

Marine Debris

OFFICE OF RESPONSE AND RESTORATION • NOAA'S NATIONAL OCEAN SERVICE

Frequently Asked Questions All About Marine Debris



How much debris enters the ocean?

There is truly no accurate answer to this question. A figure that has been cited came from a 1975 study by the National Academy of Sciences that estimated approximately 1.4 billion pounds of trash per year enters the ocean (NAS, 1975). Important items to note about this figure:

- This study was published in 1975, 13 years before the implementation of MARPOL Annex V prohibited the dumping of plastics and restricting the dumping of other wastes in the oceans, and thus is quite dated.
- This study only took into account debris from vessels. Data were collected from vessels' Garbage Record Books.

NOAA is working with other agencies and groups to investigate the best available information to work towards a more current estimate. While the NAS (1975) study estimated then-legal dumping of waste from ocean vessels, an accurate, current estimate of debris entering the oceans would need to measure debris entering from rivers, storm sewers, beach litter, illegal dumping at sea, and many other avenues.



Debris laden shores along the southeast coast of the Big Island of Hawaii.

Are there really 46,000 pieces of plastic per square kilometer of the world's oceans?

We were unable to find a reference for this figure. The closest we could find was a UNEP report published in 2005 that mentions a figure of 13,000 pieces of litter per square kilometer; however there is no source or referenced study for that figure (UNEP, 2005).

To date, there has not been a comprehensive marine debris abundance assessment for the world's oceans, or even for a single ocean. This is partly due to the lack of a standardized at-sea plastic marine debris monitoring method. The NOAA Marine Debris Program

is working together with the University of Washington, Tacoma to develop an agreed-upon standard methodology for pelagic marine debris monitoring to help us compare sampling sites and acquire reliable estimates of plastic debris in the oceans.

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.



Derelict vessels and fishing gear are two types of marine debris from the ocean.

Is it true that 80% of marine debris comes from land and 20% comes from the ocean?

This statement is possible, but unknown. We have been looking into the origin of that figure. It's frequently quoted in the press, but doesn't appear often in scientific literature. A few times the results from the International Coastal Cleanup were cited as the source for these percentages; however if you take a look at the results from any given year, you will notice percentages differing from one place to another. Additionally, this event surveys primarily beach debris, and thus may overestimate land-based sources because of beachgoers' litter.

We also know relatively little about what is lying on the ocean floor or suspended in the water column. Because of this we truly can't say what the land- and ocean-based percentages are with any certainty or accuracy. Just begin to think of all the debris types that sink (e.g., metal, dense plastics) in addition to all the ships on our ocean floor and you get the picture.

How long do various marine debris items take to degrade in the marine environment?

Bottom line: Most debris items take a long time to degrade in the marine environment. However, the more natural/organic the material composition of the item is, the less time it generally takes to degrade.

Figures on the amount of time it takes for durable debris items to break down in the environment are many and varied (e.g., Aluminum can: 100 years (The Coral Reef Alliance and Worldwise) vs. 80-200 years (Mote Marine Laboratory)). It is unknown where the numbers listed in degradation timelines for these durable items originated or how they were estimated. Likely that the numbers listed on posters and pamphlets are estimates intended to raise awareness of the very long life of marine debris items rather than provide exact degradation rates.

Basically, degradation time depends upon numerous factors including material type, size, and thickness, temperature, wave action, exposure to sunlight, and location (e.g., on the beach, in the surf, floating at sea, etc).

For more information on the degradation of plastic debris, please visit <http://marinedebris.noaa.gov/info/plastic.html>.

Is it true that 100,000 marine mammals and/or sea turtles die each year due to marine debris/plastics?

This statement is possible, but difficult to say with certainty. To date there are no published studies specifically researching how many marine mammals die each year directly due to marine debris. Regardless of the exact number that die each year due to marine debris, each death is one too many. Marine debris doesn't belong in our oceans and waterways.

Below is the closest figure that we could find. These statements were made in a paper presented at the 1984 Workshop on the Fate and Impact of Marine Debris by Wallace (1985). The manuscript does not state that marine mammals are dying from plastic pieces, but rather that mortality is caused by entanglement from lost fishing gear and other unknown causes.

“Debris entanglement is estimated to cause 50,000 to 90,000 deaths per year in the northern fur seal. The population in 1983 was dropping on the main rookery in Alaska at about 8% per year. At least 50,000 deaths are thought to be due to entanglement; the other 40,000 deaths possible entanglement or possibly some unknown factor such as disease (Fowler, 1983).”

In the conclusions: “Up to one hundred thousand marine mammals and possibly more die each year. Half or more of the individuals of certain marine reptile species are affected by the plastic litter, and beachcombing land mammals become snarled in nets and die. ...”

The figures cited here are from another study by Fowler (1983) of fur seals in the North Pacific, and not from Wallace’s research. Keep in mind that this 1983 paper predates MARPOL Annex V, an international treaty implemented in 1988, which prohibits the dumping of plastics (including fishing gear) anywhere at sea.

Many of NOAA’s marine debris projects work to help protect marine mammal and turtle populations across the nation through debris removal as well as prevention.



Entangled fur seal in Alaska.



Laysan albatross feeding its chick. *Photo courtesy NOAA PIFSC.*

Is it true that marine debris kills a million seabirds each year?

This statement is currently unknown. We are so far unable to find a scientific reference for this figure. The closest we have found is “214,500 to 763,000 seabirds are killed annually incidental to driftnet fishing by Japanese fishermen in the North Pacific Ocean (US Department of Commerce, 1981)” from Laist, 1987. This refers to active fishing gear bycatch and not marine debris; it also predates the high seas driftnet ban adopted by the United Nations General Assembly in 1992.

Seabirds live much of their lives at sea or in remote locations. While the number of deaths can be estimated, it is difficult to determine causes of mortality when the carcasses can’t be retrieved.

What happens when albatross or other seabirds ingest debris?

We have all seen and been moved by photos of a seabird carcass (typically a Laysan albatross) laden with plastic debris. The detrimental effects of marine debris ingestion on Laysan albatross have been an object of research interest for many years, but like most ecological issues the answers are not straightforward. Regardless, the problem of marine debris ingestion is real; not just in seabirds, but species of fish, marine mammals, and sea turtles.

Albatross:

Ingestion of debris may cause a blockage in the digestive tract, perforate the gut, result in a loss of nutrition (due to displacement of food), or cause a false feeling of being “full”. Studies have found that ingested plastic debris is problem for seabirds; however may not be a significant direct cause of mortality (e.g., on a population level) (Sievrt and Sileo, 1993; Auman et al., 1997). More research is needed to see if these results (mid-1990’s) have changed.

Other Seabird Species:

There are numerous studies on ingestion of debris in seabird species other than the Laysan albatross. The results of a recent study conducted by Ryan (2008) show the number of ingested plastic particles in five species of seabirds, sampled in the 1980s and again in 1999–2006, have not changed significantly in the southern Atlantic and southwestern Indian Oceans. He found that the proportion of pre-production plastic pellets decreased 44-79% in all five species. “More data are needed on the relationship between plastic loads in seabirds and the density of plastic at sea in their foraging areas, but the consistent decrease in pellets in birds suggests there has been a global change in the composition of small plastic debris at sea over the last two decades.”

What happens to marine debris once it is removed from the marine environment?

Depending on the type of debris, methods of disposal may include recycling, reusing, or even using debris to create electricity.

Two great examples of marine debris disposal are:

- Nets to Energy Program and Partnership in Hawaii
<http://marinedebris.noaa.gov/projects/netstoenergy.html>
- Fishing for Energy Program
<http://marinedebris.noaa.gov/projects/fishing4energy.html>

When options are limited or unavailable, debris is disposed of in a landfill.



Much like Hawaii’s Nets to Energy program, the northeast coast of the US implemented Fishing for Energy. *Photo courtesy of B. Haskell.*

What is being done to address marine debris in the US and around the world?

While this is a global problem, local efforts are ongoing to solve it. Together, through partnerships, work is being done nationwide to research, prevent, and reduce marine debris as well as educate the public to be better stewards of our ocean.

The NOAA Marine Debris Program has funded and helped support over 140 projects working with partners and addressing marine debris across the nation.

Much is also being done on an international level to raise awareness and address this pervasive problem. One great example is the International Coastal Cleanup coordinated by the Ocean Conservancy. The event is the largest marine debris and litter cleanup event in the world. It is held on the 3rd Saturday of every September and is coordinated by the Ocean Conservancy. The NOAA Marine Debris Program is a proud sponsor of this event.

Everyone, no matter how close to or far from the ocean, can contribute to the solution. It's simple: Reduce, Reuse, and Recycle - (1) Try to reduce the amount of trash you produce (e.g., try to purchase items with minimal additional packaging); (2) Make use of items that are reusable rather than disposable; and (3) when you do use disposable items, remember to recycle!

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Volunteers help clean up marine debris. *Photo courtesy of NOAA RC.*