

# TURNING THE TIDE ON TRASH

**A LEARNING GUIDE ON MARINE DEBRIS**



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### **DIVE DEEPER:** Other Resources on Marine Debris

- NOAA's Marine Debris Program website: [www.marinedebris.noaa.gov](http://www.marinedebris.noaa.gov)
- EPA's Marine Debris website: <http://water.epa.gov/type/oceb/marinedebris/index.cfm>



# Acknowledgments & History of “Turning the Tide on Trash”



This document was originally developed in 1992 for the US Environmental Protection Agency's (EPA) Oceans and Coastal Protection Division by Eastern Research Group, Inc., of Lexington, Massachusetts. It was revised and updated in 2007 by Sheavly Consultants, Inc. of Virginia Beach, Virginia with support from the National Oceanic and Atmospheric Administration's (NOAA) Marine Debris Program through Contract Number AB133F06CN0193, "Web-based Education Campaign for Marine Debris Awareness & Prevention." Portions of the curriculum were updated in 2012 by the NOAA Marine Debris Program.

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# For Educators and Parents: How to Use This Learning Guide

**Turning the Tide on Trash: A Learning Guide on Marine Debris** is an interdisciplinary guide designed to provide maximum flexibility in the classroom. The guide can be used as a stand-alone teaching tool, or individual activities within the guide may be used to supplement work in other subject areas. Students searching for science fair projects can also adapt some of these lessons into research projects.

## Educational Standards

The lessons in **Turning the Tide on Trash** provide understandings for various science-related personal and societal challenges as found in many states' educational standards. The lessons include scientific inquiry, pollution as an environmental problem, the role of technology and personal decisions in relation to environmental issues, as well as human impact on the survival of other species and habitat. These lessons will develop many skills, including writing, research, map reading, analyzing, classifying, data collecting, comparing and contrasting, experiment design, hypothesizing, and observing. Each lesson begins with a list of learning skills and subject areas. In addition to science, the lessons incorporate art, language arts, mathematics, and social studies.

## Ocean Literacy Principles

The lessons also are aligned to Principle 6, Essential Principle e of the Ocean Literacy Principles, which provide a framework to increase the literacy of students with respect to ocean science.

**Ocean Literacy Principle 6: The oceans and humans are inextricably interconnected**  
*Essential Principle e.* Humans affect the oceans in a variety of ways. Laws, regulations and resource management affect what is

taken out and put into the ocean. Human development and activity leads to pollution (point source, non-point source, and noise pollution) and physical modifications (changes to beaches, shores, and rivers). In addition, humans have removed most of the large vertebrates from the ocean.

For more information on Ocean Literacy, visit <http://oceanliteracy.wp2.coexploration.org/>

## A Timely and Urgent Topic

In the past, litter on beaches and along inland waterways was considered primarily an eyesore – unpleasant to look at, but otherwise not all that harmful. Through research and education, people have come to realize that marine debris has serious impacts on the marine environment, marine wildlife, human health and safety, navigation, and the economy.

Abandoned fishing nets and related gear, plastic tarps, and other debris can smother and crush sensitive coral reef and seagrass ecosystems and their benthic (bottom-dwelling) species. Each year, thousands of marine animals are caught in, strangled by, or ingest various forms of debris. Medical and personal hygiene-related debris, including syringes and broken glass, pose obvious dangers to barefooted beach-goers when it washes ashore. Coastal communities lose revenue when littered beaches must be closed or cleaned up, and the fishing industry must absorb the annual costs to replace or repair vessels and gear damaged by floating and abandoned debris.

Fortunately, while marine debris is one of the most widespread pollution problems facing the world's ocean, it is also one for which



## FOR INLAND CLASSROOMS

Although this learning guide focuses on marine debris, trash is found in other aquatic environments such as ponds, lakes, rivers, and streams. Most of the concepts associated with marine debris can apply to all aquatic debris. Therefore, the use of this learning guide should not be limited to coastal areas. Teachers in inland communities can replace the term marine debris with aquatic or waterborne debris.

individual citizens – including students and children – can become an immediate part of the solution. That’s because all marine debris can be traced back to a single source – people. For the last few decades, a great deal of our solid waste stream has consisted of durable synthetic materials that can remain in the environment for many years, causing harm to wildlife and habitat along the way. With the world’s coastal populations on the rise, it is likely that the amount of debris entering the oceans will also increase. Consequently, it is important that we act now to keep debris out of our oceans and waterways and preserve the quality of the marine environment.

## Connecting People’s Behavior to Marine Debris

Marine debris is 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. It can enter the environment either directly through human action or indirectly when blown or washed out to sea via rivers, streams, and storm drains. One of the learning guide’s central messages is that any trash that is disposed of improperly can potentially enter the ocean or other waterways, and anyone who disposes of trash improperly can be a source of marine debris! Hopefully, when people are educated about the sources and effects of marine debris, they will be less likely to contribute to the problem.

The lessons in this learning guide are designed to increase students’ awareness of the impacts of marine debris and to teach them about pollution prevention techniques. At the same time, the activities strive to inspire an appreciation of the ocean and a commitment to the preservation of its water quality, beauty, and wildlife.

## Other Pollution in the Ocean

Marine debris is not the only form of marine pollution. Marine pollution also includes forms of sewage, oil, gasoline, toxic chemicals, fertilizer, animal wastes, and pesticides that are released on land or empty into the ocean.

## Education: The First Step

As with any complex problem, education is the first step to lasting, effective solutions. Marine debris is an issue that will require continued attention for generations to come. It is essential that education start with the decision-makers of the future – our children. Unlike many environmental issues, children can play a direct and significant role in reducing the marine debris problem. Every child who learns to dispose of trash properly can be one less source of litter and marine debris. Every child who volunteers to participate in a local beach cleanup campaign can help to improve the current marine debris problem. The US Environmental Protection Agency (EPA) and the National Oceanic and Atmospheric Administration (NOAA) envision that this learning guide, combined with your personal efforts, will help to ensure the future welfare of our ocean by instilling in our young people an environmental ethic that will last a lifetime.

## Diving Deeper

A wealth of additional information and educational resources can be found on NOAA’s Marine Debris Program website:

**[www.MarineDebris.noaa.gov](http://www.MarineDebris.noaa.gov)**

## How This Learning Guide Is Organized

The learning guide has three teaching units, each of which opens with several pages of background information that will prepare the educator to present the following activities:

**UNIT ONE: Definition, Characteristics, and Sources of Marine Debris.** In this unit, students will examine what marine debris is, where it comes from, and how it enters the marine environment.

**UNIT TWO: Effects of Marine Debris.** In this unit, students will explore the effects of marine debris on wildlife and coastal communities and the potential hazards it poses to humans.

**UNIT THREE: Working Towards Solutions.** In this unit, students will learn steps they can take to prevent marine debris, investigate what individuals and organizations are doing about the problem, and explore ways to educate others about possible solutions.

The learning guide also contains a **Glossary** that contains definitions of the key terms that are introduced throughout the text in **orange-colored, bold type**.

As a final note, keeping a collection of different examples of marine debris in a box in the classroom will come in handy when introducing students to the characteristics of marine debris and its effects. In addition, activities throughout the learning guide call for the use of actual items of marine debris, if they are available. For students who may not have the opportunity to visit aquatic environments, seeing and handling actual debris may give them a better understanding of its potential effects. Adding this hands-on aspect also gives activities a real-world focus and helps spur students' curiosity and motivate them to learn.

While the lessons include suggested grade levels, educators can use the "Extensions" found at the end of each lesson to vary the scope and make the lesson appropriate for younger or for more advanced students.

### Lessons by Grade Level

#### UNIT ONE:

The Definition, Characteristics, and Sources of Marine Debris

|                                    |            |
|------------------------------------|------------|
| Coming to Terms with Marine Debris | Grades 1-6 |
|------------------------------------|------------|

|              |            |
|--------------|------------|
| Trash Traits | Grades 1-6 |
|--------------|------------|

|                        |            |
|------------------------|------------|
| A Degrading Experience | Grades 5-8 |
|------------------------|------------|

|                             |            |
|-----------------------------|------------|
| Marine Debris – Data Mining | Grades 6-8 |
|-----------------------------|------------|

|                 |            |
|-----------------|------------|
| Waste Inventory | Grades 3-9 |
|-----------------|------------|

|                                                                   |            |
|-------------------------------------------------------------------|------------|
| Sources of Marine Debris – From Street to Surf, From Hand to Sand | Grades 5-9 |
|-------------------------------------------------------------------|------------|

#### UNIT TWO:

The Effects of Marine Debris

|                                   |            |
|-----------------------------------|------------|
| Marine Animals and Harmful Debris | Grades 2-4 |
|-----------------------------------|------------|

|                |            |
|----------------|------------|
| All Tangled Up | Grades 1-4 |
|----------------|------------|

|                               |            |
|-------------------------------|------------|
| How Harmful Is Marine Debris? | Grades 3-7 |
|-------------------------------|------------|

#### UNIT THREE:

Working Towards Solutions

|                       |            |
|-----------------------|------------|
| Nations and Neighbors | Grades 4-7 |
|-----------------------|------------|

|                      |             |
|----------------------|-------------|
| A Scientific Cleanup | Grades 9-12 |
|----------------------|-------------|

|                                  |             |
|----------------------------------|-------------|
| Communicating for a Clean Future | Grades 8-12 |
|----------------------------------|-------------|

|               |             |
|---------------|-------------|
| Taking Action | Grades 5-12 |
|---------------|-------------|



# Working Towards Solutions



**Derelict fishing nets collected from reefs and shorelines in the Northwestern Hawaiian Islands.**

NOAA PIFSC

Many people are focused on solving the marine debris problem. Working through governments, organizations, and research institutions, people are actively developing solutions. Some of these groups are developing educational programs to encourage people to prevent marine debris. Other organizations are conducting projects aimed at removing debris from the marine environment through beach cleanups, adopt-a-beach programs, and other initiatives. Scientists conduct research to better understand the sources, movement, and fate of marine debris, and to develop tools that will help decrease marine debris impacts in our oceans and coastal habitats. In addition, local, state, federal, and international laws have been established to regulate commercial and recreational activities that frequently result in the generation of marine debris.

*Working through governments, organizations, and research institutions, people are actively developing solutions.*

## What Governments Are Doing To Address Marine Debris

Many nations are engaged in multiple efforts to prevent marine debris, including passing laws, conducting or funding research, and working cooperatively with industry and **environmental groups**. In the United States, the Interagency Marine Debris Coordinating Committee – including the National Oceanic and Atmospheric Administration (NOAA), the US Environmental Protection Agency (EPA), the US Coast Guard, the Department of the Interior, the Department of State and several other federal agencies – addresses marine debris issues (<http://marinedebris.noaa.gov/about/imdcc.html>). Since marine debris is a global problem that has no political boundaries, many groups are working to address these issues, including the United Nations Environment Programme (UNEP) through their Regional Seas initiative for marine litter.

## MARINE DEBRIS LEGISLATION AND POLICY

In the United States there are many laws that regulate litter and debris both on land and in the sea. The following are some of the major laws addressing marine debris. For more information on any of these laws, visit <http://marinedebris.noaa.gov> and the websites listed.

### FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972

Established in 1972 and amended in 1977, this law became commonly known as the Clean Water Act, which established pollution discharge regulations for US waters, set water quality standards, and gave the country's Environmental Protection Agency (EPA) authority over pollution control programs

<http://cfpub.epa.gov/npdes/cwa.cfm>

### COASTAL ZONE MANAGEMENT ACT

Established in 1972, the Coastal Zone Management Act authorizes the National Oceanic and Atmospheric Administration to approve and fund state programs that regulate land-based pollution discharges and works to preserve, protect, develop, restore and enhance the United States' coastal zone resources through state coastal management planning.

[http://coastalmanagement.noaa.gov/czm/czm\\_act.html](http://coastalmanagement.noaa.gov/czm/czm_act.html) or <http://www.nature.nps.gov/water/policies/coastalzonemanagementact.cfm>

### MARINE PROTECTION, RESEARCH AND SANCTUARIES ACT (MPRSA)

Established in 1972, the Act gives the US Coast Guard and EPA domestic authority to implement the London Convention in regulating the dumping of materials into ocean waters. This legislation distinguishes between ships' normal operational discharges [regulated in MARPOL and implemented domestically through APPS (see below)] and dumping of wastes from vessels (covered by the London Convention and implemented domestically by the Ocean Dumping Act).

<http://www.epa.gov/regulations/laws/mprsa.html>

### INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS (MARPOL)

Established in 1973 and modified in 1978, the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) created international guidelines to prevent ship pollution. MARPOL has six annexes covering oil discharge, hazardous liquid control, hazardous material transport, sewage discharge, plastic and garbage disposal and air pollution. Annex V controls the disposal of plastics and garbage into the oceans from ships.

[http://www.imo.org/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-\(marpol\).aspx](http://www.imo.org/about/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx)

### ACT TO PREVENT POLLUTION FROM SHIPS (APPS)

Mandated in 1983, this act gives the US Coast Guard the authority to develop

regulations and enforce MARPOL Annex V, including the discharge of garbage and plastics from ships. The Act applies to all US flag ships anywhere in the world and to all foreign flag vessels operating in navigable US waters or while at a port or terminal under US jurisdiction. The Act also establishes regulations for operational discharges and dumping of wastes from vessels.

<http://epw.senate.gov/atppfs.pdf>

#### MARINE PLASTIC POLLUTION RESEARCH AND CONTROL ACT (MPPRCA)

The US Congress passed the Marine Plastic Pollution Research and Control Act (MPPRCA) in 1987 to implement Annex V. Under MPPRCA, it is illegal to throw plastic trash off any vessel within the US Exclusive Economic Zone (within 200 nautical miles of the shoreline). It is also illegal to throw any other garbage overboard while navigating in US waters or within three miles of shore.

<http://www.csc.noaa.gov/legislativeatlas/lawDetails.jsp?lawID=730>

#### SHORE PROTECTION ACT

The Shore Protection Act of 1994 provides controls on transport vessels to prevent the release of municipal or commercial solid wastes into coastal waters.

[www.epa.gov/fedrgstr/EPA-GENERAL/1995/December/Day-13/pr-755.html](http://www.epa.gov/fedrgstr/EPA-GENERAL/1995/December/Day-13/pr-755.html)

#### BEACHES ENVIRONMENTAL ASSESSMENT AND COASTAL HEALTH ACT (B.E.A.C.H. ACT)

The B.E.A.C.H. Act of 2000 amends the Clean Water Act, requiring adoption of minimum health-based water quality criteria, comprehensive water testing and public notification when water contamination levels are unsafe.

<http://www.epa.gov/lawsregs/laws/spa.html>

#### CORAL REEF CONSERVATION ACT

The Coral Reef Conservation Act of 2000 authorizes NOAA to provide assistance to any US state, territory or possession that contains a coral reef ecosystem within its seaward boundaries in removing abandoned fishing gear, marine debris and abandoned vessels from coral reefs.

[http://coris.noaa.gov/activities/actionstrategy/08\\_cons\\_act.pdf](http://coris.noaa.gov/activities/actionstrategy/08_cons_act.pdf)

#### MARINE DEBRIS RESEARCH, PREVENTION AND REDUCTION ACT

Signed into law in 2006, the Marine Debris Research, Prevention and Reduction Act establishes a program within NOAA to identify, assess, reduce and prevent marine debris and its effects on the marine environment. The Act also directs NOAA to reestablish the Interagency Marine Debris Coordinating Committee, work with the US Coast Guard to establish a definition of “marine debris,” develop a federal marine debris information clearinghouse, emphasize the importance of outreach and education and work with the international community to address marine debris on a global scale.

<http://marinedebris.noaa.gov/about/act.html>





## Compliance With Laws

Unfortunately, laws do not guarantee compliance. In addition to enforcement and penalties, a sense of environmental stewardship among ocean users is essential for these laws to be effective. Education and outreach to boaters, fishermen, industries, and the general public is critical to fostering this sense of

### NOAA MARINE DEBRIS PROGRAM

Established in 2005 by the Marine Debris Research, Prevention, and Reduction Act, the NOAA Marine Debris Program (MDP) leads national and international efforts to research, prevent, and reduce the impacts of marine debris. The MDP is the federal government's authority on marine debris and a coordinating body for activities in the United States. Its staff of regional coordinators, scientists, and educators support projects that increase the understanding of debris, reduce its impacts, and prevent it from entering the marine environment. To learn more about NOAA's role in preventing marine debris, visit [www.MarineDebris.noaa.gov](http://www.MarineDebris.noaa.gov).



*A debris-free beach*

stewardship and reducing the impacts of marine debris.

## Governments Supporting Research

NOAA, EPA, and other government agencies provide grants to fund research on marine debris. Research topics include creation or improvement of port and marina **best management practices** that decrease the threats marine debris poses to marine life and navigational safety; work with the fishing industry and/or fisheries councils and organizations to develop better solutions to reduce the occurrence and impacts of **derelict fishing gear** in the marine environment; increase understanding of the impacts marine debris has on marine mammals, sensitive habitats, tourist and fishing industries, and navigational safety; and investigating the physical and chemical properties of marine debris. Other research includes monitoring programs that help to assess the status of marine debris on our nation's beaches and waterways.

## State and Local Level

On the state and municipal level, laws and ordinances are being passed to address the management of different types of trash, much of which can become marine debris. For example, multiple states have passed bottle deposit laws to encourage the **recycling** of beverage cans and bottles. States and communities have implemented laws requiring that dumpsters and trash trucks be covered, which will help prevent land-based trash from being blown or carried into the water and becoming marine debris. Some municipalities have established bans or fees on the use of plastic bags at grocery or convenience stores. Coastal states and communities often devote resources to educating citizens about **stormwater runoff** and how it can carry litter into waterways.

## THE HONOLULU STRATEGY



INTERNATIONAL  
MARINE DEBRIS CONFERENCE

In March 2011, Government agencies, industry representatives, non-profit organizations, and leading marine researchers came together for the Fifth International Marine Debris Conference in Honolulu, Hawai'i.

The National Oceanic and Atmospheric Administration and the United Nations Environment Programme co-organized this conference, which brought together representatives from 38 countries. Participants of the conference agreed on a new set of commitments aimed at combatting the global marine debris problem, known as the Honolulu Commitment, and began the development of a global framework to reduce marine debris, known as the Honolulu Strategy.

The Honolulu Strategy is a framework for a comprehensive and global effort to reduce the ecological, human health, and economic impacts of marine debris. It is intended for use on multiple levels—global, regional, national, and local—involving the full spectrum of civil society, government and intergovernmental organizations, and the private sector. The framework aims to reduce, prevent, and manage marine debris from at-sea and land-based sources and includes the removal and processing of marine debris.

To learn more about the Honolulu Strategy, visit [www.MarineDebris.noaa.gov](http://www.MarineDebris.noaa.gov)

## What Organizations and Industries Are Doing To Address Marine Debris

Private industry, universities, non-profit research organizations, and **environmental groups** bring new ideas, financial resources, and educational opportunities to prevent and reduce marine debris.

Their efforts are focused on:

- changing the behaviors that lead to marine debris;
- increasing awareness and a better understanding of the problem;
- finding alternative materials; and
- increasing recycling of waste items.

## Changing the Behaviors That Lead to Marine Debris

Laws and regulations are just one method to help people change their behavior to prevent marine debris. Education can also encourage behavioral changes. People are more likely to change their habits when there are easy ways to properly and responsibly dispose of waste items. Several coastal states offer debris abatement resources for boaters and the owners/operators of marinas, fishing piers, commercial fishing operations, and other coastal businesses. The US Coast Guard and its Auxiliary offer pollution prevention education through the Sea Partners program, which aims to develop community awareness of maritime pollution issues and to improve compliance with marine environmental protection laws and regulations. The Ocean Conservancy's Good Mate Program is another national program that promotes environmentally responsible boating and marina operations.

To learn more about these programs, visit the US Coast Guard's Sea Partners Program at [www.uscg.mil/hq/g-m/nmc/seapart.htm](http://www.uscg.mil/hq/g-m/nmc/seapart.htm) or the Ocean Conservancy's Good Mate Program at <http://www.oceanconservancy.org/do-your-part/green-boating/>.

## NO BOUNDARIES FOR DEBRIS



It seems that no place is free from marine debris. Even in Antarctica, one of the most isolated areas on Earth, researchers with the Australian Government Antarctic Division commonly find marine debris washed up on the shore. So few people venture to

Antarctica most of this debris could not have come from the local area. Instead, the debris enters the ocean hundreds or even thousands of miles away, and then drifts to these remote beaches.

The problem is also acute in Hawaii. With many of the Pacific currents circling around the island state, the Northwestern Hawaiian Islands act as a filter for the entire Pacific, collecting thousands of tons of refuse and debris every year. The global nature of this problem calls for international cooperation to find solutions.

For more information on the Australian Antarctic Research Human Impacts program, visit <http://www.antarctica.gov.au/environment/human-impacts-in-antarctica>

## Industry Efforts to Change Behavior

In addition, several business and industry groups have initiated projects aimed at educating industry employees and consumers about the problems of marine debris. Since the 1980s, plastics manufacturers – through the Society of the Plastics Industry and the American Chemistry Council (previously known as the American Plastics Council) – have organized research and educational efforts aimed at minimizing the effects of plastics in the oceans, lakes, and rivers. The Society of the Plastics Industry, a trade association of nearly 2,000 members representing all segments of the plastics industry in the United States, implements an educational effort aimed at industry members to prevent plastic resin pellets from entering the environment, waterways, and oceans. Pellet loss is an environmental concern for plastic resin producers, as well as a financial concern – even a loss of one tenth of 1 percent of the pellets could result in over 114 million pounds of pellet loss per year. This could equal 12 railroad cars full of resin pellets being emptied into the environment each year. Well trained employees who correctly transport and handle resin pellets could eliminate pellet presence in the environment.<sup>1</sup>

*The 2004 US Ocean Commission on Ocean Policy Report identified marine debris as one of the major threats to the nation's marine resources and human health and safety along the coasts.*

**To learn more, visit [www.oceancommission.gov](http://www.oceancommission.gov)**

<sup>1</sup> United Nations Environmental Programme – Caribbean Environmental Programme, 2006, *Marine Litter in the Wider Caribbean*.





## Increasing Awareness and a Better Understanding of the Problem

One of the most widely recognized efforts to raise awareness and increase our understanding of marine debris is the Ocean Conservancy's International Coastal Cleanup (ICC), which has been held annually each fall since 1986. Each year, the Ocean Conservancy mobilizes thousands of **volunteers** in the United States and multiple countries to scour the coast, picking up debris and recording data on the types of debris found on coastlines. The **data** are logged into the national marine debris database, which the Ocean Conservancy and other researchers use to study the nature of marine debris and measure the impact of efforts to reduce it.

## Finding Alternative Materials

Researchers and industries are currently searching for alternative materials that are less invasive or harmful to the environment, and exploring steps to successfully integrate these materials into the economic mainstream. For example, researchers are examining how to minimize packaging and modify fishing gear to prevent loss or decrease impacts.

## Increasing Recycling of Waste Items

Additional work has been done to increase the feasibility of plastic recycling. Most frequently used plastic containers – especially beverage containers such as soft-drink bottles and milk jugs – can and should be recycled. In fact, there is a great demand from manufacturers



for the resins from recycled bottles. Some recycled resins are used in plastic lumber materials, a growing industry.

The recovery of shrink wrap used for transporting new boats and for cold weather protection is another example of how industry has been proactive in dealing with the disposal of plastic materials. The plastics industry supported a shrink wrap recovery pilot program at 44 marinas in Massachusetts and Rhode Island that collected and recycled three tons of material.

## Working Together

Nonprofits groups working with local, tribal, state, federal, and community representatives operate many projects to remove derelict fishing gear from the environment. In northwest Washington, from the Strait of Juan de Fuca and northern Puget Sound to the Canadian border, the Northwest Straits Marine Conservation Initiative sponsors a joint effort to remove

derelict gear, which includes public outreach and education about derelict fishing gear removal and its impacts on the marine environment. In Hawaii, a private-public partnership supports a yearly removal of derelict nets from the shores and reefs of the Northwestern Hawaiian Islands Marine National Monument.



## BEACH CLEANUPS: COLLECTING DEBRIS AND DATA

The Ocean Conservancy's annual International Coastal Cleanup (ICC) is a testament to the resolve of dedicated individuals around the globe who are working to reduce the amount of debris in our oceans and waterways. Each year, volunteers remove marine debris from the world's shorelines, recording the types and quantities of items they collect. EPA and NOAA are sponsors of these cleanup events in the United States.

In addition, the Ocean Conservancy's trained volunteers have collected more precise data as part of a multiple-year study called the National Marine Debris Monitoring Program, which was funded by the EPA. Data collected through these efforts was analyzed to examine long-term trends in marine debris to determine which solutions are effective and which sources of marine debris will require further control efforts. For more information on these efforts, visit <http://www.oceanconservancy.org/our-work/marine-debris/> and <http://water.epa.gov/type/oceb/marinedebris/nmdmp.cfm>.



## What You Can Do

While governments, industry groups, and private organizations have become increasingly active in preventing marine debris, individual initiative remains one of the best ways to tackle ocean pollution. Whether properly disposing of waste, cutting down on the amount of waste produced, organizing local marine debris projects, or joining the efforts of larger organizations, citizens of all ages can help reduce marine debris and increase public awareness of the problem.

There are often clear connections between our individual behaviors and the effect these activities have on the environment (e.g., the candy wrapper littered on the street can easily be washed into a storm sewer and carried to the sea). Since prevention is the simplest and most effective way to reduce marine debris, individuals can begin by examining their **lifestyles** – considering how much garbage they generate and where it all ends up. To reduce the possibility that any of their trash will become marine debris, people can ensure that all of their waste is properly disposed of. For example, when outdoors, especially at the beach or on a boat, people should make efforts to prevent any litter from blowing away or being left behind. People should also recycle as much trash as possible and practice waste prevention techniques, such as reusing bags and containers rather than throwing them away. When individuals make purchases, they should select items made from recycled content.

Concerned individuals can multiply their effectiveness by organizing into groups to address marine debris in communities or regions. For example, groups can learn how marine debris affects a nearby beach, clean the area periodically, and inform others about the project. Such “adopt-a-beach” programs can be very effective ways to educate the community about the impact of marine debris and how to prevent it.



Learn if your state or community offers an “Adopt-a-Beach,” “Adopt-a-Stream,” or similar stewardship program.

Marinas can organize education **campaigns** to alert recreational boaters to the need to store waste for proper disposal on land. Boaters can also start a network committed to helping others understand and comply with marine debris laws and reporting suspected regulation violations.

Established marine debris prevention organizations are always looking for people to help them organize and staff their programs. Individuals of all ages can volunteer for certain short-term projects, such as the Ocean Conservancy’s International Coastal Cleanup (ICC). Not only do students get a chance to help protect the environment through such efforts, but they also can witness the marine debris problem firsthand.

If you are a scuba diver, you can participate in underwater cleanup projects through Project AWARE, which coordinates the underwater portion of International Cleanup Day in cooperation with the Ocean Conservancy. To learn more about underwater cleanups, visit [www.projectaware.org](http://www.projectaware.org)

Volunteers are also needed to respond to marine animal **strandings** and **entanglements** through the NOAA National



Marine Fisheries Service, the US Fish and Wildlife Service, and regional programs. Many state and local environmental agencies also maintain a volunteer corps to help educate people about marine debris.

Young people can also help prevent marine debris and educate others about the problem through a variety of youth organizations, such as the Boy or Girl Scouts of America. Students can learn more about aquatic environments and their wildlife by visiting museums, aquariums, and nature reserves. They also can read books and magazines and watch television shows on these topics. In addition, young people individually can make a difference in their communities by organizing cleanups, writing letters to elected representatives, and talking about environmental issues with parents and friends.

Solving this global problem will require the engagement of governments, nonprofit groups, academic researchers, industries, and citizens to increase awareness, establish debris abatement programs, and change behaviors. Fortunately, when many environmental problems seem beyond individual action, marine debris is an area where people of all ages can make – and have already made – a real difference!

*“Reducing and controlling debris in the marine environment is a significant – but achievable – challenge.”*

Seba Sheavly, UNEP Marine Litter Report

## Key Points

- Prevention is the most effective way to stop marine debris. Multiple countries, private organizations, industries, federal agencies, and individuals are taking action to prevent debris from entering the marine environment.
- MARPOL Annex V is the first international legislation to regulate the disposal of trash at sea. US federal, state, and local legislation also has been passed addressing ocean disposal and management of solid waste, encouraging recycling, and banning particularly harmful plastic items.
- Many conservation groups have been working to stop marine debris by developing educational programs and lobbying for additional US and international legislation. One prominent effort is the Ocean Conservancy’s International Coastal Cleanup (ICC), which mobilizes thousands of volunteers to remove marine debris from the world’s beaches, rivers, and streams.
- Industry groups are addressing the problem by educating their members about marine debris and sponsoring conferences and research projects to combat the issue.
- Individuals can make a difference in their daily lives by reducing the amount of waste they produce and ensuring that the remainder is recycled or disposed of properly.
- People who want to become more involved in preventing marine debris can organize projects within their community, join established marine debris prevention programs, and alert their elected representatives to the importance of the marine debris issue.

# Turning the Tide on Trash

**abandoned fishing gear:** See derelict fishing gear.

**abandoned net:** See derelict fishing gear.

**abandoned vessels:** Lost or discarded ships, boats, or other watercrafts.

**annex:** An addition to an established structure or document. The annexes in the MARPOL regulations are the sections containing the specific provisions of the law.

**aquatic habitats:** Freshwater or marine home or environment of a plant or animal; examples include streams, rivers, bays, salt marshes, sea grass beds, oyster beds, coral reefs, and oceans.

**awareness:** To be acquainted with an issue or fact.

**beach:** The part of a coast that is washed by waves or tides, which cover it with sediments of various sizes and composition, such as sand or pebbles.

**best management practices (BMPs):** A method, activity, maintenance procedure, or other management practice for preventing or reducing the pollution resulting from an activity. The term originated in the Clean Water Act. Specific BMPs are defined for each pollution source.

**bioaccumulation:** An increase in the concentration of a chemical in a biological organism over time, compared to the chemical's concentration in the environment. The accumulation process involves the biological storage of substances that enter the organism through respiration, food intake, epidermal (skin) contact with the substance, and/or other means.

**biodegradable:** A process by which microorganisms (bacteria) break materials down into compounds that can be reused in the environment.

**biodiversity:** Short for biological diversity, which

refers to the diverse forms of life on Earth and involves three main components:

1. Genetic diversity – diversity within a species, including individuals, eggs, sperm, etc.
2. Species diversity – the different kinds of organisms and their numbers and distribution within an ecosystem.
3. Ecosystem diversity – the variety of habitats and communities of various species that interact in complex, interdependent relationships.

**biomagnification:** An increase in concentration of a pollutant from one link in a food chain to another; the tendency of pollutants to concentrate as they move from one trophic (feeding) level to the next.

**buoyant:** Capable of floating in water.

**business/industry:** Relating to companies, groups of companies, and their representatives engaged in commerce or trade in specific products or services.

**campaign:** An organized effort with a specific goal, such as informing a group of people about a particular subject.

**combined sewer overflow:** Pipes that carry a combination of sewage and stormwater are known as combined sewers. Unlike independent storm sewers, combined sewer pipes run to a sewage treatment plant rather than directly into a nearby body of water. During heavy rainstorms sewage treatment plants can be overwhelmed by the volume of water and discharge raw sewage directly into the receiving water body, bypassing the treatment plant. See outfall pipe.

**coral reef:** Limestone formations produced by living organisms, found in shallow, tropical marine waters. In most reefs, the predominant organisms are stony corals. Reef-forming corals do not grow at depths of over 100 ft (30 m) or where the water temperature falls below 72°F (22°C). Reefs are under numerous environmental pressures, including damage from derelict fishing gear.

**data:** A set of facts or information about a particular subject, which can be analyzed to learn more about the subject.

**debris:** Discarded items; trash and litter; man-made materials and solid wastes that are released accidentally or intentionally into the environment.

**degradable:** Capable of being broken down into smaller pieces by natural forces. See biodegradable and photodegradable.

**derelict fishing gear:** Fishing gear that has been lost or abandoned at some point during use; capable of catching marine life as it continues to float throughout the water column or trap animals. Also capable of smothering sensitive habitats such as coral reefs and sea grass beds. Examples of derelict fishing gear include: nets, crab pots, lobster traps, coils of abandoned or discarded monofilament fishing line.

**disposal:** The permanent storage or removal of trash from the environment.

**diversity:** A measure that combines the number of species in a community with the relative abundances of those species.

**ecosystem:** A natural community composed of biotic (living) creatures that live in connection with each other and abiotic (non-living) elements like sun, soil, and water. An ecosystem can be as big as a planet or as small as a puddle.

**endangered species:** Any species that is “in danger of extinction throughout all or a significant portion of its range,” according to the Endangered Species Act of 1973.

**Endangered Species Act (ESA):** A 1973 Act of Congress that mandated that endangered and threatened species of fish, wildlife, and plants and their habitats be protected and restored.

**entanglement:** The looping of a piece of debris around part of an animal's body. Entanglement may impair swimming and feeding, cause suffocation, decrease ability to elude predators, and cause open wounds.

**environmental group:** An organization of individuals concerned with reducing and preventing environmental degradation.

**estuary:** A body of water at the lower end of a river which is connected to the ocean and semi-enclosed by land. In an estuary, sea water is measurably diluted by freshwater from the land.

**extinct:** A species that is no longer in existence. In biology and ecology, extinction is the ceasing of existence of a species. The moment of extinction is generally considered to be the death of the last individual of that species.

**fishing gear:** Equipment used for fishing (e.g., gillnet, handline, harpoon, seine, longline, midwater trawl, purse seine, rod-and-reel, trap, trawler, etc. but not vessels).

**foamed plastic:** A type of plastic that is generally made from polystyrene and consists of small spheres that are fused together. Foamed plastic is very light and easily breaks into smaller pieces. It is frequently used in disposable cups for hot beverages.

**food chain:** A series of animals and plants, each depending on the next for food. A food chain usually forms part of a much larger, more complex food web.

**food web:** A network of living things that depend on each other for food.

**garbage:** Spoiled or waste food that is thrown away, generally defined as food waste. It is also a general term for all products discarded.

**ghost fishing:** The capability of lost or discarded fishing gear, such as nets, traps, or fishing line, to continue to catch fish, shellfish, or other marine life.

**gillnets:** A type of large fishing net designed so fish can get their head into the holes in the net, but not their bodies. Fish become caught by their gills.

**gyre:** A circular pattern of currents in an ocean basin.

**habitat:** The area in which a plant or animal naturally lives, grows, and reproduces that provides adequate food, water, shelter, and living space.

**hatchling:** A bird, fish, or reptile (including a turtle) that has just hatched.



**ingestion:** The consumption of a piece of debris by an animal. Ingestion may cause blockages in the digestive tract, suffocation, or a false feeling of fullness that can lead to malnutrition or starvation.

**inland:** Land areas away from the coast, associated with watersheds.

**landfill:** A specially engineered site for disposing of solid waste on land that is constructed to reduce any hazards to public health and safety. Landfills usually have liner systems and other safeguards to prevent groundwater contamination.

**lifestyle:** The way a person conducts his or her life and how this impacts other people, animals, and the surrounding environment.

**litter:** Improperly discarded wastes; see debris.

**marine:** Relating to the ocean.

**marine debris:** Any man-made object discarded, disposed of, or abandoned that enters the coastal or marine environment.

**marine ecosystem:** A salt-water ecosystem, including oceans and shorelines. Ocean ecosystems include pelagic (sea surface) and benthic (sea floor) communities. Shoreline ecosystems range from rocky and sandy beaches to tidal pools and salt marshes.

**MARPOL Annex V:** MARPOL refers to the International Convention for the Prevention of Pollution from Ships, a set of international conventions concerned with the prevention of pollution (oil, hazardous substances, sewage, plastic, and garbage) from ships. Annex V is the section of this convention that addresses prevention of pollution by garbage from ships.

**medical waste:** Waste that comes from hospitals or other medical institutions and that may be infectious. Medical waste includes needles, bandages, glassware, and other items.

**municipal solid waste:** Garbage or refuse that is generated by households, commercial establishments, and industrial offices; includes durable goods, non-durable goods, containers and packaging, food wastes, and yard trimmings.

**navigable waters:** generally speaking navigable waters are streams, rivers, lakes and other

bodies of water that can be used for commercial transportation.

**nondegradable:** Incapable of being broken down into simple compounds or components.

**offshore oil and gas platform:** A structure in the ocean or a bay that forms a base from which oil and gas drilling is conducted.

**outfall pipe:** A pipe that discharges water and other materials into a receiving water body.

**persistent:** In the environment this refers to the ability of a substance or material to remain in the environment for long periods of time without being broken into smaller components.

**photodegradable:** The ability to degrade due to exposure to ultraviolet radiation where the chemical bonds or links in the polymer or chemical structure of a plastic are broken.

**plastic resins:** Material used in making plastics; usually petrochemical-based.

**plastic resin pellets:** Small, round pellets that are produced as the raw form of plastic. Resin pellets are melted down and used to form plastic products. During plastic resin pellet production, transportation, and processing, some resin pellets can be released into the environment. The pellets resemble fish eggs, and can be mistaken for food by marine animals and sea birds.

**press release:** A brief report intended to provide news organizations with the basic facts of an event or issue and encourage them to cover it.

**recycling:** The collection and reprocessing of materials so they can be used again in a similar or different form.

**ring carrier:** See six-pack holders.

**salt marshes:** Low coastal grassland frequently overflowed by the tide. A maritime habitat found in temperate regions, but typically associated with tropical and subtropical mangrove.

**saturated:** Thoroughly wet; unable to absorb any additional liquid. Some marine debris items will float until they become saturated, and will then sink out of the water column to the bottom.

**seagrass beds:** Communities of grass-like marine

plants, usually on shallow, sandy or muddy bottoms of sea. Because these plants require sunlight to photosynthesize, they are limited to growing in shallow and sheltered coastal waters anchored in sand or mud bottoms. Highly diverse and productive ecosystems, seagrass beds are home to hundreds of associated species.

**sewage:** Used water and water-carried solids from homes that flow in sewers to a wastewater treatment plant. Also referred to as wastewater.

**sewage treatment plant:** See combined sewer overflow.

**six-pack holders:** Plastic rings that group a set of beverages and other liquids into a package for shipping and purchase.

**sludge:** Solids that remain after the wastewater treatment process that settle to the bottom of a septic tank or a treatment plant pond. Current regulations require that these materials are disposed of through land applications, incineration, or are land-filled.

**solid waste:** Any solid, semi-solid, liquid, or contained gaseous materials discarded from industrial, commercial, mining, or agricultural operations, and from community activities. Solid waste includes garbage, construction debris, commercial refuse, sludge from water supply or waste treatment plants, or air pollution control facilities, and other discarded materials.

**species diversity:** See biodiversity.

**storm drain:** A pipe system which includes grates, gutters, underground pipes, streams, or open channels designed to transport rain from developed areas to a receiving body of water.

**stormwater:** Runoff in the storm drain system.

**stormwater runoff:** The water that flows along streets or along the ground as a result of a storm.

**stormwater sewers:** See storm drain.

**stranded:** Run aground. See strandings.

**strandings:** A behavioral phenomenon where marine wildlife species that normally live in deeper waters swim into shallow waters or

ashore when ill or affected by changes in their environment; species commonly known to strand include sea turtles, whales, and dolphins.

**tar balls:** Crude oil from seeps and spills often form tar residues or tar balls that become stranded on the shoreline.

**threatened species:** Any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. A threatened species is not in immediate danger of extinction, but is likely to become endangered if it is not protected.

**trash:** Materials that have been made or used by people and discarded. Also referred to as waste, garbage, and solid waste.

**volunteer:** To offer to work for a cause without pay, generally because the cause is deemed important and in need of support.

**waste water:** Used water and water-carried solids from homes that flow in sewers to a wastewater treatment plant. Also referred to as sewage.

**zooplankton:** Small, usually microscopic animals that are suspended or swim in the water column, including larvae of many fish and benthic invertebrates; the animal component of plankton; the first consumers in a marine food chain.