

# BIOLOGICAL MAGNIFICATION

## THE TRAGEDY OF PLASTIC WASTE

20<sup>th</sup> SGRA

SUSTAINABLE SHARED GROWTH SEMINAR

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ATENEO DE MANILA UNIVERSITY

Presented by

**EnP Grace P. Sapuay**

President

Solid Waste Management Association of the Philippines

# The History of Plastic

How plastic was developed and went on to conquer the world

The Early Days:  
Mesoamericans  
made items with  
natural rubber



In Europe, horn  
and tortoiseshell  
were used in  
early plastics



1839: Charles  
Goodyear invents  
the process of  
vulcanization



1870: Chemist  
John Hyatt further  
develops the  
making of celluloid



1856: Alexander  
Parkes invents an  
early celluloid  
he calls 'Parkesine'



This involved adding sulphur to  
heated rubber, which gave it  
new stretchy and malleable  
properties

Hyatt and his brother went  
on to patent the first plastics  
injection moulding machine  
two years later

1909: Bakelite, and  
an early synthetic  
plastic is launched



1926: Polyvinyl  
Chloride (PVC)  
perfected by BF  
Goodrich scientists



1941: Polyethylene  
Terephthalate (PET)  
first produced



1939: DuPont  
introduces the  
world to nylon



1933: Researchers  
at ICI discover  
how to make  
polyethylene



1939-45: The development of  
plastics up to this point  
makes them in high demand  
for production during  
World War II

The first  
polyethylene  
bags are seen  
in the 1950s



1954: Giulio  
Natta discovers  
polypropylene



Nowadays, around 300  
million tons of plastic  
are produced each year

From the 1960s and 70s  
onwards, plastics were  
further toughened and  
refined, allowing them to  
compete with metals

In the same year,  
expanded  
polystyrene  
is invented by  
Dow Chemical





# FACTS ABOUT PLASTIC BAGS AND PLASTIC WASTE

Plastic Pandemic: the facts about plastic bags and plastic waste

- 1) Plastic bags were introduced to supermarkets in 1977.
- 2) Over 1 trillion plastic bags - used annually all over the world;
- 3) About 1 million plastic bags - used every minute;
- 4) A single plastic bag can take 2,000 years to degrade (guesstimate);
- 5) >3.5 million tons of plastic bags, sacks, and wraps - discarded in 2008;
- 6) 1,020,426 – plastic dumped in the oceans (globally this year) and increasing by the minute
- 7) Plastic bags remain toxic after they break down;



# FACTS ABOUT PLASTIC BAGS AND PLASTIC WASTE

8) 46,000 pieces of plastic bags floating/square mile of ocean.

9) In the North Pacific Ocean, there are 6x more plastic debris than plankton causing deaths to our marine animals (mistake them for food).

10) 10% of the plastic we use yearly end up in the ocean. That's equivalent to 700 billion plastic bottles!

11) 90% of the trash floating in our oceans - made of plastic.

12) The Great Pacific Garbage Patch (a floating landfill of garbage in the Pacific twice the size of Texas) - mostly composed of plastic.

13) In 2008, a sperm whale was found beached in California. It died due to the more than 22 kg of plastic found in its stomach





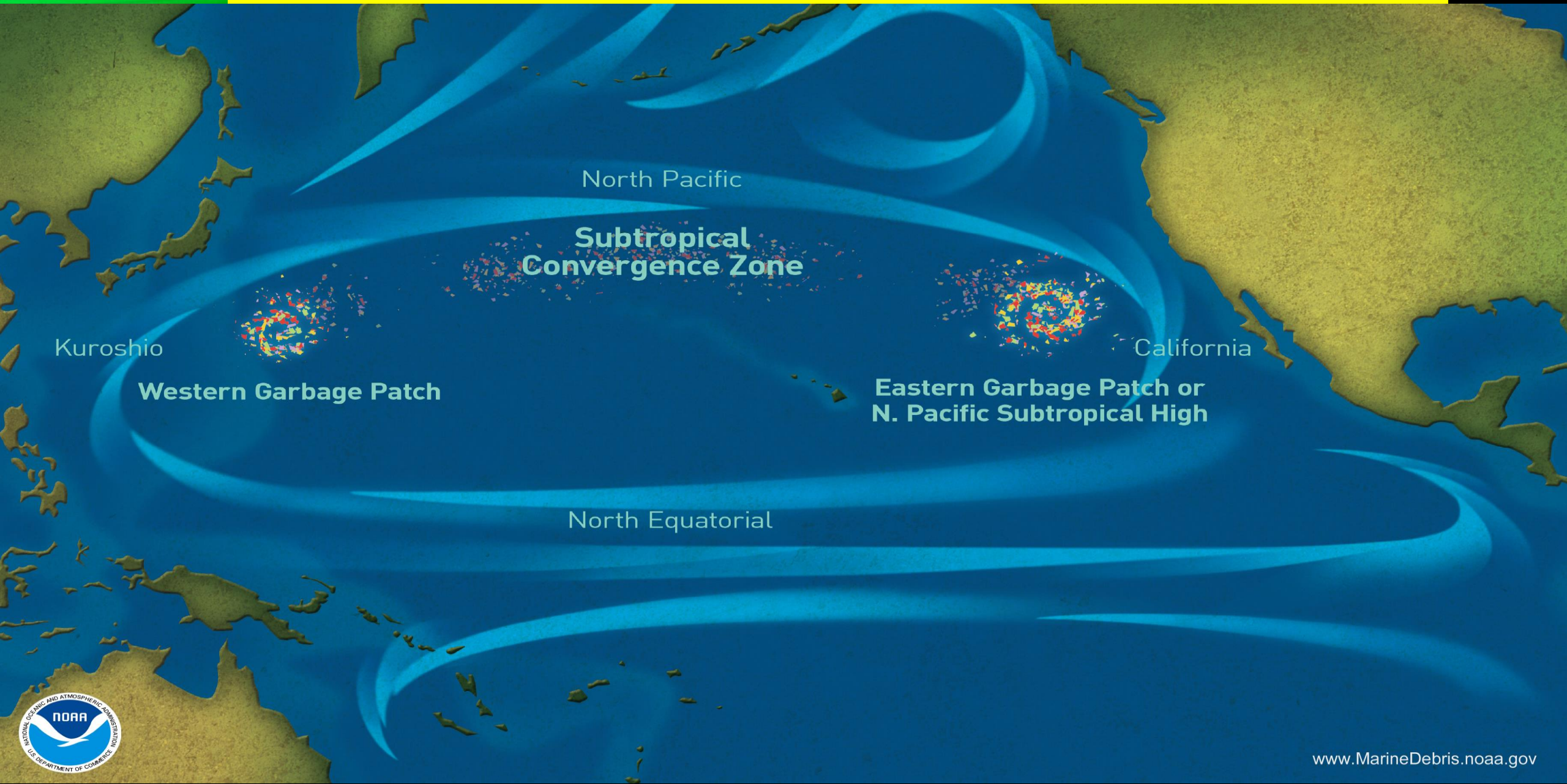
# MISMANAGED PLASTIC WASTE IN 2010

## TOP COUNTRIES FOR MISMANAGED PLASTIC WASTE IN 2010





# THE GREAT PACIFIC GARBAGE PATCH





# Understanding Ocean Gyres

- A mass of plastic debris float somewhere in the middle of the Pacific trapped by North Pacific gyre – a slow moving circular current.
- In the gyre there are 2 dumps that scientists estimate to be 80 years old

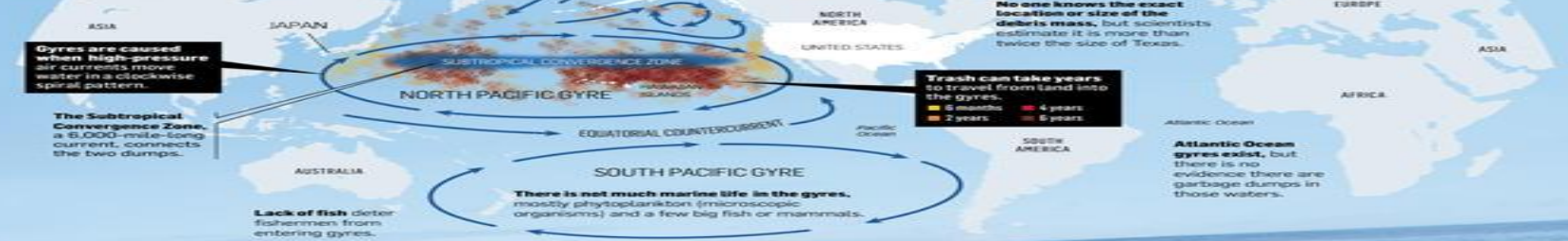
<http://marinedebris.noaa.gov/movement/how-debris-accumulates>

## News Illustrated

Find this page, interactive graphics, games and more at [SunSentinel.com/broadband/theedge](http://SunSentinel.com/broadband/theedge)

### UNDERSTANDING OCEAN GYRES

A mass of plastic debris floats somewhere in the middle of the Pacific, trapped by the North Pacific Gyre – a slow-moving, circular current. Within the gyre, there are two dumps that scientists estimate to be 80 years old.



### AN ENVIRONMENTAL DISASTER?

There are 46,000 pieces of plastics floating on every square mile of water, according to the United Nations.



80 percent of the trash comes from land and the rest from ships, oil platforms and shipping containers. RICK LOOMIS/LOS ANGELES TIMES



Nets and debris can catch on coral reefs and can choke or entangle turtles, whales, seals and other sea life. UNITED NATIONS ENVIRONMENT PROGRAMME/PHOTO

Most of the debris consists of small pieces, about the size of confetti, making it difficult to clean up. Scientists are studying the debris field to find a solution.

The small pieces make the trash vortex difficult for satellites to detect.



Invasive species attach themselves to bottles and other large objects and float to other countries. JIM LICHTER/SOPIPS INSTITUTE OF OCEANOGRAPHY

Plastic is a concern for marine life. They ingest small pieces and absorb plastic's deadly chemicals, resulting in a poisonous chain reaction.

Phytoplankton mix with plastic particles.

Zooplankton eat phytoplankton and plastic particles.

Small fish eat zooplankton and plastic particles.

## THE GREAT PACIFIC GARBAGE PATCH

Somewhere in the North Pacific Ocean is a large, swirling mass of waste. Ninety percent of it is plastic.

Plastic doesn't biodegrade. Instead, the sun heats up the material and breaks it down into smaller and smaller pieces in a process called photodegradation.

10 percent of the world's annual 200-billion-pound plastic production ends up in the ocean.



Saltwater temperatures keep the plastic cool, slowing down the photodegradation process.

70 percent is estimated to sink to the ocean floor. The rest floats or stays submerged.

6-to-1 ratio For every pound of phytoplankton, there are 6 pounds of plastic in the ocean.

### CHEMICAL SPONGE

Plastic is a concern for marine life. They ingest small pieces and absorb plastic's deadly chemicals, resulting in a poisonous chain reaction.

Phytoplankton mix with plastic particles.

Zooplankton eat phytoplankton and plastic particles.

Small fish eat zooplankton and plastic particles.

Big fish eat smaller fish and plastic particles. Fishermen trap these fish in their nets.

Humans eat fish and absorb plastic chemicals.

Humans eat fish and absorb plastic chemicals.



SOURCE: SEAPLEX, SEAPLEX INSTITUTE OF OCEANOGRAPHY, UNIVERSITY OF CALIFORNIA AT SAN DIEGO, ALGALIA FOUNDATION, HOW STUFF WORKS, UNITED NATIONS ENVIRONMENT PROGRAMME, LOS ANGELES TIMES, MCT, SUN SENTINEL RESEARCH. [asklong@sun-sentinel.com](mailto:asklong@sun-sentinel.com)



# THE TRAGEDY OF PLASTIC WASTE AND OTHER POLLUTANTS

We're drowning in plastic...

Enough plastic is thrown away each year to circle the earth four times.

93 percent of Americans age six or older test positive for the plastic chemical BPA. (BPA-free is not safer).

Billions of pounds of plastic can be found in our oceans.

HELP?

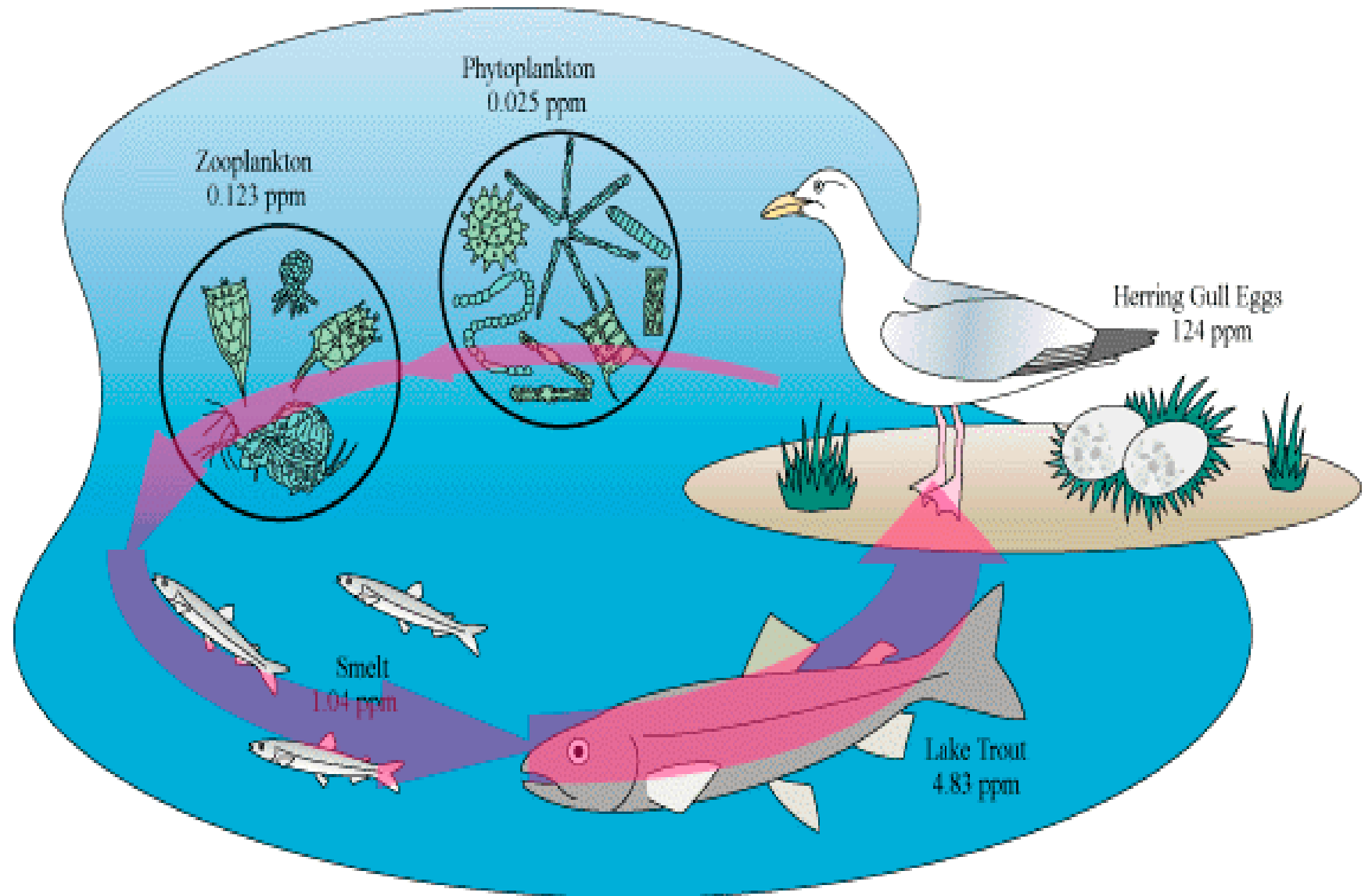
TheGreenDivas.com

<https://www.youtube.com/watch?v=LgP8Du7DZW8>



# BIOLOGICAL MAGNIFICATION

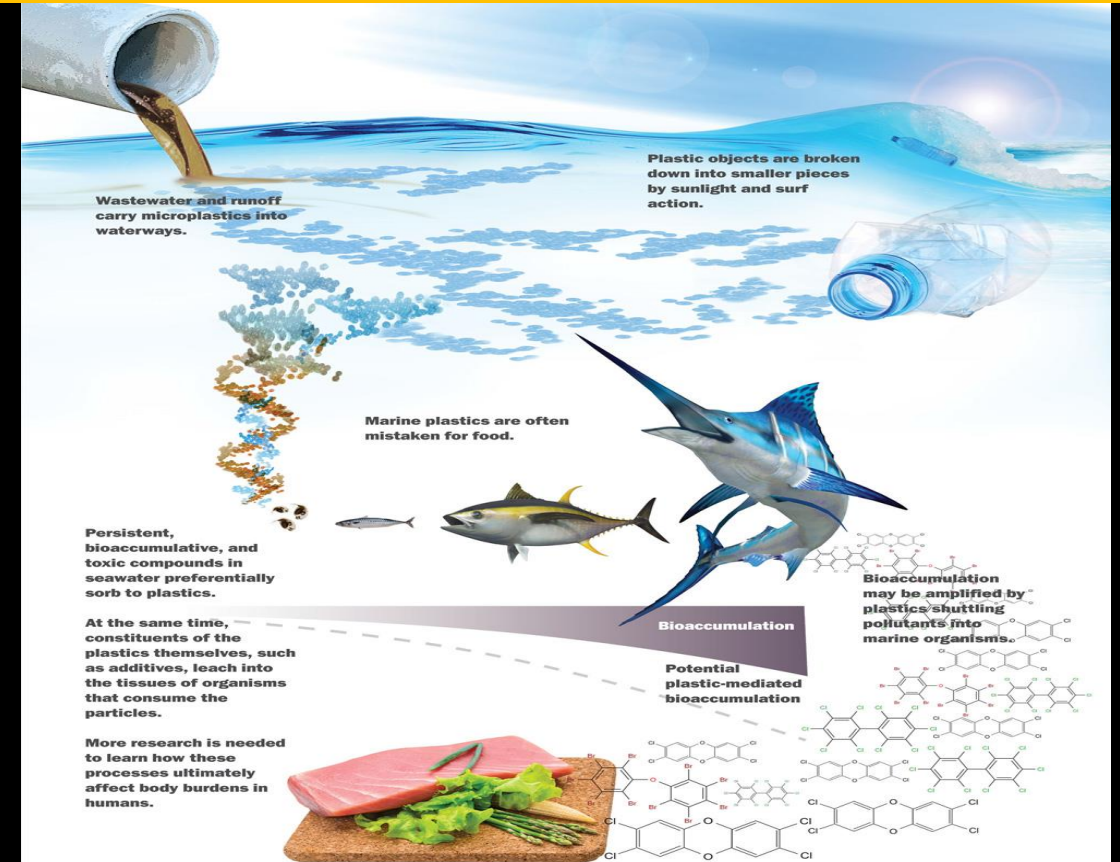
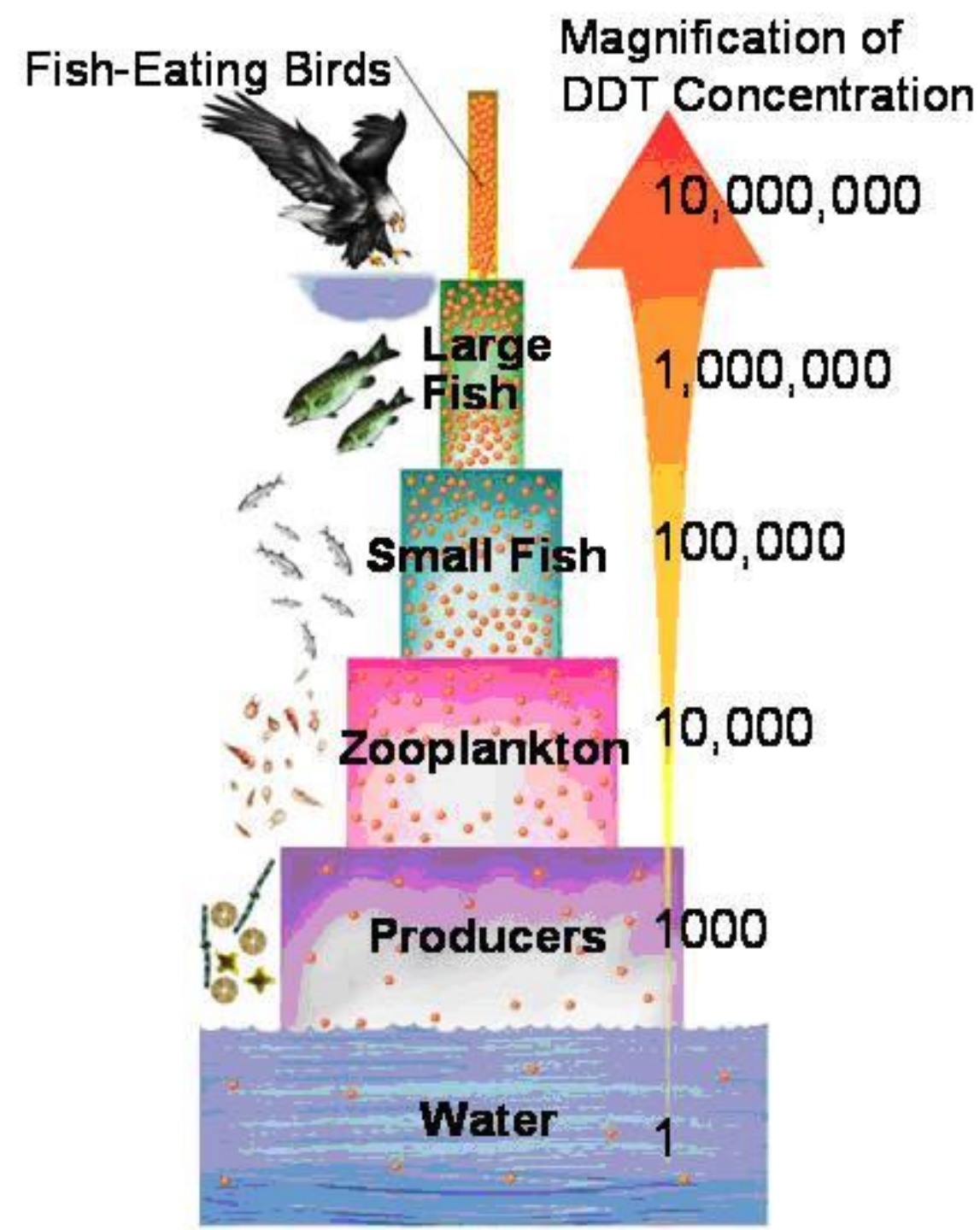
**EVEN MORE  
TRAGIC IS A  
PROCESS CALLED  
BIOLOGICAL  
MAGNIFICATION**





# WHAT IS BIOLOGICAL MAGNIFICATION???

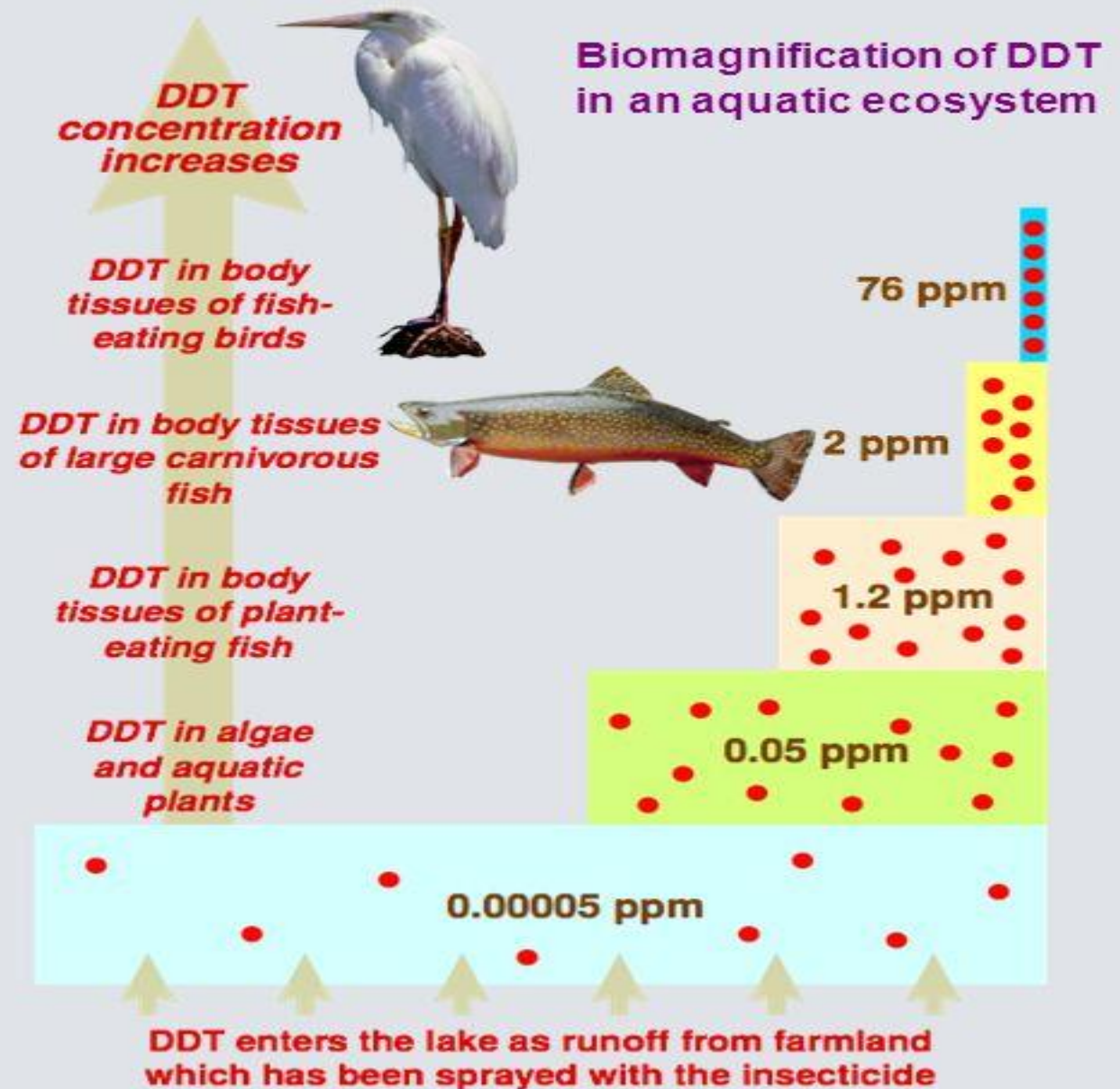
Biological magnification often refers to the process whereby certain substances such as pesticides or heavy metals move up the food chain, work their way into rivers or lakes, and are eaten by aquatic organisms such as fish, which in turn are eaten by large birds, animals or humans.





# Bioaccumulation

- ▶ Bioaccumulation (also called biological magnification) occurs when highly persistent pesticides, which cannot be metabolized or excreted, are stored and accumulate in the fatty tissues of the body.
- ▶ There is a progressive concentration of the pesticides with increasing trophic level; higher order consumers are at greater risk because they eat a large number of lower order consumers.





# PLASTIC: IT'S WHAT'S FOR DINNER

More than 18% of the bluefin, albacore, and swordfish studied in the Mediterranean Sea had plastic in their stomach contents, either from direct consumption or through smaller fish they had consumed...

May 8 - Study Finds That Your Favorite Sushi Roll Could Be Contaminated By Plastic  
May 8, 2015



We are what we eat, and it's possible that we are becoming more toxic thanks to plastic. But we can continue to fight back against this dangerous trend by reducing the amount of single-use plastic unnecessarily entering our environment.



**AN INVESTIGATION INTO THE QUALITY OF  
FISH IN CALIFORNIA AND INDONESIA  
HAS SHOWN THAT PROMINENT SPECIES  
IN THE SEAFOOD CHAIN ARE  
CONTAMINATED WITH PLASTIC AND  
TEXTILE FIBERS.**



The study was able to discern the kinds of contaminants prominent in fish caught in different coasts along the Pacific Ocean.

Image: [Vegan-Magazine](#)

Textile fibers from washing machine wastewater was found in fish sold in the United States.



**FOOD SAFETY CONCERN:**

**FISH CONTAMINATED WITH  
PLASTIC AND TEXTILE FIBERS**

<http://www.citizensreport.org/2015/10/12/fish-contain-plastics-and-textile-pollution/>



# WHAT CAN WE DO???

- **Ten Ways To “Rise Above Plastic.”**
- **Choose to reuse when it comes to shopping bags and bottled water. Cloth bags and metal or glass reusable bottles are available locally at great prices.**
- **Refuse single-serving packaging, excess packaging, straws and other “disposable” plastics. Carry reusable utensils in your purse, backpack or car to use at bbq’s, potlucks or take-out restaurants.**
- **Reduce everyday plastics such as sandwich bags and juice cartons by replacing them with a reusable lunch bag/box that includes a thermos.**
- **Bring your to-go mug with you to the coffee shop, smoothie shop or restaurants that let you use them, which is a great way to reduce lids, plastic cups and/or plastic-lined cups.**
- **Go digital! No need for plastic cds, dvds and jewel cases when you can buy your music and videos online.**
- **Seek out alternatives to the plastic items that you rely on.**
- **Recycle. If you must use plastic, try to choose #1 (PETE) or #2 (HDPE), which are the most commonly recycled plastics. Avoid plastic bags and polystyrene foam as both typically have very low recycling rates.**
- **Volunteer at a beach cleanup.**
- **Support plastic bag bans, polystyrene foam bans and bottle recycling bills.**
- **Spread the word. Talk to your family and friends about why it is important to reduce plastic in our lives and the nasty impacts of plastic pollution.**

# DON'T TRASH YOUR PLASTIC WASTE



Waste reduction is even better than recycling!



Reduce Title Card

## REDUCE

Reduce Definition Card

This means creating less waste through the products we use and purchase.

***Did you know?** Using a bag for life cuts down on the number of carrier bags you use.*

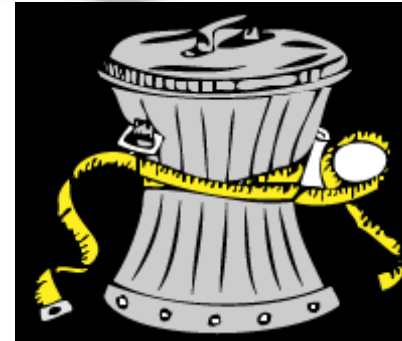
Reuse Title Card

## REUSE

Reuse Definition Card

This means using items again or using them for a different purpose.

***Did you know?** Donating unwanted items to charity means others can use them again.*





# MARAMING SALAMAT PO



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