

- Buy in bulk and bring your own cloth or recycled grocery bags to the store
- Keep litter, leaves, and debris out of the street gutters and storm drains
- Reuse whenever possible
- Reduce consumption by avoiding excessively packaged products
- Use environmentally friendly cleaners or products that are low in phosphorous to reduce the amount of nutrients discharged into our lakes, streams and coastal waters
- Choose products packaged in recycled materials
- Pay attention and follow the 4 R's of sustainability –

## REDUCE - REUSE - RECYCLE - REFUSE

### Join the Algalita Marine Research Foundation (AMRF)

AMRF is a 501c(3) nonprofit organization founded in Long Beach, California and is dedicated to the protection of the marine environment through research and education. Our primary work is to establish baseline data, track the levels of plastic debris in our oceans, and inform the public and civic leaders.

#### Membership Levels

- **Basic Membership** ..... \$25
- **Friend of Algalita** ..... \$50
- **Good Friend of Algalita** ..... \$100
- **Great Friend of Algalita** ..... \$250

A membership donation of \$250 or more will receive an AMRF "Research Clips" video.

#### Member Information:

Name \_\_\_\_\_  
 Address \_\_\_\_\_  
 \_\_\_\_\_  
 Phone# \_\_\_\_\_  
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Send by mail or fax.

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We drink out of them, eat off of them, sit on them and even drive in them. They are durable, lightweight, and can be made into virtually anything. But it is these useful properties of plastics which make them so harmful when they end up in the environment.

## Plastics, like diamonds... ARE FOREVER!

- Only 6.8% of municipal plastic waste gets recycled in the U.S.
- 63 pounds of plastic packaging goes into landfills in the U.S. per person per year.
- Broken, degraded plastic pieces outweigh surface zooplankton in areas of the North Pacific over 6 to 1.

## Because plastic does not biodegrade!

When something biodegrades, naturally occurring organisms break materials down into their simple chemical components. Paper, when it breaks down, becomes carbon dioxide and water. But plastic, a synthetic material, never biodegrades. Plastic goes through a process called photodegradation, where sunlight breaks it into smaller and smaller pieces, all of which are still plastic polymers. Even this degradation process can take a very long time. Estimates of 400 years for a plastic six-pack ring, 450 years for a plastic bottle, and 500 years for a disposable diaper until the final degradation has been made. The more plastic we produce, the more we have to live with... forever!



A plastic bottle takes 450 years to degrade.

## The ocean is especially susceptible to plastic pollution because:

**It takes longer for the sun to break apart a piece of plastic in the ocean than a piece of plastic on land.**

This is because the ocean water cools the plastic piece, prevents heat build-up and limits UV light exposure.

**Plastics are carried by currents, which can concentrate the plastic in certain areas and prevent it from washing onshore.** Circulating currents in the ocean caused by stable weather patterns are called "gyres." When plastic is flushed out of a gyre by storms and washes ashore, or when rain sends plastics down rivers to the sea, much of it is mixed into beach sand and can never be recovered.

## Plastic pollution doesn't just look bad...

It is bad for the millions of animals that inhabit our ocean waters and for the people who fish, swim, and recreate there.

## Many marine birds and animals mistakenly eat free-floating plastic.

- Often these animals cannot distinguish plastic from food. Plastic, because of its high molecular weight and the nature

Example of plastic beach sand.



of its chemical bonds, can never be digested. It provides no nutrients, yet animals feel full even though they are not actually consuming food.

In birds, ingestion of plastics can prevent migration and reproduction, and can eventually cause starvation and death. In turtles, plastic has been shown to block intestines and make the animals float so that they cannot dive for food. Plastic can puncture and damage organs.

- Toxic chemicals in plastics can sicken marine birds and make animals sick. Over 80 species of seabirds have been found to ingest plastic. Sea bird chicks are especially vulnerable as they receive high levels of pollution from the yolk sac and, after hatching, from food brought by their parents.

- 100% of Laysan Albatross chick carcasses and regurgitated food boluses contain plastic.

- Marine birds and animals can become entangled in plastic nets and fishing line. An estimated 100,000 marine mammal deaths occur this way each year in the North Pacific.



- Chemicals used to make plastics can escape into the atmosphere during the manufacturing process. Fourteen percent of the toxic airborne chemicals nationally are from "plastics sector" releases. These chemicals can be toxic or carcinogenic, harming both people and animals.

## The plastic future looks grim.

- Virgin plastic pellets are released into the environment by thousands of consumer plastics manufacturers and are the most common contaminant on some beaches.
- In 2008 scientists found over a 7-fold increase in ocean plastics compared to a 1999 study, with the ratio of surface plastic to zooplankton in the North Pacific Subtropical Gyre at 46:1 by weight.

# Facts about plastic

## Did you know this about plastic?

- In 2007, the U.S. produced 58 million tons of plastic, over twice the weight of the entire population. Over half that amount (30.7 million tons) was thrown away.
- 63 pounds of plastic goes to landfills in the U.S. per person per year. The average American throws away about 186 pounds of plastic per year.
- Reheating plastic gives it a “heat history” which reduces its flexibility. Reheating temperatures are too low to burn off contaminants; therefore, very few plastics are recycled into the same type of container or product that they were originally. Usually, recycled merely means collected, not reprocessed into the same product.



Less than 5% of plastic gets recycled worldwide.

■ The “chasing arrows” symbol (shown at left) only denotes type of plastic; otherwise it is meaningless. Better symbols are needed for intelligent recycling.

## How are plastics getting in the ocean?

Approximately 100 million containers are shipped annually over the world’s oceans. Shipping across the North Pacific Ocean from Asia to North America is along Great Circle routes in the West Wind Drift current at the northern edge of the North Pacific Subtropical Gyre. Frequent severe storms along this route cause the loss of hundreds of containers overboard each year contributing, among other plastics, tens of thousands of shoes and millions of plastic shopping bags made in Asia.

Only about 20% of ocean pollution comes from activities at sea. Activities on land contribute most of the remaining 80%.



Surface trawl sample of 5.79 sq. miles from North Pacific Ocean.

Because of their buoyancy and persistence, plastic items contribute disproportionately to the overall impact of marine debris. Most of the debris that either entangles animals or is found in their stomachs is made of plastic.

The majority of the plastic that ends up in the North Pacific Subtropical Gyre (a continent-sized area) has been shown to circulate for decades.

Not all plastic floats on the surface. Approximately half of plastics are negatively buoyant. They therefore do not receive sunlight to facilitate the photodegradation process that breaks them into smaller pieces. This debris accumulates on the bottom of the ocean or “benthos.” There the particulates are used by polychaete worms to make their dwelling tubes and some are eaten by flounders and lobsters. The nets, traps and lines that do not photo degrade continue to “ghost fish” (catch fish without a fisherman) and entangle fish and mammals for years.

## What’s happening in the North Pacific Ocean.

Scientists have been studying the problem of plastic floating pollution in the area since the 1970’s. These are some of their findings over the last few decades:

- In a 1999 study, one area of the North Pacific Subtropical Gyre was found to contain six pounds of plastic for each pound of surface zooplankton.



Floating plastic pollution in the L.A. River.

- The results of studies done in late 1989 and 1999 indicate that the quantity of plastic tripled in ten years from maximum densities of 320,000 particles to 1 million particles per square kilometer.
- The filter-feeding animals in this area, mucous web feeding jellies and salps, were found to be heavily impacted by plastic fragments. The smaller the fragments, the fewer of them were found to be free floating, indicating that filter feeders or larval fish had caught them.
- Filter feeders are at the lower end of the food chain, and fifty species of fish and many turtles are known to eat them, thus accumulating plastic in their stomachs.
- Plastic materials accumulate and concentrate organic chemicals and environmental pollutants up to one million times their concentration in the surrounding sea water. Many of these chemicals are called “endocrine disruptors”, and can be released when the plastics are ingested. The endocrine system produces hormones in humans and animals.



Animals and birds ingest plastic and it accumulates in their stomachs.

- Hormones are amazingly potent. Estradiol, the body’s key estrogen hormone, operates at a concentration in the part per trillion range. One part per trillion is equivalent to one drop of water in 660 rail tank cars – a train 6 miles long.
- Effects of hormone disruption on humans run the gamut from enlarged prostates and cancer to early puberty in young girls, even mental retardation and propensity to violence. In fish it can cause males to become female or fail to produce sperm.

# SIX MISCONCEPTIONS ABOUT PLASTIC

- 1. Plastics that go into curbside recycling bins get recycled.**  
FACT: Most do not.
- 2. Curb side collection significantly reduces the amount of plastic land-filled.**  
FACT: It does not. Less than 5% gets recycled worldwide.
- 3. Packaging resins are made from petroleum refinery waste.**  
FACT: Nearly all are made from virgin petroleum and natural gas.
- 4. Plastic recyclers promote its recyclability.**  
FACT: Plastic resin pellet producers pay for recycling ads to promote the sale of plastics. Most plastics can only be down-cycled, made into lesser-grade products. Plastics, whether made from virgin or recycled resin, pose health and environmental risks through leaching, abrasion, and off-gassing.
- 5. Using plastic containers conserves energy.**  
FACT: Most of the energy costs of plastic are incurred by the manufacturer. Virgin glass uses an equal amount of energy, while recycled glass uses far less than either virgin plastic or virgin glass.
- 6. Our choice is limited to recycling or wasting.**  
FACT: Many healthy alternatives to plastic exist already, and are readily available.

For more information our video “Synthetic Sea: Plastics in the Open Ocean” is available from AMRF for \$20 per copy.

Information on authors, contributors & literature cited can be found at: [www.algalita.org](http://www.algalita.org)

## A Brief History of Plastics

**1869** John Wesley Hyatt invents celluloid, the first plastic product given a trade name.

**1909** Bakelite is introduced to the Chemist Club in NY as the “first thermoset plastic,” meaning once formed, it was set for life.

**1939** Nylon stockings debut at the World’s Fair.

**1946** Earl S. Tupper produces a 7-ounce polyethylene tumbler, the first of many products available from Tupperware Home Parties, Inc.

**1955** The Corvette is the first car to use plastic for body panels.

**1957** Monsanto’s House of Tomorrow, completely made of plastic, opens at Disneyland. The Hula Hoop creates a surge in demand for polyethylene.

**1983** Microwave ovens open up a new market for plastic packaging.

**2000** In the U.S., pre-production plastic reaches 100 billion pounds (50 million tons) of virgin resin pellets per year.

**2007** In the US, pre-production plastic reaches 57 million tons.

**2008** Algalita’s research determines that bait fish as well as food fish are ingesting plastic particles.

