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FACT SHEET

PLASTIC PERIL:
THE WIDESPREAD AND DEVASTATING IMPACTS OF PLASTIC POLLUTION ON OUR OCEANS

Despite numerous, well-publicized studies and news stories revealing the destructive effects that plastics have on terrestrial and marine environments, plastic production continues to increase, and much of the resulting waste is steadily accumulating in our oceans.

Marine debris includes any solid material that is human-made and abandoned in the marine environment. Between 60 and 80 percent of all marine debris comes from plastic products and packaging, and conservative estimates suggest that eight million metric tons of plastic finds its way into the world's oceans every single year.[1] That is equivalent to two Empire State Buildings' worth of plastic going into the ocean every *month*.[2] The majority of this plastic is created from fossil fuels and does not biodegrade. This means that once it is present in marine environments, this pollution will have far-reaching impacts on organisms and ecosystems for centuries to come. Plastic waste impacts organisms from plankton, fish, coral reefs, and seabirds all the way up the food chain to marine mammals and humans.

THE TRUTH ABOUT PLASTICS

- The United States recycles only about 9 percent of its plastic trash.[3]
- Plastic packaging represents 40 percent of total plastic production, and most of this packaging is meant for single use.[4]
- Plastic debris devalues marine ecosystems by as much as $13 billion per year.[5]
- Plastic production is among the most greenhouse gas-intensive industries in the manufacturing sector—and the fastest growing.[6]

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A dolphin with a white plastic shopping bag caught on its fin, swimming off the coast of Brazil.

Plastic is found across marine environments, even in some of the most isolated places on the planet. Images from remotely operated vehicles show plastic bags drifting 10,898 meters (6.8 miles) below sea level in the Mariana Trench, the deepest known place in the world's oceans.[7] Scientists have found traces of 17 different types of plastic embedded in core samples taken from Arctic sea ice.[8] Swaths of plastic nurdles, the small plastic pellets used to manufacture larger products, are scattered on beaches across the globe.[9]

The main sources of marine plastic pollution are land-based. Plastic waste can be carried in urban and storm runoff and sewer overflows; it can start out as beach litter; and it can come from inadequate waste disposal and management, industrial activities, construction, and illegal dumping.[10] It includes items such as cigarette butts, plastic bottles, food wrappers, bottle caps, and straws (Figure 1). These

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ocean plastics can concentrate in large systems of circular ocean currents, known as gyres, resulting in huge offshore "patches" of floating and submerged debris that stretch for miles.[11] However, plastics are present in all oceans, at all depths, creating what may be more accurately envisioned as plastic "soup."

During the 2018 International Coastal Cleanup, most of the top 10 most found waste items were made from plastic—including cigarette butts, which contain plastic filters. This excessive amount of plastic waste is only going to continue year after year unless we take action to stop it.

FIGURE 1: TOP 10 ITEMS COLLECTED DURING THE INTERNATIONAL COASTAL CLEANUP, 2018[12]

While more than half of the plastic debris found in the area known as the Great Pacific Garbage Patch comes from land-based sources, another 46 percent is made up of fishing nets.[13] One study conducted by World Animal Protection, a nonprofit organization, estimates that upwards of 700,000 tons of fishing gear is deposited in the ocean each year.[14]

Abandoned fishing gear (also called "ghost gear") finds its way into the ocean in numerous ways. Nets and traps accidentally fall overboard, get caught on reefs, malfunction and detach from the lines or buoys keeping them afloat, or get cut by boat propellers. Fishers will also intentionally throw damaged gear overboard if they do not want to invest the time or money to repair it or dispose of it properly. In other cases, those who have been fishing illegally may throw gear overboard to get rid of any evidence of their illegal actions. These ghost nets are a problem not only because they pollute marine environments, but because this gear can continue to trap and ensnare sea life for years after it has been discarded.

Additionally, floating plastic debris of all kinds is often confused with food. In 2018, a dead sperm whale washed up on the coast of Spain; necropsy results revealed that the whale's stomach contained 64 pounds of plastic trash.[15] Upwards of 186 species of seabirds have been documented eating plastic—they are attracted to its smell and shine and will ingest it or feed it to their young.[16] Similarly, sea turtles eat floating plastic bags, mistaking them for jellyfish. To date, scientists have documented harmful impacts of marine plastic pollution on 800 different marine species.[17] To learn more about how plastic pollution impacts marine life, see our accompanying fact sheet, "Choked: The Deadly Impacts of Plastic Pollution on Marine Life."[18]

Adding to the complexity of the matter is the increasing evidence that microplastics—plastic particles or fibers that are less than 5 millimeters in diameter, about the size of a sesame seed—are entering marine food webs. While some microplastic beads are intentionally added to personal care products and cosmetics such as toothpaste, face wash, and body scrub, the majority of microplastics are generated from the chemical and physical breakdown of larger plastic materials, such as packaging, and synthetic fibers used in clothing and fishing gear.[19]

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Dead fish tangled in a discarded "ghost" fishing net.

MICROPLASTIC FIBER FACTS

- With a single wash, one fleece garment can release 2 grams' worth of synthetic fibers.[20]
- Microplastic fibers are so small and lightweight that a typical wastewater treatment plant is unable to filter and capture them.
- Microplastic fibers have been found in the Mariana Trench, which is the deepest part of the ocean and deepest location on Earth.[21]
- One study in California found that 25 percent of fish sampled had microplastics (primarily fibers) in their stomachs.[22]

Pieces of microplastics and fishing net from the breakdown of discarded marine debris, collected from Papahānaumokuākea Marine National Monument, Hawaii.

As plastic waste breaks down into microplastics, smaller and smaller organisms are at risk of consuming these particles. Studies demonstrate that planktonic organisms, which serve as a critical mechanism for ocean carbon sequestration and oxygen production and are a food source for other marine organisms, are now ingesting plastic particles and fibers.[23] The full extent of how plastics affect these organisms (and those that consume them) has yet to be determined. But preliminary research shows that microplastics disrupt functions of the endocrine system, impact metabolism, increase mortality in zooplankton, and impede the growth and efficiency of photosynthesis in microalgae.[24]

Also of concern is that many plastics adsorb other toxic chemicals such as DDT, polychlorinated biphenyls (PCBs), and heavy metals, sometimes in concentrations as much as one million times higher than the surrounding environment.[25] These toxic plastics not only harm the marine life that ingests them but can travel up the food chain to potentially harm humans who eat plastic-contaminated seafood. [26]

THE PATH FORWARD

To prevent marine ecosystems from becoming completely inundated with plastic, we need to tackle the issue at its source by preventing plastic from entering the environment in the first place. Studies of the Great Pacific Garbage Patch estimate that upwards of 80 percent of the debris found in this patch originates from land-based sources, primarily in North America and Asia.[27] While marine plastic pollution is often attributed to poor waste management of products that could be recycled, the reality is that most of this pollution comes from unrecyclable products and single-use plastic items. To prevent plastic from reaching the ocean, then, we must transform the ways we generate and handle waste—beyond recycling.

Marine debris, including plastic fishing buoys and glass bottles, washed ashore on a beach at Laysan Island in the Hawaiian Islands National Wildlife Refuge.

NRDC is working to reduce the amount of new plastic produced, slash the use of plastic packaging, and expand recycling infrastructure and capabilities. This means pushing for greater responsibility from both consumers and producers. To accomplish this, NRDC is advocating for policies that require manufacturers to invest substantially, both financially and logistically, in ensuring that their products and packaging can be reused or recycled after their first life.[28] If producers are responsible for the end-of life recycling of the products they manufacture, they will be incentivized to incorporate more sustainable practices into their production lines and design products that are more durable and more easily recyclable. They will also share the logistical and financial responsibility for managing their products at end-of-life.

GOVERNMENT ACTIONS TAKEN TO REDUCE PLASTIC POLLUTION

To date, states across the country have taken the initiative to pass legislation and adopt policies to reduce plastic pollution. These actions have helped many states decrease their waste and educate their residents about the dangers of plastic. For instance:

- In 2014, California became the first state to pass statewide legislation to ban the use of carry-out plastic grocery bags (SB 270). NRDC worked with partner groups throughout the state to secure this legislation and to defend the law in 2016, when the plastics industry attempted to overturn it through the state's referendum process. Californians resoundingly confirmed their commitment to banning single-use plastic bags in the state, beating back Proposition 67 with 53 percent of the vote.
- Since California's action, seven other states—Connecticut, Delaware, Hawaii, Maine, New York, Oregon, and Vermont—have banned single-use plastic bags.[29]
- Maine has banned the use of food containers made of expanded polystyrene foam (Styrofoam) in restaurants, coffee shops, and grocery stores. This law will go into effect in 2021.
- New York City banned polystyrene foam food and beverage containers (and packing "peanuts") as of 2019.
- More than 120 towns in California have banned the use of polystyrene foam in various applications.[30]
- Starting in 2019, full-service restaurants in California and DC stopped providing single-use plastic straws unless specifically requested by the customer.[31]

While these steps are a great start, more states need to adopt similar policies, and legislation must advance at federal, state, and local levels to reduce plastic production and use and to require packaging to be reusable, recyclable, or compostable. At the federal level, in 2015, the U.S. Congress passed the Microbead-Free Waters Act, prohibiting the production and distribution of cosmetics containing plastic microbeads.[32] Much more remains to be done.

GET INVOLVED

People across the world are taking action to combat plastic pollution in their own ways. Whether it is educating friends, reducing or reusing products, or calling elected officials, there are many ways individuals can make a difference. Ready to help in the fight against plastic pollution? For tips and advice, check out "10 Ways to Reduce Plastic Pollution" at https://www.nrdc.org/stories/10-ways-reduce-plastic-pollution, and see our plastics overview at https://www.nrdc.org/stories/single-use-plastics-101.

FREQUENTLY ASKED QUESTIONS ABOUT PLASTIC POLLUTION

Q: How big is the Great Pacific Garbage Patch?

A: A 2018 study estimates that the Great Pacific Garbage Patch contains at least 79,000 tons of ocean plastic and is twice the size of the state of Texas.[33] However, while it can be helpful to refer to a land mass to conceptualize the size of the problem, this description can be misleading. Plastic pollution gets concentrated in five large gyres where ocean currents converge, but these are not the only places in the ocean where plastic is found. And referring to ocean plastic pollution as "garbage patches" may create the inaccurate impression that most plastic pollution consists of large pieces that float on the surface of the ocean; the reality is that most of the plastic materials in the ocean are very small and distributed throughout the water column. The "garbage patch" is more like "garbage soup."

Q: Can't we just clean up the plastic?

A: Unfortunately, solving the problem of marine plastic pollution is not as simple as picking it all up. While a lot of plastic pollution is concentrated in the gyres, it is not floating in a single mass on the surface. Pieces of plastic are found at every depth. Plastic also breaks down into tiny particles in the ocean, making cleanup efforts very difficult. Additionally, it is challenging to remove the plastics from the ocean without also removing or damaging marine life. Considering these difficulties, it is important that we work toward solutions that prevent plastic from entering the waste stream in the first place.

Q: Are bioplastics the solution?

A: The term *bioplastics* is increasingly being used to refer to a wide range of products intended as alternatives to traditional plastics. The term, though, does not necessarily signify that a material is free of fossil fuels, compostable, or otherwise ecologically preferable. Some bioplastic products are entirely plant-derived, while others are made at least partly from fossil fuels. Some of them are compostable, while others are not. In some cases, plastics claim to be biodegradable, which is not the same as compostable. *Biodegradable* may mean only that a product will eventually decompose, but not necessarily within a specified time frame or to a specified particle size.[34] While these products offer the promise of "green" alternatives to traditional plastics, the reality is more complex. Even plant-derived plastics that are certified as compostable are typically designed to break down efficiently only in commercial composting systems. And even if plastics are plant-based and compostable, if they become litter, they can persist long enough to harm water systems and wildlife.

The production of some bioplastics is also potentially problematic. Replacing some current plastics with plant-based bioplastics (especially those made using agricultural residues, which otherwise would be treated as waste) is a promising way to reduce our use of fossil fuels. However, the most widely available bioplastics today are based on corn. While these represent a positive step toward finding alternatives to nonrenewable, fossil-fuel-derived plastic, they rely on the production of corn, which raises concerns about agricultural impacts related to land use, food production, and global warming. More research is needed to develop better products that will reduce our reliance on nonrenewable resources and address concerns associated with marine plastic pollution without causing harm in other areas.

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