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Marine Debris: NOAA's Role

Researchers have found marine debris, especially plastic items, to have some effects on humans, wildlife, and the environment, but the extent of these impacts is currently unclear. Congress has directed the National Oceanic and Atmospheric Administration (NOAA) or the Secretary of Commerce (through NOAA) to lead federal government efforts to address marine debris and has enacted additional marine debris-related legislation in recent years. Members of Congress periodically consider directing NOAA and other federal agencies to take additional action to prevent and address marine debris, domestically and internationally.

What Is Marine Debris?

Congress has defined *marine debris*, also known as *marine litter* and *anthropogenic debris*, to include “any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment or the Great Lakes” (33 U.S.C. §1956). Marine debris can be made of plastic, glass, metal, or wood. Plastic is the most abundant type of marine debris in shoreline and oceanic surveys. Plastic debris comes in a range of sizes and types, from tiny pieces (*microplastics*) to larger items, such as food wrappers, bottles, bags, foam materials, and fishing gear (*macroplastics*).

NOAA identifies microplastics as plastic particles less than 5 millimeters (0.2 inches) in size, including *nanoplastics*, which are less than 1 micrometer. Microplastics can be categorized as primary or secondary. Primary microplastics are manufactured as microbeads, capsules, fibers, nurdles, or pellets and are used in cosmetics, personal care products, industrial products, and synthetic textiles. Secondary microplastics form through the degradation and fragmentation of larger plastic items.

Location of Marine Debris

Marine debris has been recorded in numerous marine environments extending from the ocean surface to the sea floor, including shorelines (**Figure 1**), coral reefs, polar regions, and estuaries. Marine debris has also been found within oceanic *garbage patches*—areas of rotating ocean currents that can accumulate dense concentrations of marine debris. A dynamic combination of factors influences local accumulation, including marine debris size and density, proximity to human population centers, ocean currents, and wind. These factors also make it difficult to determine an item's provenance or establish an accurate estimate of the total mass of marine debris currently in or entering the marine environment. For example, NOAA's estimate of the total number of pieces of plastic on the U.S. shoreline in 2017 ranged from as few as 20 million pieces to as many as 1.9 billion pieces, a near 100-fold difference.

Figure 1. Marine Debris on a Hawaiian Shoreline



Source: NOAA Marine Debris Program.

Sources of Marine Debris

Marine debris originates from ocean- or land-based sources. However, determining the exact source of an item can be difficult. Ocean-based sources primarily include derelict fishing gear (e.g., nets, lines), abandoned and derelict vessels and structures, and equipment or waste released from at-sea vessels and structures. Some countries also may allow the disposal of municipal and industrial waste directly into the ocean, although the practice is prohibited or regulated in many developed countries.

Mismanaged land-based waste has found pathways to marine environments as well. Mismanaged waste generally includes littering or inadequate disposal (i.e., disposal in an open dump or a poorly contained landfill). The United States and other developed countries have laws prohibiting such practices; however, some countries lack such laws or have low observance of the laws. Rain can wash litter and poorly managed wastes into storm ditches and drains, discharging it to rivers and streams that may provide a pathway to the ocean. Some researchers have found that rivers act as major transport pathways for waste into the ocean. Extreme natural events (i.e., flooding, tsunamis, mudslides, or hurricanes) also may create debris or carry it into nearby waterways. There may be other sources of land-based debris that are more difficult to identify. For example, studies have found that some wastewater treatment plants discharge microplastics. How much debris is discharged, what amount reaches the ocean, and its original source may be uncertain.

Impacts on Humans, Wildlife, and the Environment

According to NOAA, marine debris has varying effects on humans, wildlife, and the environment; however, many

aspects are poorly understood. Debris at the water's surface can cause navigation and boating hazards, whether through damage to vessels on impact or via tangled propellers and clogged intake pipes. Shoreline communities with high amounts of marine debris may experience adverse economic effects on local tourism. Some researchers have found microplastics in food items and in the air and soil, although the effects on human health are still unknown.

Wildlife may become entangled in marine debris and, as a result, can experience injury, illness, suffocation, starvation, and death. Wildlife also are at risk of ingesting marine debris, which may lead to starvation, internal injury, and blockage; it also may provide a pathway for toxic constituents associated with certain types of marine debris, such as plastics, to be absorbed by wildlife. According to NOAA, marine debris may negatively affect individual organisms, but its impacts on populations and communities remain unclear. Marine debris may cause habitat degradation to varying degrees, including by providing transport to non-native and invasive species.

NOAA's Role

In 2006, Congress enacted the Marine Debris Research, Prevention, and Reduction Act (P.L. 109-449; 33 U.S.C. §§1951 et seq.). The act has been amended several times, including by the Marine Debris Act Amendments of 2012 (P.L. 112-213, which renamed the act to the Marine Debris Act), the Save Our Seas Act of 2018 (SOS Act of 2018; P.L. 115-265), and the Save Our Seas 2.0 Act (SOS 2.0; P.L. 116-224) in 2020. P.L. 117-263, enacted in 2022, made changes to the authorization of appropriations for NOAA's Marine Debris Program (MDP) as well.

The Marine Debris Act, as amended, is NOAA's primary authority related to marine debris and establishes NOAA's MDP to "identify, determine sources of, assess, prevent, reduce, and remove marine debris and to address the adverse effects of marine debris on the [U.S. economy], the marine environment, and navigation safety." According to NOAA, the MDP achieves its mission through six program pillars: prevention, removal, research, monitoring and detection, response, and coordination.

SOS 2.0 amended the Marine Debris Act to increase the authorization of appropriations for the MDP to \$15 million for certain activities and to direct the Secretary of Commerce to work with heads of other federal agencies to combat marine debris by increasing innovation in methods and effectiveness of efforts (§101). SOS 2.0 also directs NOAA to fulfill a variety of new responsibilities (codified at 33 U.S.C. §§4201 et seq.). The law

1. establishes the Marine Debris Foundation (MDF), to support NOAA's marine debris activities and other efforts, and authorizes \$10 million for the Department of Commerce for each of FY2021 through FY2024 to use as a match for nonfederal contributions made to MDF (Subtitle B);
2. directs the Secretary of Commerce to establish and administer the Genius Prize for SOS Innovation to

"encourage technological innovation with the potential to reduce plastic waste" and associated pollution, and authorizes up to \$1 million for the effort (Subtitle C);

3. directs NOAA, Department of Commerce leadership, or the Interagency Marine Debris Coordinating Committee (IMDCC) to report on or study various marine debris-related issues, including innovative uses of plastic waste (§131), microfiber pollution (§132), U.S. plastic pollution data (§133), sources and impacts of derelict fishing gear (§135), and expansion of derelict vessel recycling (§136); and
4. directs the Under Secretary of Commerce to establish a pilot program to assess incentives for fishermen to collect and dispose of marine debris (§137).

SOS 2.0 also directs several other federal agencies (National Institute of Standards and Technology; U.S. Environmental Protection Agency [EPA]; and Department of State) to support marine debris research, prevention, removal, and beneficial use efforts in various ways.

NOAA may also address marine debris under other authorities, including the Coastal Zone Management Act (16 U.S.C. §§1451 et seq.), Endangered Species Act (16 U.S.C. §§1531 et seq.), Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§1801 et seq.), Marine Mammal Protection Act (16 U.S.C. §§1361 et seq.), National Marine Sanctuaries Act (16 U.S.C. §§1431 et seq.), and National Sea Grant College Program Act (33 U.S.C. §§1121 et seq.), among others.

Congress has appropriated funding for marine debris activities through annual and supplemental appropriations laws. For example, Congress appropriated \$6.4 million to MDP in FY2024 via P.L. 118-42. Congress also provided \$200 million for NOAA's marine debris activities over five years through the Infrastructure Investment and Jobs Act (P.L. 117-58), and additional funding in P.L. 117-169, commonly known as the Inflation Reduction Act.

Interagency Coordination

The Marine Debris Act established the IMDCC (33 U.S.C. §1954), with NOAA as chair. The IMDCC coordinates federal agency activities and makes recommendations on research priorities, monitoring, and regulatory action. The Marine Debris Act requires the IMDCC to include senior officials from NOAA, the Departments of the Interior and State, EPA, the U.S. Coast Guard, and the U.S. Navy. The act provides the Secretary of Commerce the discretion to invite representatives from other federal entities; these currently include the Departments of Energy and Justice; Marine Mammal Commission; National Aeronautics and Space Administration; National Science Foundation; and U.S. Agency for International Development.

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