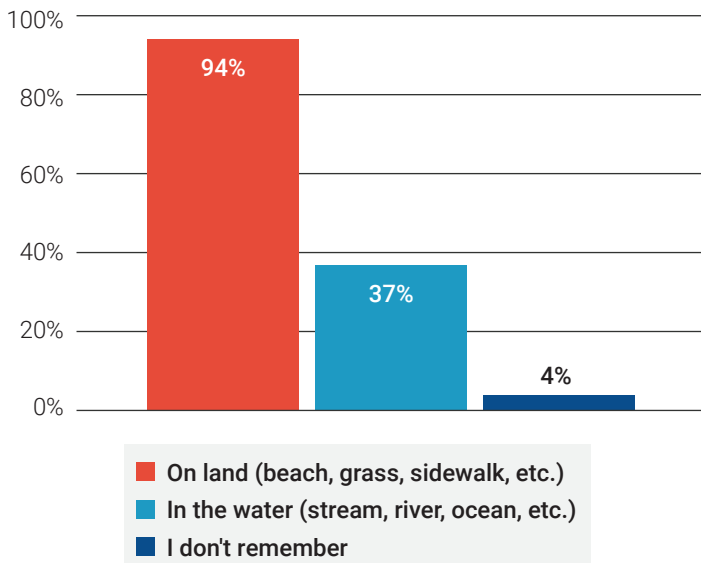


Sample size = 215 respondents

² <https://www.cfr.org/in-brief/which-countries-are-requiring-face-masks>

³ <https://www.bbc.com/news/uk-england-esssex-53474772>; <https://blog.theanimalrescuesite.greatertgood.com/animals-tangled-in-masks/>; <https://phys.org/news/2021-01-macaques-crabs-wildlife-threat-masks.html>

FIGURE 3. Where did you observe PPE during the cleanup?



Sample size = 215 respondents

respondents noted that it tends to accumulate in certain places, such as outside restaurants and bars that require masks for entry to keep their customers safe. Respondents also noted that sanitizing wipes, another form of PPE, are sometimes visible in places where shopping carts are sanitized.

PPE pollution was most commonly found on beaches, the grass, and sidewalks (Figure 3), with 94% of surveyed volunteers and coordinators observing PPE on land. However, 37% of volunteers reported seeing PPE pollution in waterways and the ocean, too.

PPE Pollution During the Pandemic

Data collected by Ocean Conservancy and its global ICC partner network suggest that PPE is making its way into our environment in vast quantities. The raw data alone show that volunteers collected 107,219 individual pieces of PPE in 2020. However, it's important to remember that PPE was added to Ocean Conservancy's mobile app, Clean Swell, in late July of that year, meaning any PPE that was collected before that point would have been captured under other data categories like "Personal Hygiene" or "Other Trash." Indeed, the amount of personal hygiene litter

"The amount of PPE I'm seeing, not just in the streets but also in the canal right here, is alarming and shocking."¹

—A cleanup organizer in Miami Beach, Florida

¹ <https://esemag.com/news/ppe-litter-problem-environment/>

collected between January and July 2020 was three times higher than what was recorded in that same time period for each of the previous three years. Documentation of PPE was likely the primary reason for this increase.

Increases in both of these data categories compared to previous years substantiate the information we acquired through the survey. Nearly 92% of volunteers and coordinators surveyed reported that they proactively collected PPE pollution at cleanups. Several coordinators indicated that when it wasn't collected, it was largely due to perceived health risks from handling PPE. However, 30% of respondents reported that they did not record PPE data at all, again suggesting that the PPE numbers are likely a vast underestimate of what was in fact seen and collected by volunteers and coordinators alike. When advising volunteers on where and how to record PPE data when the PPE category was not available in the app (if, for example, volunteers were unable to update the app to the latest version), approximately 46% of coordinators surveyed reported instructing volunteers to record PPE as "Personal Hygiene" or "Other Trash" items.

PPE Pollution and Mask Use

As of December 2020, two-thirds of American adults reported that they always wear a mask outside of the home.⁴ This number is on the decline, but it still represents a very large amount of potential waste that could become PPE pollution without proper disposal. Researchers at the Centre for Environmental and Marine Studies at the University of Aviero in Portugal estimated that worldwide, 129 billion face masks and 65 billion gloves are used every month of the pandemic.⁵ As we achieve safer, healthier communities by

⁴ <https://consumer.healthday.com/12-21-mask-wearing-declines-even-as-covid-19-touches-more-u-s-lives-poll-2649533284.html>

⁵ <https://pubs.acs.org/doi/abs/10.1021/acs.est.0c02178>

wearing PPE, especially face masks, we should also be striving for a healthier environment by addressing proper management and disposal of PPE items.

Ocean Conservancy’s survey of ICC volunteers and coordinators revealed that at 71% of cleanup locations local or federal mandates required volunteers to wear masks.

Ocean Conservancy’s Clean Swell app does not distinguish sub-categories of PPE (e.g., face masks vs. gloves, etc.). However, eight in 10 ICC participants surveyed reported that face masks were the most common form of PPE they encountered during a cleanup (Figure 4). Comparatively, one in 10 identified disposable gloves as the most common form of PPE. About half of ICC volunteers and coordinators surveyed estimated that more than 75% of PPE found during cleanups was single-use/disposable (Figure 5).

FIGURE 4. What was the most common type of PPE you encountered?

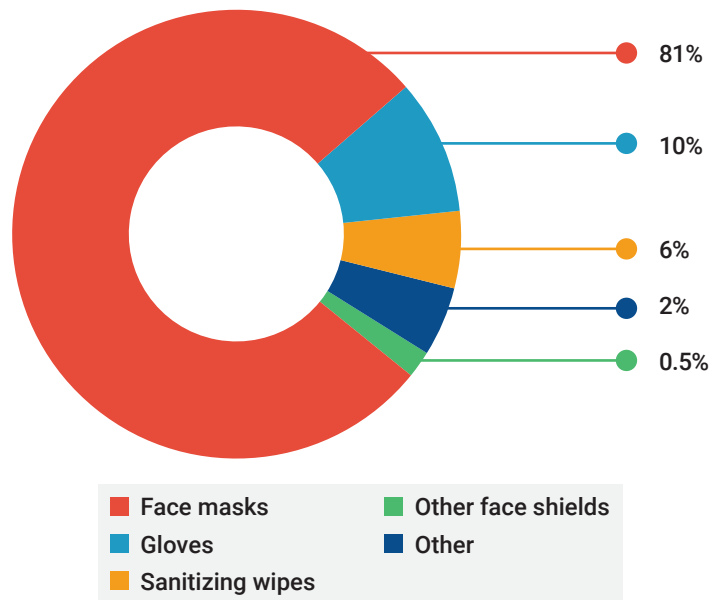
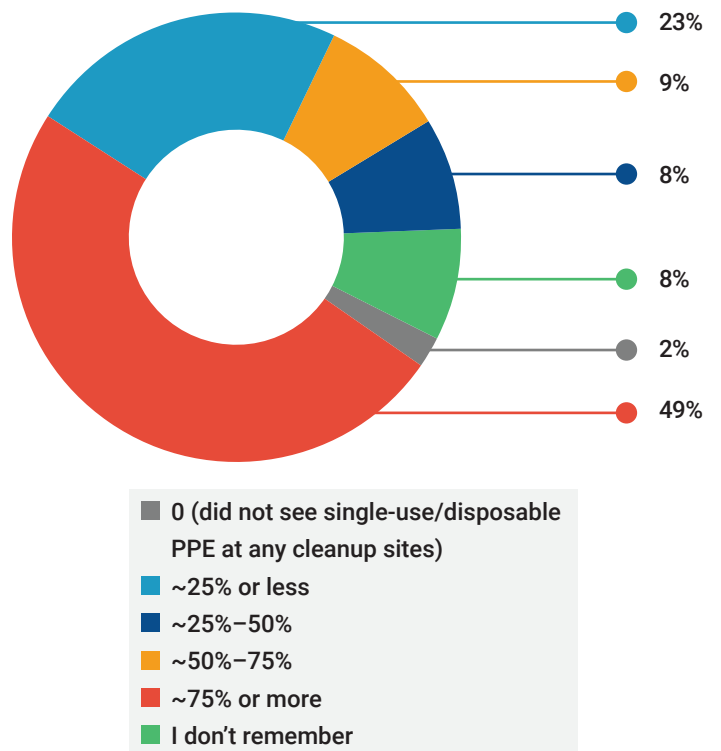


FIGURE 5. What percentage of PPE pollution found was single-use/disposable?



Sample size = 215 respondents

PPE and Wastewater Infrastructure

In addition to threatening wildlife, PPE can strain wastewater infrastructure. Cities across the United States and around the world have reported that blockages and sewer overflows caused by disposable wipes have increased exponentially. “People were always flushing wipes, but at a much, much lower rate and not in as much of a concentrated period of time,” Keith Oldewurtel, chief operating officer at Veolia North America, which operates water and wastewater facilities around the world, told the publication *Smart Cities Dive*. “When COVID-19 came about and people started using the disinfecting wipes, it exploded.”

Wipes caused several mainline sewer clogs in Cincinnati, OH, pump failures and sewer line blockage in Rhode Island, and sanitary sewer overflows in Houston, TX. Besides these infrastructure risks, sanitizing wipes can be a source of microplastic fibers. In one recent study conducted by researchers at the National University of Ireland Galway, 50% of the wipes labeled flushable contained microplastics.¹

¹ <https://www.sciencedaily.com/releases/2020/06/200623104234.htm>



PPE, Microplastics, and Microfibers

Disposable PPE such as face masks and gloves is made from a number of different types of plastic polymers and is therefore likely to contribute to microplastic pollution as it breaks down.¹ Microplastics are defined as any plastic that is 5 millimeters in length or smaller, and are either intentionally made for certain products (like microbeads in beauty products) or result from the degradation of larger plastic items. Plastic items that enter the environment slowly break up into smaller and smaller pieces, eventually forming microplastics. Thread-like microplastics, called microfibers, are produced from textiles shedding or abrading, but can also be formed when larger items containing fibrous plastic materials like cigarette filters break down.²

Two polymers common in PPE, polyethylene (PE) and polypropylene (PP), are frequently detected in ocean fauna, including fish, shellfish, and even marine mammals.³ Many species found to contain PE and PP are also eaten by humans, raising concern about the potential health consequences of exposure to microplastics not only to the marine organisms that ingest them, but also to human consumers. While more research is needed to understand the presence and potential consequences of microplastics in food and beverage products and humans, respectively, the current body of evidence suggests seafood may be a key vector for human exposure.⁴

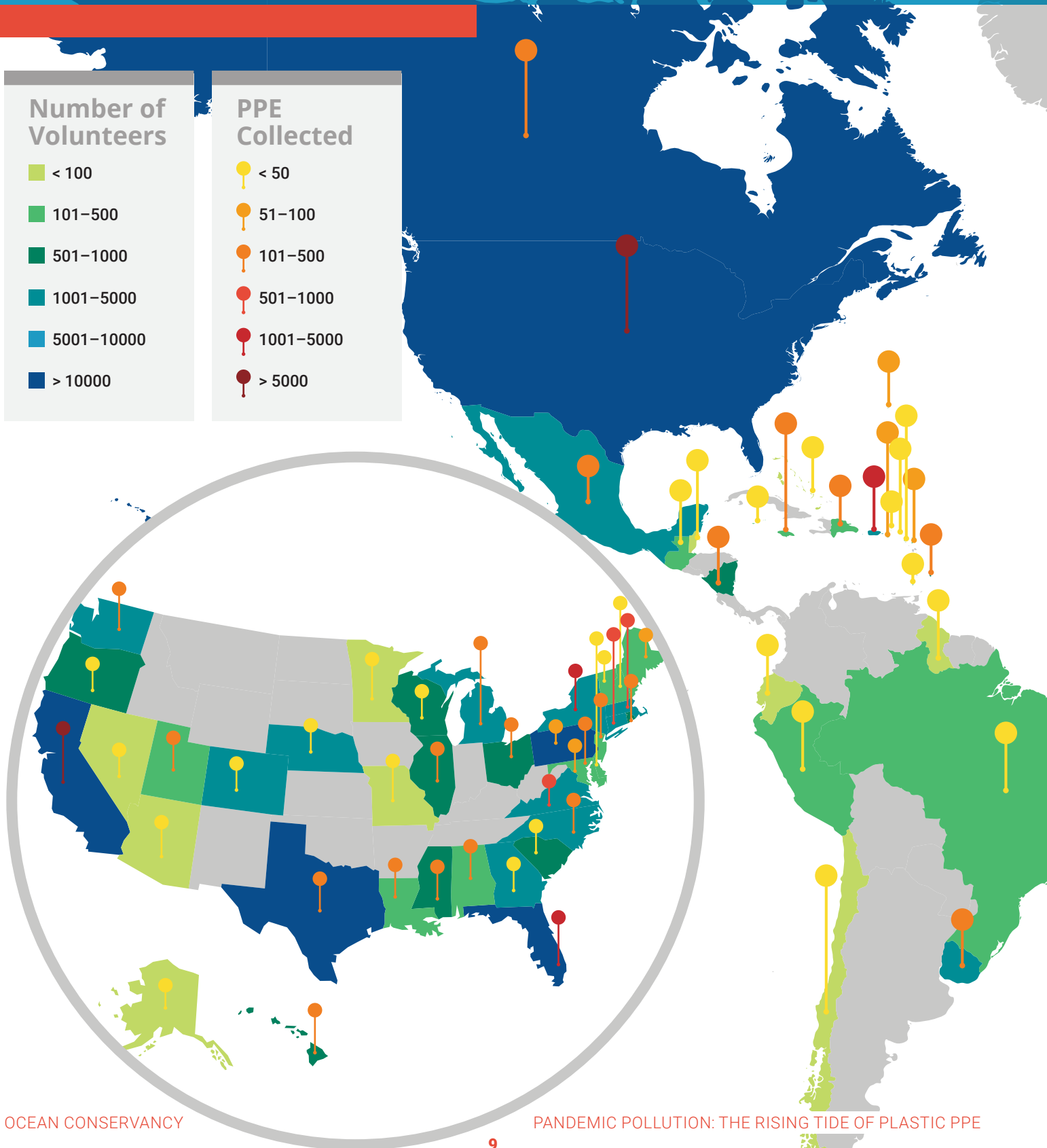
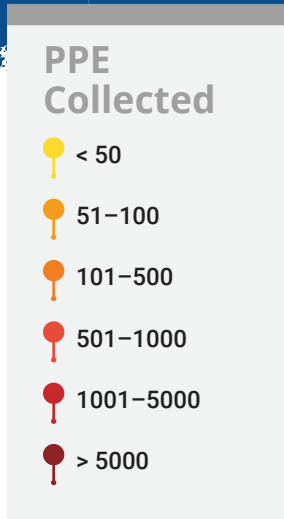
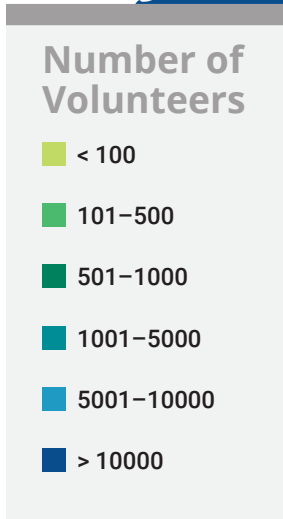
¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7297173/>

² <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0237839>; <https://pubmed.ncbi.nlm.nih.gov/33360456/>

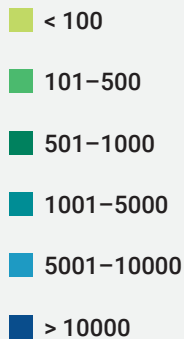
³ <https://www.sciencedirect.com/science/article/abs/pii/S0269749119365996>; <https://www.sciencedirect.com/science/article/pii/S0025326X18304685>; <https://www.sciencedirect.com/science/article/abs/pii/S026974911833241X>; <https://www.sciencedirect.com/science/article/pii/S0025326X15001952>

⁴ <https://pubs.acs.org/doi/10.1021/acs.est.9b01517>

By the Numbers



Number of Volunteers



PPE Collected



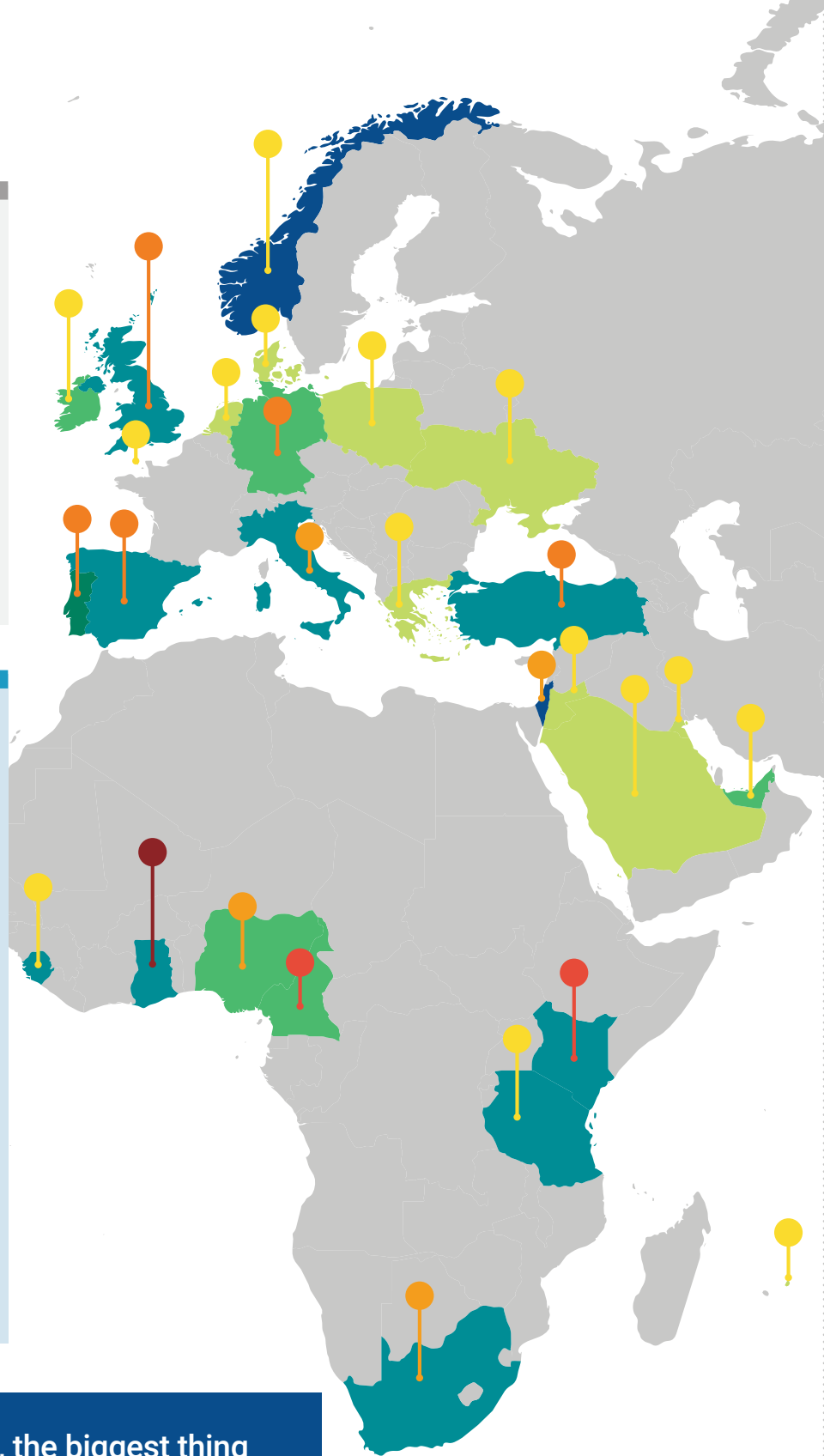
Key Findings

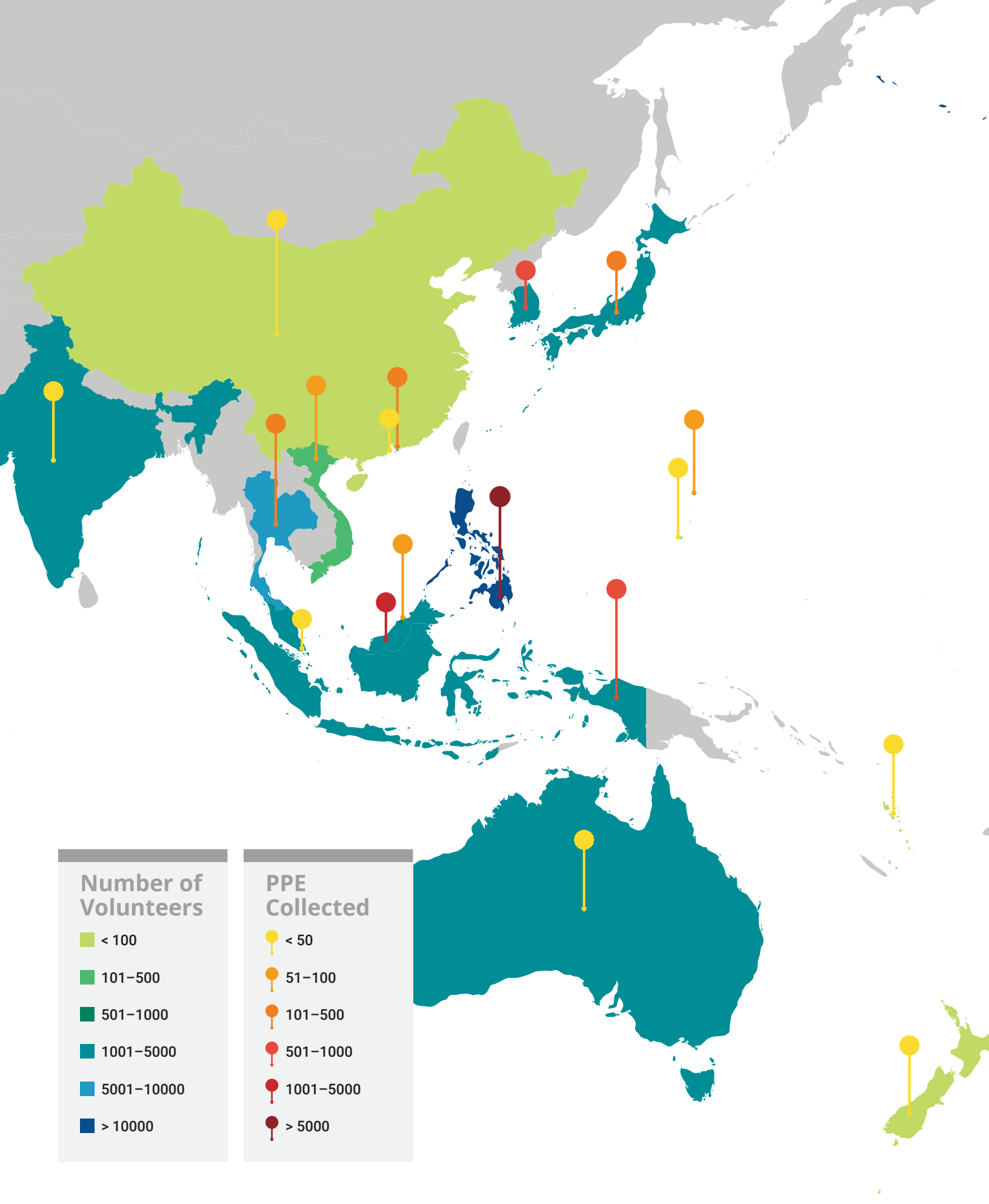
- PPE collected by ICC volunteers in 70 out of 115 participating countries
- 107,219 individual pieces of PPE collected by volunteers
- 94% of volunteers and coordinators surveyed found PPE at a cleanup
- 40% of surveyed volunteers found 5 or more PPE items at a cleanup; over 50% of surveyed volunteers found 1–5 PPE items at a cleanup; less than 2% didn't see any PPE at their cleanups
- Nearly 50% of surveyed volunteers and coordinators reported that 75%+ of PPE was single-use/disposable

“While general litter is status quo, the biggest thing we noticed is that discarded PPE, such as masks and latex gloves, is washing up quite frequently now.”¹

—A cleanup organizer following a cleanup in the UK's Channel Islands

¹ <https://jerseyeveningpost.com/news/2021/02/24/ppe-disposal-plea-after-beach-clean/>







Recommendations for Action

The pandemic has been a stark reminder of how a sudden change to our daily lives can exacerbate existing environmental crises. This has been especially true of plastic pollution, which already reaches every corner of the globe. More than 11 million metric tons of plastics enter our ocean annually, and plastics have been found everywhere from the deepest ocean trenches to the most remote, uninhabited beaches on the planet. All of us everywhere will have a role to play in reversing the environmental impacts of the pandemic.

In the United States, Ocean Conservancy recommends that governments, businesses, and individuals take the following steps to address the scourge of pandemic-related pollution while better preparing ourselves against the impact of future unpredictable crises.

Federal Government

- Implement legislation like the Break Free from Plastic Pollution Act that addresses the full lifecycle of plastics and promotes a circular economy
- Ensure that guidance to address plastic pollution is included in any executive-level actions related to sustainability and federal procurement
- Direct federal agencies to phase out procurement of unnecessary single-use plastics
- Direct funding to reduce the burden and threat of plastics production and waste to the health of marginalized, underserved, and/or vulnerable communities in the United States and worldwide

- Provide robust funding across the government to ensure that all relevant agencies, including the EPA and NOAA, have resources to help address waste management challenges and cleanup needs associated with PPE

State and Local Governments

- Pass state-level policies that:
 - Phase out single-use plastics, particularly those that are difficult or impossible to recycle and that frequently appear as litter on beaches and waterways worldwide during Ocean Conservancy's annual International Coastal Cleanup (e.g., plastic bags, foam food and beverage containers, straws)
 - Create Extended Producer Responsibility programs to ensure the private sector takes greater responsibility for the entire lifecycle of plastic products they produce
 - Establish recycled-content standards to increase demand for recycled plastics

Businesses

- Ensure facilities and locations have sufficient receptacles for customers' and employees' used PPE to be disposed of safely
- If providing reusable PPE to employees or customers, follow health authorities' guidelines
 - CDC recommends masks that have two layers of breathable fabric, cover your nose and mouth, and fit snugly⁶
- Turn used PPE into new products
 - Entrepreneurs in India have made bricks and bedrolls out of discarded PPE
- When sourcing non-PPE plastic materials and products, opt for those made with recycled content and that are easily recyclable to reduce the strain on current waste management systems

Individuals

- Cut the ear loops of masks before disposal
 - Much like six-pack rings, the intact ear loops of a mask can pose an entanglement risk to wildlife
- Dispose of PPE responsibly at home
 - Used PPE should be disposed of in a garbage bag that is tied or otherwise sealed to prevent the contents from escaping



Follow other states' leads:

- **Maine, Maryland, New York, Vermont, Virginia, and the District of Columbia have banned foam food containers**
- **New Jersey passed the strongest single-use plastics ban in the country in November 2020**
- **California passed the most aggressive recycled-content requirement to date for beverage bottles in October 2020**
- **Legislators from California, Hawaii, Maryland, Massachusetts, New York, Oregon, Washington, Colorado, New Hampshire, Vermont, and Maine are working to introduce legislation on Extended Producer Responsibility**
- **California, Hawaii, Connecticut, Delaware, Maine, New York, Oregon, Vermont, and Washington have statewide plastic bag bans**

- Keep a trash bag in your car to stow used PPE when you're not at home
- Don't flush sanitizing wipes
- Follow health authorities' guidelines regarding the use of reusable PPE
 - CDC recommends masks that have two layers of breathable fabric, cover your nose and mouth, and fit snugly
- Conduct a safe, socially distanced or solo cleanup
 - Use Ocean Conservancy's Clean Swell app to track PPE pollution and help inform data-driven solutions to the problem

⁶ <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html>

If it is safe to do so in your community, help Ocean Conservancy track PPE and other pollution using the Clean Swell mobile app. Here are eight steps to safely conduct a solo or small cleanup:



1

PICK A LOCATION

Identify a safe location to clean where social distancing is easily achievable. Think ahead about where you will properly dispose of trash at the location you choose. Monitor your health and the health of your family members before considering a cleanup of any size.



2

GATHER MATERIALS

Gather materials needed. This includes proper Personal Protective Equipment (masks and gloves), hand sanitizer, grabbers, trash bags, closed toed shoes and a reusable water bottle.



3

DOWNLOAD CLEAN SWELL

If you are able, please help us collect important data on the types and amount of trash you remove. Download the Clean Swell application on your phone or other smart device. Be sure to "Allow" location services while using the app.



4

CLEAN UP

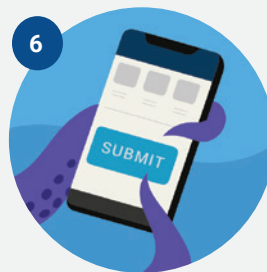
Safely collect trash using gloves, and take pictures to document your efforts. Never pick up any trash items that you are not comfortable with.



5

CAREFULLY REMOVE GLOVES

After you finish collecting items, carefully remove gloves and wash hands and arms with soap and water for at least 20 seconds.



6

RECORD DATA

Follow steps on the Clean Swell app to review and submit your data. Data automatically submit to Ocean Conservancy's database when you see a "Thank You!" screen.



7

PROPERLY DISPOSE OF WASTE

Properly dispose of items collected. Do not place trash bags in overflowing bins. This may cause items to fly away and end up back in the water.



8

SANITIZE

Immediately and thoroughly sanitize any gear used during the cleanup including grabbers, gloves and buckets.

Visit <https://oceanconservancy.org/trash-free-seas/international-coastal-cleanup/clean-icc-2020/> to learn more.



Methodology

Cleanup Data

Data on PPE pollution collected by volunteers were gathered primarily through Ocean Conservancy's mobile application, Clean Swell. Item-count data and other information on location and number of volunteers per cleanup are submitted by app users and automatically enter Ocean Conservancy's online, open-access global database. PPE data collected via other methodologies such as paper data cards are also added to this online system. For this report, global data on PPE, number of volunteers and geographic information were all downloaded using a time filter of January 1, 2020 through December 31, 2020.

Three specific item categories—"Personal Hygiene," "Other Trash," and "Gloves & Masks (PPE)"—were included in the year-over-year analysis. The first two categories have been part of the Clean Swell app and data card since 2016, whereas the PPE category was added to the Clean Swell mobile app and digital version of the data card in late July 2020.

Survey Methods

Two nearly identical surveys were created to answer questions related to PPE encountered and collected through ICC partners

or cleanups. These surveys were virtually distributed to two audiences through email: ICC coordinators (cleanup organizers) and volunteers that had either submitted data to Ocean Conservancy via the Clean Swell mobile app or by sending in paper data cards. Survey questions were tailored to either the ICC coordinator or volunteer groups based on type of involvement in cleanups. The coordinator survey was sent to 726 recipients. The volunteer survey was sent to just under 50 volunteer email addresses that sent in scanned or photographed ICC data cards as well as 300 randomly selected volunteer email addresses pulled from a list of Clean Swell users who submitted at least one cleanup during the time period of January 1, 2020 through January 26, 2021. Survey response was voluntary, with the majority of questions being multiple choice, and an open-ended field for respondents to provide comments at the end. Survey period spanned from January 26, 2021 to February 5, 2021.

Summary statistics were generated in Excel to compare number and percentage of respondent answers for each of the survey questions administered. For questions present on both the ICC coordinator and volunteer surveys, data for these responses were combined.



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