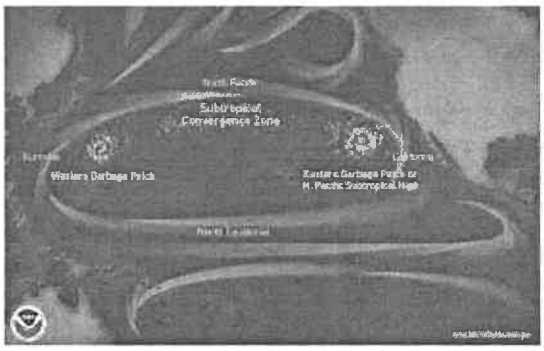
Grade 6: Science



The Great Pacific Garbage Patch

Dear Families,

In planning ahead for a long term closure the science department is posting the following assignment for the 6th grade. You can find the assignment on the school webpage.

Regards,

GFMS Science Department

Part 1:

Directions: Watch the videos and read the National Geographic article. Answer the accompanying questions.

Videos:

- "How Big the Great Pacific Garbage Patch Is"
  - https://www.youtube.com/watch?v=vrPBYS5zzF8

- The Swim- "The Great Pacific Garbage Patch Is Not What You Think It Is"
  - https://www.youtube.com/watch?v=6HBtI4sHTqU

Part 2:

Directions: Brainstorm and list 10 ways our school could reduce its' plastic use. Imagine your presenting your new ideas to your classmates. Write a persuasive paragraph to convince others to support your suggestions.

Topic: The Great Pacific Garbage Patch

Title of article: The Great Pacific Garbage Patch

National Geographic Education

Link: https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/

Questions Name _____

Directions: Read the article and answer the questions using information provided in the article.

1. **Where in the world can the Great Pacific Garbage Patch be found?**

2. **Why does the trash that enters the ocean, end up at this place and then stay there?**

3. **The majority of the trash that can be found in this garbage patch is made up of what material? What chemical characteristic of this trash makes it such a problem?**

4. **Give two reasons why this garbage patch, which covers millions of miles, can't be detected by satellites?**

5. **The trash coming into the Garbage Patch can be traced backed to two causes. What are the two causes?**

Topic: The Great Pacific Garbage Patch

Questions Continued Name _____

Directions: Read the article and answer the questions using information provided in the article.

6. **How are plastics broken down into microplastics?**

7. **List three environmental affects that the trash can have on marine life in the ocean.**

8. **Why isn't the Great Garbage Patch cleaned up?**

9. **How can this be prevented in the future?**

10. **Have you ever heard of this Garbage Patch before? What are your thoughts after reading this article? What do you think could be done to solve this problem? Would you be willing to eliminate plastic from your daily lifestyle?**

RESOURCE LIBRARY | ENCYCLOPEDIC ENTRY

Great Pacific Garbage Patch

The Great Pacific Garbage Patch is a collection of marine debris in the North Pacific Ocean. Marine debris is litter that ends up in the ocean, seas, and other large bodies of water.

GRADES
4 - 12+

SUBJECTS
Biology, Ecology, Earth Science, Oceanography

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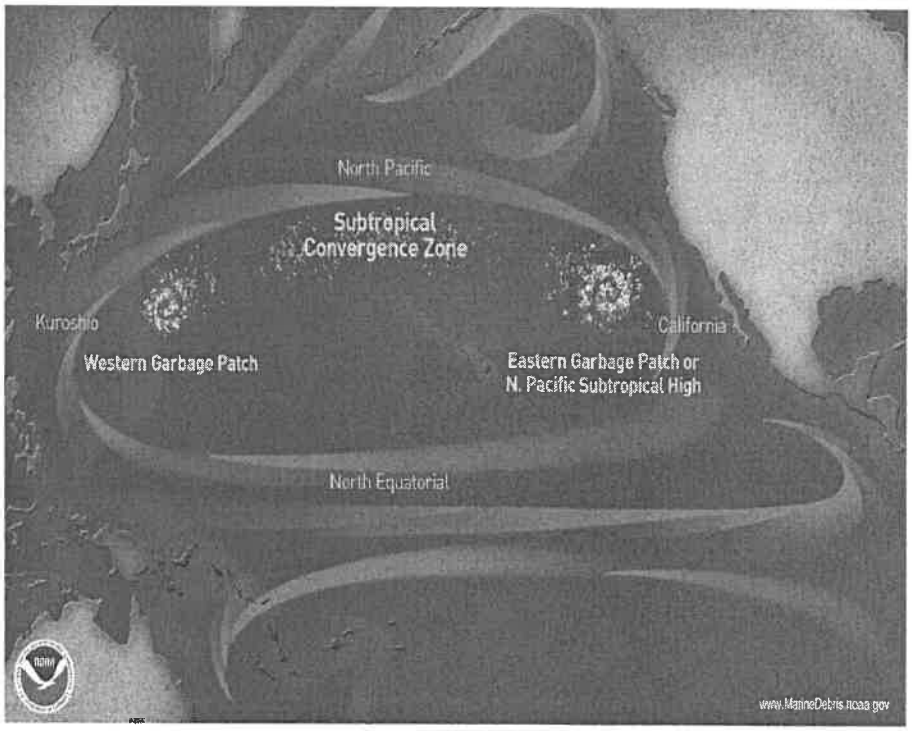
9 Images, 1 PDF

IMAGE

Great Pacific Garbage Patch

The Great Pacific Garbage Patch is a collection of marine debris in the North Pacific Ocean. Also known as the Pacific trash vortex, the garbage patch is actually two distinct collections of debris bounded by the massive North Pacific Subtropical Gyre.

MAP BY NOAA



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ENCYCLOPEDIC ENTRY VOCABULARY

Select Text Level:

4th Grade 7th Grade 9th Grade 10th Grade 12th Grade

The area in the center of a gyre tends to be very calm and stable. The circular motion of the gyre draws debris into this stable center, where it becomes trapped. A plastic water bottle discarded off the coast of California, for instance, takes the California Current south toward Mexico. There, it may catch the North Equatorial Current, which crosses the vast Pacific. Near the coast of Japan, the bottle may travel north on the powerful Kuroshiro Current. Finally, the bottle travels westward on the North Pacific Current. The gently rolling vortexes of the Eastern and Western Garbage Patches gradually draw in the bottle.

The amount of debris in the Great Pacific Garbage Patch accumulates because much of it is not biodegradable. Many plastics, for instance, do not wear down; they simply break into tinier and tinier pieces.

For many people, the idea of a "garbage patch" conjures up images of an island of trash floating on the ocean. In reality, these patches are almost entirely made up of tiny bits of plastic, called microplastics. Microplastics can't always be seen by the naked eye. Even satellite imagery doesn't show a giant patch of garbage. The microplastics of the Great Pacific Garbage Patch can simply make the water look like a cloudy soup. This soup is intermixed with larger items, such as fishing gear and shoes.

The seafloor beneath the Great Pacific Garbage Patch may also be an underwater trash heap. Oceanographers and ecologists recently discovered that about 70% of marine debris actually sinks to the bottom of the ocean.

While oceanographers and climatologists predicted the existence of the Great Pacific Garbage Patch, it was a racing boat captain by the name of Charles Moore who actually discovered the trash vortex. Moore was sailing from Hawaii to California after competing in a yachting race. Crossing the North Pacific Subtropical Gyre, Moore and his crew noticed millions of pieces of plastic surrounding his ship.

Marine Debris

No one knows how much debris makes up the Great Pacific Garbage Patch. The North Pacific Subtropical Gyre is too large for scientists to trawl. In addition, not all of the trash floats on the surface. Denser debris can sink centimeters or even several meters beneath the surface, making the vortex's area nearly impossible to measure.

About 54 percent of the debris in the Great Pacific Garbage Patch comes from land-based activities in North America and Asia. The remaining 20 percent of debris in the Great Pacific Garbage Patch comes from boaters, offshore oil rigs, and large cargo ships that dump or lose debris directly into the water. The majority of this debris—about 705,000 tons—is fishing nets. More unusual items, such as computer monitors and LEGOs, come from dropped shipping containers.

While many different types of trash enter the ocean, plastics make up the majority of marine debris for two reasons. First, plastic's durability, low cost, and malleability mean that it's being used in more and more consumer and industrial products. Second, plastic goods do not biodegrade but instead, break down into smaller pieces.

In the ocean, the sun breaks down these plastics into tinier and tinier pieces, a process known as photodegradation. Most of this debris comes from plastic bags, bottle caps, plastic water bottles, and Styrofoam cups.

Marine debris can be very harmful to marine life in the gyre. For instance, loggerhead sea turtles often mistake plastic bags for jellies, their favorite food. Albatrosses mistake plastic resin pellets for fish eggs and feed them to chicks, which die of starvation or ruptured organs.

Seals and other marine mammals are especially at risk. They can get entangled in abandoned plastic fishing nets, which are being discarded largely due to inclement weather and illegal fishing. Seals and other mammals often drown in these forgotten nets—a phenomenon known as "ghost fishing."

Marine debris can also disturb marine food webs in the North Pacific Subtropical Gyre. As microplastics and other trash collect on or near the surface of the ocean, they block sunlight from reaching plankton and algae below. Algae and plankton are the most common autotrophs, or producers, in the marine food web. Autotrophs are organisms that can produce their own nutrients from carbon and sunlight.

If algae and plankton communities are threatened, the entire food web may change. Animals that feed on algae and plankton, such as fish and turtles, will have less food. If populations of those animals decrease, there will be less food for apex predators such as tuna, sharks, and whales. Eventually, seafood becomes less available and more expensive for people.

These dangers are compounded by the fact that plastics both leach out and absorb harmful pollutants. As plastics break down through photodegradation, they leach out colorants and chemicals, such as bisphenol A (BPA), that have been linked to environmental and health problems. Conversely, plastics can also absorb pollutants, such as PCBs, from the seawater. These chemicals can then enter the food chain when consumed by marine life.

Patching Up the Patch

Because the Great Pacific Garbage Patch is so far from any country's coastline, no nation will take responsibility or provide the funding to clean it up. Charles Moore, the man who discovered the vortex, says cleaning up the garbage patch would "bankrupt any country" that tried it.

Many individuals and international organizations, however, are dedicated to preventing the patch from growing.

Cleaning up marine debris is not as easy as it sounds. Many microplastics are the same size as small sea animals, so nets designed to scoop up trash would catch these creatures as well. Even if we could design nets that would just catch garbage, the size of the oceans makes this job far too time-consuming to consider. The National Ocean and Atmospheric Administration's Marine Debris Program has estimated that it would take 67 ships one year to clean up less than one percent of the North Pacific Ocean.

Many expeditions have traveled through the Great Pacific Garbage Patch. Charles Moore, who discovered the patch in 1997, continues to raise awareness through his own environmental organization, the Algalita Marine Research Foundation. During a 2014 expedition, Moore and his team used aerial drones, to assess from above the extent of the trash below. The drones determined that there is 100 times more plastic by weight than previously measured. The team also discovered more permanent plastic features, or islands, some over 15 meters (50 feet) in length.

All the floating plastic in the Great Pacific Garbage Patch inspired National Geographic Emerging Explorer David de Rothschild and his team at Adventure Ecology to create a large catamaran made of plastic bottles: the *Plastiki*. The sturdiness of the Plastiki displayed the strength and durability of plastics, the creative ways that they can be repurposed, and the threat they pose to the environment when they don't decompose. In 2010, the crew successfully navigated the Plastiki from San Francisco, California, to Sydney, Australia.

Scientists and explorers agree that limiting or eliminating our use of disposable plastics and increasing our use of biodegradable resources will be the best way to clean up the Great Pacific Garbage Patch. Organizations such as the Plastic Pollution Coalition and the Plastic Oceans Foundation are using social media and direct action campaigns to support individuals, manufacturers, and businesses in their transition from toxic, disposable plastics to biodegradable or reusable materials.

The Great Pacific Garbage Patch is a soupy collection of marine debris—mostly plastics.

Worldwide Garbage Patches

The Great Pacific Garbage Patch is not the only marine trash vortex—it's just the biggest. The Atlantic and Indian Oceans both have trash vortexes. Even shipping routes in smaller bodies of water, such as the North Sea, are developing garbage patches.

Quotable Captain

"So on the way back to our home port in Long Beach, California, we decided to take a shortcut through the gyre, which few seafarers ever cross. Fishermen shun it because its waters lack the nutrients to support an abundant catch. Sailors dodge it because it lacks the wind to propel their sailboats.

"Yet as I gazed from the deck at the surface of what ought to have been a pristine ocean, I was confronted, as far as the eye could see, with the sight of plastic.

"It seemed unbelievable, but I never found a clear spot. In the week it took to cross the subtropical high, no matter what time of day I looked, plastic debris was floating everywhere: bottles, bottle caps, wrappers, fragments. Months later, after I discussed what I had seen with the oceanographer Curtis Ebbesmeyer, perhaps the world's leading expert on flotsam, he began referring to the area as the 'eastern garbage patch.'"

Capt. Charles Moore, discoverer of the Great Pacific Garbage Patch, in an article for Natural History magazine in 2003

Strange Cargo

When ships are caught in storms, they often lose cargo to the oceans. The following are just a few of the strange items that have washed up on shores:

- In 1990, five shipping containers of Nike sneakers and work boots were lost to the Pacific in a storm. People in Washington and Oregon snatched up the shoes on shore, holding swap meets to find matched pairs to wear or sell.
- In 1992, rubber duckies floated in the Pacific when a ship lost tens of thousands of bathtub toys. The ducks were accompanied by turtles, beavers, and frogs.
- In 1994, a ship lost 34,000 pieces of hockey gear, including gloves, chest protectors, and shin guards.

Articles & Profiles

- NOAA: Marine Debris—De-mystifying the 'Great Pacific Garbage Patch'

Audio

- NOAA: The Great Pacific Garbage Patch

Images

- National Geographic News: Giant Ocean Trash Vortex Documented

Video

- SchoolTube: The Great Pacific Garbage Patch—Good Morning America
- TEDx: Great Pacific Garbage Patch

Websites

- The Plastiki Expedition
- Algalita Marine Research Foundation

Credits

User Permissions

National Geographic
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