Grade 6

Opinion Writing

Why is it important to keep garbage and plastics out of water?

What can a country do to help?

What can you do to help?

Name _____

Opinion Essay: Keeping Garbage and Plastics out of Water

Directions:

You are going to be writing an essay that will include:

- Descriptions of the conditions in water affected by garbage and plastics.
- What countries can do to help improve the conditions in water.
- What you as an individual can do to improve the conditions in water.

In your writing response, be sure to:

- Clearly organize your writing and express what you have learned.
- Accurately and completely answer the questions being asked.
- Support your responses with evidence and details from the texts.
- Write in complete sentences using correct spelling, grammar, capitalization, and punctuation.

Brainstorm

What do you think some effects of garbage and plastics in water are?

Marine pollution, explained

By Jenny Howard

A wide range of pollution—from plastic pollution to light pollution—affects marine ecosystems.

THE OCEANS ARE so vast and deep that until fairly recently, it was widely assumed that no matter how much trash and chemicals humans dumped into them, the effects would be negligible.

Today, we need look no further than the New Jersey-size dead zone that forms each summer in the Gulf of Mexico, or the thousand-mile-wide belt of plastic trash in the northern Pacific Ocean to see that this early "policy" placed a once flourishing ocean ecosystem on the brink of collapse.

Many "flavors" of marine pollution

Ocean water covers more than 70 percent of the Earth, and only in recent decades have we begun to understand how humans impact this watery habitat. Marine pollution, as distinct from overall water pollution, focuses on human-created products that enter the ocean.

Before 1972, humans around the word spewed trash, sewage sludge, and chemical, industrial, and radioactive wastes into the ocean with impunity. Millions of tons of heavy metals and chemical contaminants, along with thousands of containers of radioactive waste, were purposely thrown into the ocean.

The London Convention, ratified in 1975 by the United States, was the first international agreement to spell out better protection for the marine environment. The agreement implemented regulatory programs and prohibited the disposal of hazardous materials at sea. An updated agreement, the London Protocol, went into effect in 2006, more

specifically banning all wastes and materials except for a short list of items, like leftover materials from dredging.

Many of these pollutants sink to the ocean's depths or float far distances from their original source, where they are consumed by small marine organisms and introduced into the global food chain. Marine pollution encompasses many types of pollution that disrupt the marine ecosystem, including chemical, light, noise, and plastic pollution.

Chemical pollution

Chemical pollution is the introduction of harmful contaminants. Common man-made pollutants that reach the ocean include pesticides, herbicides, fertilizers, detergents, oil, industrial chemicals, and sewage.

Many ocean pollutants are released into the environment far upstream from coastlines. Nutrient-packed fertilizers applied to farmland, for example, often end up in local streams and are eventually deposited into estuaries and bays. These excess nutrients trigger massive blooms of algae that rob the water of oxygen, leaving dead zones where few marine organisms can live. Some chemical pollutants climb high into the food webs—like DDT, the insecticide that placed the bald eagle on the United States Fish and Wildlife's endangered species list.

Scientists are starting to better understand how specific pollutants, leached into the ocean from other materials, affect marine wildlife. PFAS, a chemical incorporated into many household products, accumulates in human and marine mammal blood. Even pharmaceuticals ingested by humans, but not fully processed by our bodies, end up in aquatic food webs.

Light pollution

Since the invention of the lightbulb, light has spread across the globe, reaching almost every ecosystem. Often thought of as a terrestrial problem, scientists are starting to understand how artificial light at night affects many marine organisms.

Light pollution penetrates under the water, creating a vastly different world for fish living in shallow reefs near urban environments. Light disrupts the normal cues associated with circadian rhythms, to which species have evolved timing of migration, reproducing, and feeding. Artificial light at night can make it easier for predators to find smaller fish prey and can affect breeding in reef fish.

Noise pollution

Pollution is not always visible. In large bodies of water, sound waves can carry undiminished for miles. The increased presence of loud or persistent sounds from ships, sonar devices, and oil rigs disrupts natural noises in the marine environment.

For many marine mammals, like whales and dolphins, low visibility and large distances make non-visual underwater communication critical. Toothed whales use echolocation—emitting sounds that reflect off surfaces—to help them "see" in the ocean. Unnatural noises interrupt communication, disrupting migration, communication, hunting, and reproduction patterns for many marine animals.

Plastic pollution

Plastic pollution seeps into the ocean through run-off and even purposeful dumping. The amount of plastic in the Atlantic Ocean has tripled since the 1960s. The garbage patch floating in the Pacific Ocean, almost 620,000 square miles—twice the size of Texas—is a powerful image of our plastic problem.

A huge culprit is single-use plastics, used once before tossed into the trash or directly into the ocean. These single-use items are accidentally consumed by many marine mammals. Plastic bags resemble jellyfish, a common food for sea turtles, while some seabirds eat plastic because it releases a chemical that makes it smell like its natural food. Discarded fishing nets drift for years, ensnaring fish and mammals.

Bits of plastic swirl throughout the water column, even sinking to the deepest depths of the ocean. Scientists found plastic fibers in corals in the Atlantic Ocean—and more concerning, they found that the corals

readily ate plastic over food. Dying marine mammals, washing up on shore, also contain plastic inside their stomachs.

Is there a "fix" to marine pollution?

Many national laws, as well as international agreements, now forbid dumping of harmful materials into the ocean, although enforcing these regulations remains a challenge.

Many pollutants still persist in the environment, difficult to fully remove. Chemical pollutants often cannot be broken down for long periods of time, or they increase in concentration as they move up the food web. Because plastic is thought to take hundreds of years to break down, it poses a threat to the marine environment for centuries.

Isolated efforts to restore estuaries and bays have met with some success, but pollution gets trapped in marine sediment and makes complete clean-ups nearly impossible.

Moving forward, encouraging recycling and reuse can minimize plastic pollution. Dampening unnecessary lights at night can limit light pollution. And encouraging responsible chemical-use through consumer and political actions can protect the environment for the future.

"Marine pollution, explained" Questions

1. Why is it important to keep garbage and plastics out of water?

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_____

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2. What can a country do to help?

_____

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_____

Evidence/Quote:

_____

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3. What can you do to help?

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Evidence/Quote:

_____

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Tiny plastic, big problem
By Alison Pearce Stevens

Scientists find that tiny pieces of plastic travel great distances, threatening the ocean ecosystem.

Plastic bottles lying in the gutter. Grocery bags tangled in branches. Food wrappers scuttling across the ground on a windy day. Although such examples of litter easily come to mind, they only hint at the serious and growing problem of plastic pollution — a problem mostly hidden from view.

The problem with plastics is they do not easily degrade. They may break down, but only into smaller pieces. The smaller those pieces get, the more places they can go.

Many pieces wind up at sea. Tiny bits of plastic float throughout the world's oceans. They wash up on remote islands. They collect in sea ice thousands of kilometers (miles) from the nearest city. They even meld with rock, creating a whole new material. Some scientists have proposed calling it plastiglomerate (pla-stih-GLOM-er-ut).

Exactly how much plastic is out there remains a mystery. Scientists are hard at work trying to find out. So far, though, experts haven't found as much plastic floating in the oceans as they expected. All that missing plastic is worrisome, because the smaller a plastic bit becomes, the more likely it will make its way into a living thing, whether a tiny plankton or an enormous whale. And that may spell some real trouble.

Into the soup

Plastics are used to make countless everyday products — from bottles to auto bumpers, from homework folders to flowerpots. In 2012, 288 million metric tons (317.5 million short tons) of plastic were produced worldwide. Since then, that amount has only grown.

Just how much of that plastic winds up in the oceans remains unknown: Scientists estimate about 10 percent does. And one recent study suggests as

much as 8 million metric tons (8.8 million short tons) of plastic wound up in the ocean in 2010 alone. How much plastic is that? “Five plastic bags filled with plastic for every foot of coastline in the world,” says Jenna Jambeck. She’s the researcher from the University of Georgia, in Athens, who led the new study. It was published February 13 in *Science.*

Of those millions of tons, as much as 80 percent had been used on land. So how did it get into the water? Storms washed some plastic litter into streams and rivers. These waterways then carried much of the trash downstream to the sea.

The other 20 percent of plastic ocean trash enters the water directly. This debris includes fishing lines, nets and other items lost at sea, dumped overboard or abandoned when they become damaged or are no longer needed.

Once in the water, not all plastics behave the same way. The most common plastic — polyethylene terephthalate (PAHL-ee-ETH-ill-een TEHR-eh-THAAL-ate), or PET — is used to make water and soft-drink bottles. Unless filled with air, these bottles sink. This makes PET pollution tough to track. That’s especially true if the bottles have drifted to the ocean depths. Most other types of plastic, however, bob along the surface. It’s these types — used in milk jugs, detergent bottles and Styrofoam — that make up the abundance of floating plastic trash.

Abundant, indeed: Evidence of plastic pollution abounds across the world’s oceans. Carried by circular currents called gyres (JI-erz), discarded pieces of plastic can travel thousands of kilometers. In some areas, they **amass** in huge quantities. Reports on the largest of these — the “Pacific Garbage Patch” — are easy to find online. Some sites report it to be twice the size of Texas. But defining the actual area is a difficult task. That’s because the garbage patch is actually quite patchy. It shifts around. And most of the plastic in that area is so tiny that it’s hard to see.

Entering the food web

Cózar proposes several possible explanations. The tiniest bits might have broken down quickly into particles too small to catch in his net. Or maybe something caused them to sink. But a third explanation seems even more likely: Something ate them.

Unlike the organic matter found in living things, plastics do not provide energy or nutrients to growing animals. Still, critters do eat plastic. Sea turtles and toothed whales gulp down plastic bags, mistaking them for squid. Sea birds scoop up floating plastic pellets, which can resemble fish eggs. Young albatross have been found dead from starvation, their stomachs full of plastic garbage. While feeding, adult seabirds skim floating trash with their beaks. Parent birds then regurgitate the plastic to feed their young. (These plastic bits eventually can kill them.)

Yet such large animals wouldn't eat pieces just millimeters in size. Zooplankton might, however. They are much smaller marine creatures.

"Zooplankton describe a whole range of animals, including fish, crab and shellfish larvae," explains Matthew Cole. He is a biologist at the University of Exeter in England. Cole has found that these tiny critters are just the right size to snap up the millimeter-size bits of plastic.

His research team has collected zooplankton from the English Channel. In the lab, the experts added polystyrene beads to tanks of water holding the zooplankton. Polystyrene is found in Styrofoam and other brands of foam. After 24 hours, the team examined the zooplankton under a microscope. Thirteen of the 15 zooplankton species had swallowed the beads.

In a more recent study, Cole found that microplastics limit the ability of zooplankton to consume food. Zooplankton that had swallowed polystyrene beads ate smaller bits of algae. That cut their energy intake nearly in half. And they laid smaller eggs that were less likely to hatch. His team published its findings January 6 in *Environmental Science & Technology*.

"Zooplankton are very low on the food chain," Cole explains. Still, he notes: "They are a really important food source for animals like whales and fish." Reducing their population could have a widespread impact on the rest of the ocean ecosystem.

And, it turns out, not just tiny zooplankton are eating the plastic bits. Larger fish, crabs, lobster and shellfish do too. Scientists have even found plastic in the guts of marine worms.

Once there, the plastic tends to stick around.

In crabs, microplastics remain in the gut six times longer than food does, says Andrew Watts. He is a marine biologist at the University of Exeter. What's more, eating plastic causes some species, such as marine worms, to store less fat, protein and carbohydrate, he explains. When a predator (such as a bird) now eats those worms, it gets a less nutritious meal. It also ingests the plastic. With each meal consumed, more and more plastic makes its way into a predator's body.

That's cause for concern. "Plastics might pass up the food chain," says Cole, "until it gets into food that ends up on our own dinner plates."

Managing microplastics

The very nature of microplastics makes cleanup impossible. They are so tiny and so widespread that there is no way to remove them from the seas, notes Law.

The best solution is to prevent more plastic from reaching the ocean. Trash traps and litter booms can snag garbage before it enters waterways. Even better: Reduce plastic waste at its source. Be aware of packaging and buy items that use less of it, Law suggests. Skip the plastic bags, including zippered ones used for foods. Invest in reusable water bottles and lunch containers. And say no to straws.

Law also recommends asking restaurants to stop using polystyrene foam containers. These break up quickly and are not recyclable. Talk to friends and parents about the problems of plastic, and pick up litter when you see it.

Law recognizes that reducing plastic use won't be an easy change. "We live in an era of convenience," she says. And people find it convenient to throw things away when they are done with them.

That's not to say that we should do away with plastic altogether. "Plastic has a lot of beneficial uses," says Law. But people need to stop looking at plastic as disposable, she argues. They need to view plastic items as durable things to hold on to and reuse.

"Tiny plastic, big problem" Questions

1. Why is it important to keep garbage and plastics out of water?

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2. What can a country do to help?

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_____

Evidence/Quote:

_____

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3. What can you do to help?

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Evidence/Quote:

_____

_____

Plastic Oceans: What is the impact of pollution in the sea?

https://www.youtube.com/watch?v=cwTDvqaqPlM

1. How long can an ocean hang onto plastic? _____

2. How many pieces of plastic were found in the bird's stomach?

_____

3. How many pieces of plastic are estimated to enter the world's oceans daily? _____

4. What groups of people worked with the scientists to gain information? _____

5. How many species are affected worldwide by marine debris?

_____

6. What do plastics do over years of laying on the beach? Why is this dangerous?_____

_____

7. It is estimated that fish in the north pacific consume up to how much plastic a year? _____

8. How can this plastic problem affect humans?

_____

_____

After viewing the video, respond to the following questions:

1. Why is it important to keep garbage and plastics out of water?

_____

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2. What can you do to help?

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Opinion Essay: Keeping Garbage and Plastics out of Water

Paragraph 1 (Introduction):

- Background Information
    - Attention Getter
    - Where is pollution in water found?
    - What does pollution in water affect (in water)?
    - What/who does pollution in water affect (out of water)?
    - Your opinion statement

Paragraph 2:

- Why is it important to keep garbage and plastics out of water?
    - Give details form the articles you read, and video you viewed.
- Who should help?

Paragraph 3:

- What can an individual do to help? What can you do to help?
    - Way to help #1 with evidence. Explain your evidence.
    - Way to help #2 with evidence. Explain your evidence.
    - Way to help #3 with evidence. Explain your evidence.

Paragraph 4 (Conclusion):

- How does helping keep garbage and plastic out of water make you feel?
- Why is it important to keep garbage and plastic out of water?
- How can you take what you learned from the articles and video and apply it to your life?

Graphic Organizer

Paragraph 1: Introduction
Attention Getter
Where is pollution in water found?
What does pollution affect (in water)?
What does pollution affect (out of water)?
Opinion Statement

Paragraph 2	
Why is it important to keep garbage and plastics out of water?	
Article/Video	**Detail/Quote (at least one from each article/video)**
Who should help?	

Paragraph 3	
What can an individual do to help?	
What can you do to help?	
Way to help #1	**Evidence**
Way to help #2	**Evidence**
Way to help #3	**Evidence**

Paragraph 4: Conclusion
How does helping keep garbage and plastic out of water make you feel?
Why is it important to keep garbage and plastic out of water?
How can you take what you learned from the articles and the video and apply it to your life?