



Credit: Chaleow Ngamdee/Shutterstock.com

Sea Stewards

Handbook

Learn about issues affecting our ocean, and what you can do to help.



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Sea Stewards Handbook

Disclaimer

This handbook is intended as an outreach tool for students. Information within this handbook should not be cited in scientific journals or other publications.

Hard Copies

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Credit: Jim Milbury, NOAA Fisheries

About the Handbook

This handbook was developed to support the Sea Stewards program. Through this program, underserved students, persons with disabilities, and veterans spend a day recreating on the ocean and learning about what it means to be an ethical angler and a marine steward. This program is made possible by a partnership between California State Coastal Conservancy, Los Angeles Rod and Reel Club Foundation, Marina Del Rey Anglers, and NOAA Fisheries West Coast Region.

California State Coastal Conservancy (CSCC)

The Conservancy was established in 1976 to protect and improve natural lands and waterways, help people access and enjoy the outdoors, and sustain local economies along the length of California's coast and around San Francisco Bay.

Los Angeles Rod and Reel Club (LARRC)

LARRC and its Foundation promote Sportfishing and other causes, including: fishing trips for disadvantaged kids and disabled veterans, fishing fellowship grants and marine biology scholarships, construction of artificial reefs, marine research, and hatchery programs.

Marina Del Rey Anglers (MDRA)

MDRA aims to preserve the tradition of sport fishing through camaraderie, philanthropy, and conservation. This nonprofit fishing club sponsors fishing trips for members as well as kids from at-risk environments and disabled veterans from the West Los Angeles VA Center. MDRA also engages in marine conservation programs including the white seabass grow out facilities in Marina Del Rey.

NOAA Fisheries West Coast Region (NMFS WCR)

NOAA Fisheries is responsible for the stewardship of the nation's ocean resources and their habitat. Our work is guided by two core mandates—to ensure the productivity and sustainability of fisheries and fishing communities through science-based decision-making and compliance with regulations, and to recover and conserve protected resources including marine mammals, sea turtles, and fish.

Dedication

This handbook is dedicated to the stewards of our ocean. Whether you organize beach cleanups, encourage your community to reduce its water consumption, protect our watersheds and wetlands from urban runoff, or teach young people how to be ethical anglers, you are the hero our ocean needs. Because of people like you—who raise awareness of the critical issues facing our ocean—future generations will have a healthy ocean to enjoy.

Introduction

The ocean is in trouble, but you can help save it! Every day the news is filled with stories about issues affecting our ocean, such as marine debris, ocean acidification, and sea level rise. But most stories will not explain how individuals can help. The Sea Stewards Handbook is here to teach you what you need to know to help save the world, or at least the 70% of it that is covered in saltwater. In this handbook, you will discover:

- The importance of watersheds, which connect our doorsteps to the ocean.
- Nine big problems facing the ocean today.
- Examples of kids, teens, and adults who are ocean heroes.
- Ways that you can get involved and become a sea steward.



Page 01-02

What's a Watershed?

A watershed is an area of land where surface water drains down to a single point, such as a pond, lake, or ocean. Watersheds connect everyone to the ocean.



Page 03-04

Runoff

Runoff is water that flows over the ground before reaching waterways, such as lakes and rivers. Stormwater runoff carries pollutants such as oil, gasoline, pesticides, and litter directly to streams and rivers.



Page 05-06

Marine Debris

Marine debris is any human-made object that ends up in the marine environment such as straws, soda bottles, plastic grocery bags, and more.



Page 07-08

Wildlife Interactions

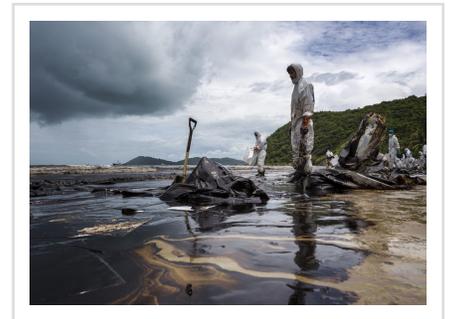
Although it can be tempting to try to get close to marine animals, it's best to view wildlife from a distance for their safety—and yours.



Page 09-10

Overfishing

Overfishing has been happening around the world for many decades. Today, there are half as many fish in the ocean as there were in 1970.¹



Page 11-12

Oil Spills

The vast majority of oil spills come from minor spills and leaks. This includes cars and trucks that drip oil onto roads and lawnmowers that leak oil into grass.

All around the world, people are waking up to the issues facing our ocean and are rising up to make a difference. From hosting cookie fundraisers to designing inventions that suck up marine debris to writing songs about marine ecosystems, kids and adults are using their talents to help save the ocean.

Many of the problems facing our ocean may seem too big to solve. When you think of major challenges like overfishing, urban runoff, and oil spills, you may think, "What can I do? I'm just one person." While solving these problems alone might be impossible, people around the world are banding together to find creative solutions.

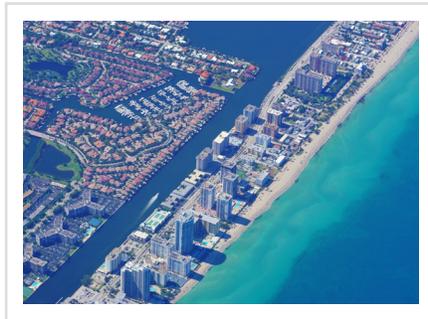
You have a voice, and the ocean needs you to speak for it. Are you ready to become a Sea Steward? If so, keep reading!



Page 13-14

Ocean Acidification

The ocean absorbs about 30% of the CO₂ that is released into the atmosphere. As levels of atmospheric CO₂ increase, so do the levels in the ocean.



Page 15-16

Sea Level Rise

About 40% of the US population lives in coastal areas that may be affected by sea rising sea levels.²



Page 17-18

Pharmaceuticals

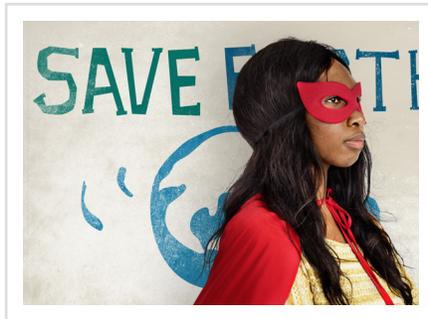
In the US alone, at least 250 million pounds of pharmaceuticals are flushed every year!³ These drugs ultimately make their way into the ocean where they can be absorbed by marine species.



Page 19-20

Shoreline Armoring

Shoreline armoring (e.g., breakwaters, bulkheads, etc.) slows down erosion, but it can come at a cost. Hard armoring can shrink beaches, destroy coastal habitat, and displace animals.



Page 21-24

Ocean Heroes

Around the world, people are working together to create healthier environments and raise awareness of the issues facing our ocean. Learn about individuals who are making a big difference.

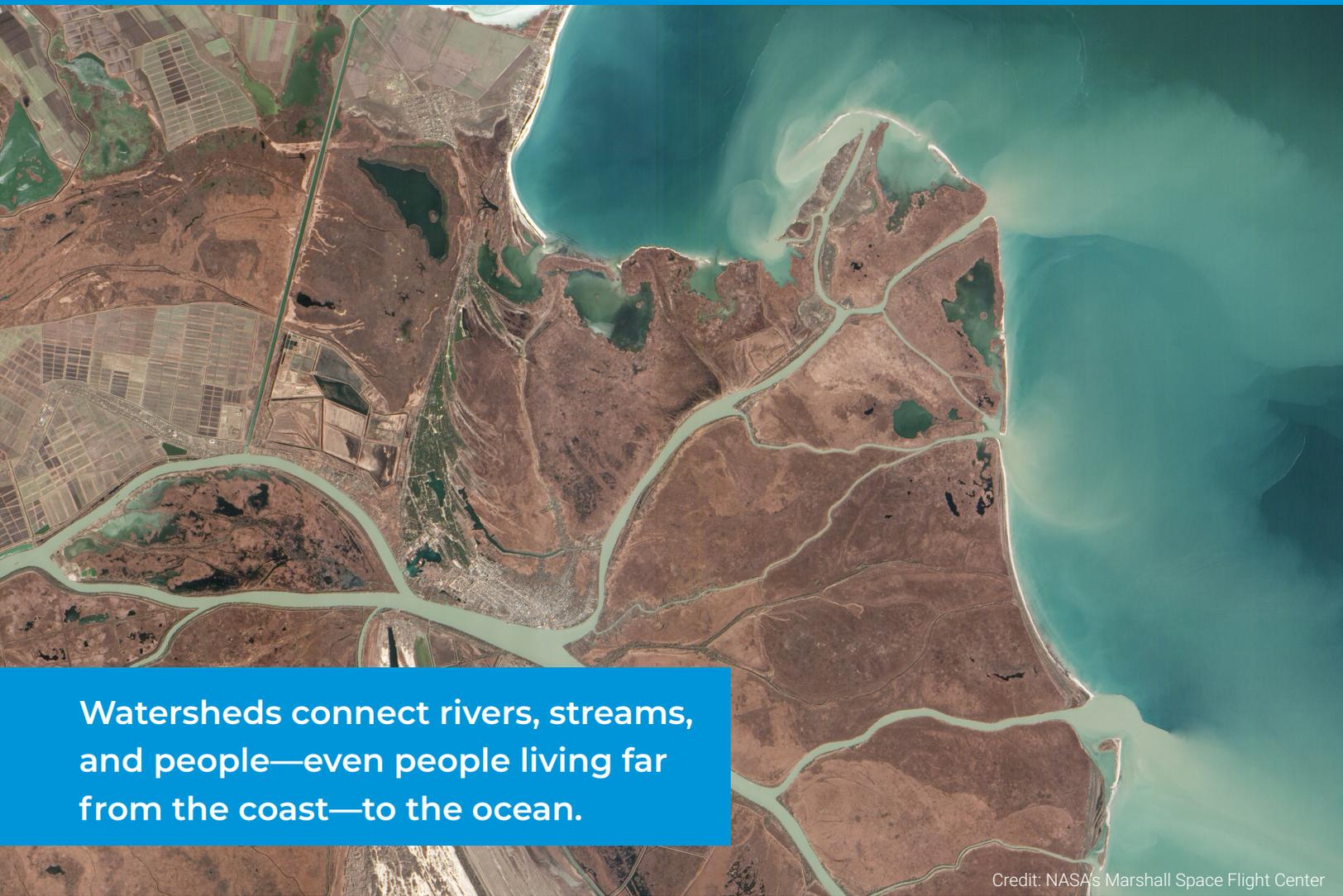


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Get Involved!

Find resources that will help you become an advocate for our ocean. You can make a difference one step at a time!

What's a watershed?



Watersheds connect rivers, streams, and people—even people living far from the coast—to the ocean.

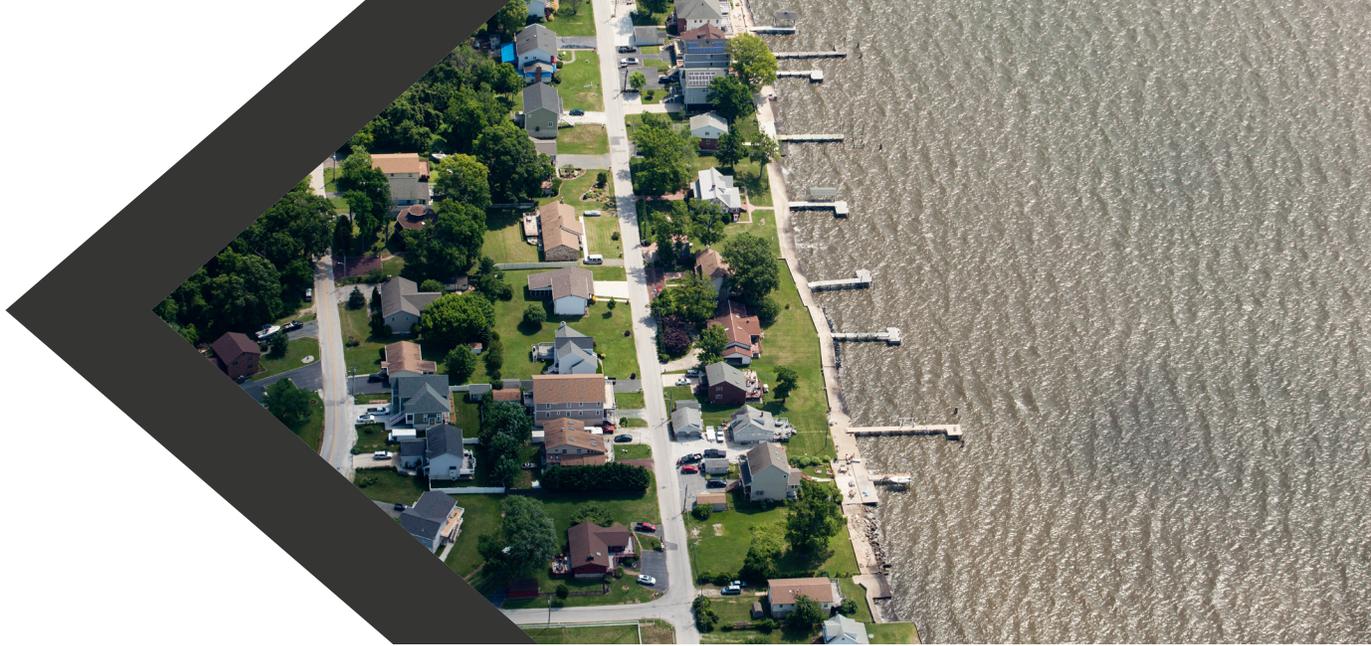
Credit: NASA's Marshall Space Flight Center

A watershed is an area of land where surface water drains down to a single point, such as a pond, lake, or ocean. The boundary of a watershed is the high land surrounding it, like the edge of a bowl. Water from hundreds, if not thousands, of creeks and streams flow from higher ground into rivers. This water eventually winds up in a larger body of water, such as larger rivers, lakes, or the ocean.

A watershed can be small, such as a single lake or a single county. Some watersheds encompass thousands of square miles and may contain streams, rivers, lakes, reservoirs, and groundwater. The largest watershed in the

“Water is our most precious and interconnected natural resource. It sustains all ecosystems, communities, and economies from local watersheds to the seas. It’s vital to sustaining our health, safety, and the environments in which we live and work. Simply put, water is life.”

- Alexandra Cousteau
Filmmaker and granddaughter of Jacques Cousteau



Credit: Chesapeake Bay Program/Flickr

US is the Mississippi River Watershed. It drains nearly 3 million square km (1.15 million square miles) from 31 states and two Canadian provinces!

As rainwater and snowmelt run downhill, they carry whatever is on the land—such as oil from cars, trash and debris on streets, and exposed soil from construction—to the nearest body of water. These pollutants can concentrate in streams and rivers and can be carried down the watershed and into the ocean.

Not all water flows directly to the sea, however. When rain falls on dry ground, it can soak into, or infiltrate, the ground. This groundwater remains in the soil, where it will eventually seep into the nearest stream. Some water infiltrates much deeper, into underground reservoirs called aquifers. In other areas, where the soil contains a lot of hard clay, very little water may infiltrate. Instead, it quickly runs off to lower ground.

Rain and snowmelt from watersheds can take many routes to the sea. During periods of heavy rain and snowfall, water may run onto and off of impervious surfaces such as parking lots, roads, and buildings because it has nowhere else to go. These surfaces transport water directly into storm drains. The excess water volume can quickly overwhelm streams and rivers, causing them to overflow and possibly result in floods.

Many of the major issues facing our ocean begin in watersheds—even those far from the ocean. This handbook will help you understand how problems in

our local communities can ultimately affect the ocean. Before we dive in, visit [Surf Your Watershed](#) from the US Environmental Protection Agency or [Model My Watershed](#) from the Stroud Water Research Center to find your local watershed and to learn how it connects you to the ocean.

In the upcoming sections, we'll take a look at some of the most pressing issues facing our ocean today and what you can do in your community to make a difference. We'll start by examining issues that might be familiar, such as marine debris, and then zoom out to look at issues that might be less familiar, such as shoreline armoring.

In the next section, we will cover:

- Runoff
- Marine debris
- Wildlife interactions
- Overfishing
- Oil spills
- Ocean acidification
- Sea level rise
- Pharmaceuticals
- Shoreline Armoring

It's important to remember that even if we live far from the coast, our everyday actions still affect the ocean. While you are reading this handbook, ask yourself:

- How does this apply to my watershed?
- How can I make a difference in my community?

Runoff

When it rains, have you noticed water rushing down the street or out of gutters?

Where is this water going?

What kind of pollutants might this water be carrying?

Runoff is water that flows over the ground before reaching waterways, such as lakes and rivers. This water can come from rain, snow, or irrigation. Runoff carries sediment from the land into the ocean, which naturally adds sand to beaches and makes the ocean salty. Runoff can become polluted as it runs over streets, lawns, and farms.

Much of our urban and suburban land is covered by buildings and pavement, such as sidewalks, parking lots, driveways, and roads. This development does not allow rain or snowmelt to soak into the ground. Most developed areas rely on storm drains to carry large amounts of runoff from roofs and pavement to nearby waterways. This is known as stormwater runoff, and it carries pollutants such as oil, gasoline, pesticides, litter, and fertilizers directly to streams and rivers. Some stormwater is toxic enough to kill an adult salmon in just 2.5 hours!⁴

Agricultural runoff is water that leaves farmland. This water can contain animal feed, animal waste, pesticides, herbicides, and fertilizers. Pesticides and herbicides pollute water. Animal feed, animal waste, and fertilizers add extra nutrients—like nitrogen and phosphorous—to the water. Algae feed on the extra nutrients. When groups of algae grow really big, this is called an algal bloom. Algal blooms are natural events, but nutrient-rich runoff makes them happen more often.

Harmful algal blooms, or HABs, occur when colonies of algae grow out of control and produce harmful effects. Some HABs are toxic. Toxic HABs can poison animals and may also make the surrounding air hard to breathe. Other types of HABs are not toxic but cause harm to marine life in other ways. They can damage or clog fish gills or block sunlight that beneficial algae and seagrass need to grow. Some HABs bloom so densely that the death and decay of the algae leads to oxygen



Credit: Dave Zapotosky/NOAA

A glass of water from Lake Erie during a harmful algal bloom.

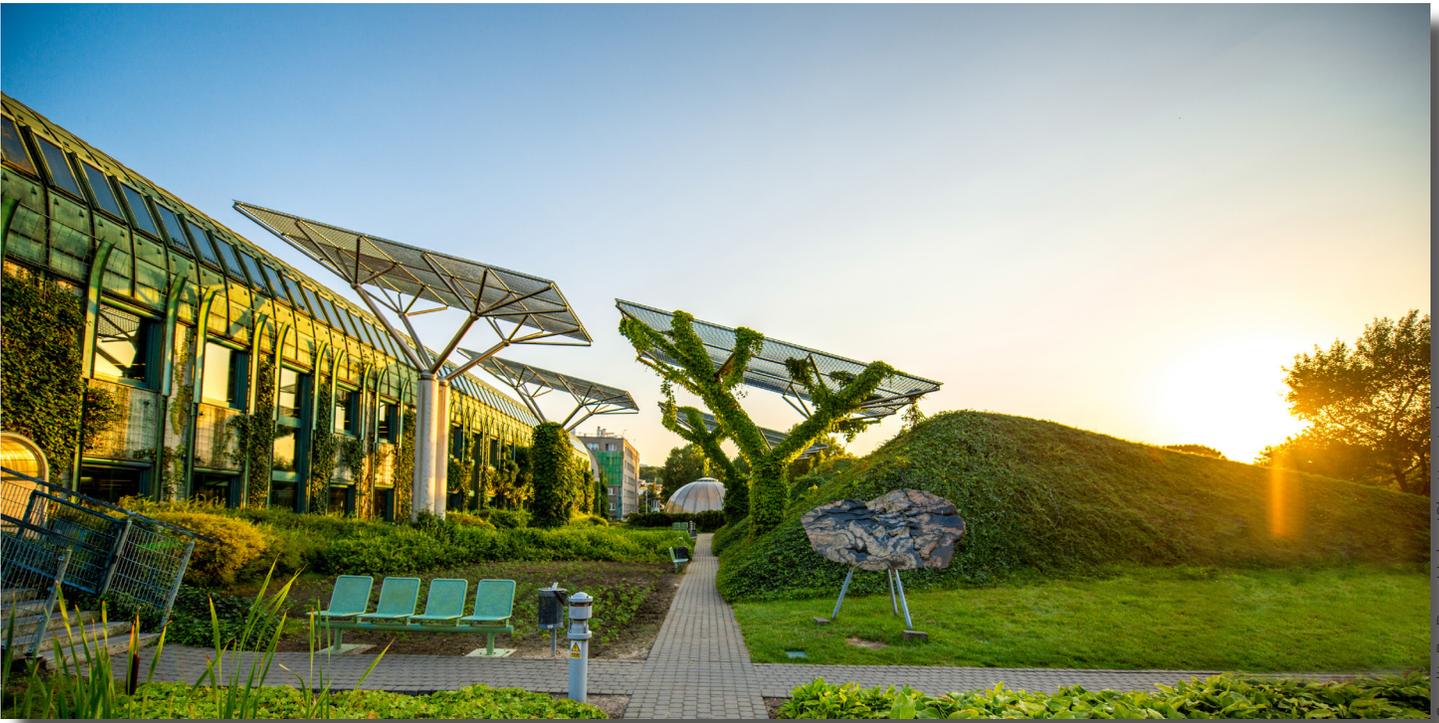
MAKING CHANGE



Credit: Stewardship Partners

A rain garden is a depressed area in the landscape that collects rain water from a roof, driveway, or street. Like a sponge, these gardens allow rain water to soak into the ground. The gardens are planted with native grasses and flowering perennials. Rain gardens can be a cost effective and beautiful way to reduce runoff. They can also help filter out pollutants in runoff and provide food and shelter for butterflies, song birds, and other wildlife.

Students at Carnation Elementary School in Washington State wanted to reduce runoff from their school's nearly 2,000 m² (6,500 ft²) roof. A third grade class worked with the Snoqualmie Tribe and a local nonprofit called Stewardship Partners to design and build a pair of rain gardens. The gardens are large enough to absorb the runoff from the schools' entire roof, treating over 500,000 L (150,000 gal) of rainwater each year!



Credit: By RossHelen/Shutterstock.com

depletion, suffocating animals or forcing them to migrate.

Cities are fighting against toxic stormwater runoff by using green infrastructure. Green infrastructure allows runoff to spread out and soak into the ground. Some examples are: rain gardens, porous pavement, and green roofs. These structures filter the runoff before it reaches waterways. You can make simple changes to help reduce runoff, too:

Take Action!

1

Maintain Vehicles

When it rains, stormwater runoff carries oil, antifreeze, gasoline, and other products that drip from our cars to rivers, streams, lakes. Regularly check your car for leaks, and fix them as soon as possible. Many repair shops offer free leak inspections. Visit www.fixcarleaks.org to learn more.

2

Use Commercial Car Washes

Soap, gasoline, heavy metals, and motor oil washes off cars and flows into nearby waterways. Most commercial car washes reuse water several times before sending it to a treatment plant. If you must wash your car at home, wash it on your lawn and empty the wash bucket into a sink or toilet.

3

Redirect Downspouts

Downspouts are often directed onto a paved surface, such as a driveway, which sends water directly into the street when it rains. Redirecting downspouts to a landscaped area is a great way to help reduce runoff from a property.

Marine Debris

*Do you ever notice cigarette butts, food wrappers, or soda bottles on the sidewalk or in the street?
What happens to this litter if it isn't picked up?*

Potential marine debris is found all over our streets and shorelines. Marine debris is any human-made object that ends up in the marine environment such as straws, water bottles, candy wrappers, plastic grocery bags, and more. People used to think that marine debris only came from fishing and shipping boats, but that isn't true! Only 20% of marine debris comes from fishing and shipping.⁵ The other 80% comes from things on land, like litter on the beach or street that gets swept down storm drains and out into the ocean.⁶ Worldwide, most marine debris is plastic.⁷

Marine entanglement is a huge problem that affects more than 200 species worldwide.⁸ Fish, marine mammals, and birds can become trapped in nets and plastics. These animals have trouble eating, breathing, and swimming. Sometimes, the animals can get stuck and die. Other times, they can drag the debris with them for the rest of their lives. How would it feel if you were wrapped up in a net everywhere you went?

Plastic bags are one of the worst culprits. Sea turtles are known to eat them because the bags look like jellies, which are one of their favorite snacks. The bags can become stuck inside the turtle, causing them to get sick or starve. Animals living on the bottom of the ocean are affected by marine debris too. A survey 2.5 miles off the coast of Monterey Bay, California found more marine debris 2,000 meters (6,500 feet) deep in the water than was present at the surface!⁹ The sea floor was littered with plastic, metal, and fishing gear. Even car tires and shoes were discovered!



Credit: Suppalerk Arrunvaikit/Shutterstock.com

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Afroz Shah is a lawyer from Mumbai, India who wanted his local beach to be clean. Shah, along with his 84-year-old neighbor, began picking up trash on Versova Beach every weekend. Shah would knock on doors around his neighborhood and ask people to help. Every weekend, he invited them for a "date with the ocean." What he really meant was picking up rotting trash in the blazing heat.

Eventually, Shah gathered more than 4,000 volunteers to help. Together, they cleared more than 2.4 km (1.5 mi) of beach of almost 3 million kg (6.4 million pounds) of trash! This is the largest beach cleanup in the world, and it began with just two people. Shah was awarded the United Nation's highest honor for environmental stewardship: The Champions of the Earth award.

Credit: Hindustan Times

Marine Debris

People are making an effort to filter wastewater to remove potential marine debris. But there are some things that the filters can't catch: microplastics and microfibers.

Microplastics are bits of plastic less than 5 mm (0.2 in) long. They have turned the world's ocean into what scientists call a "plastic soup." Many microplastics come from personal care products, like toothpaste and face wash, that contain tiny beads of plastic. When larger plastics, such as soda bottles or plastics bags, wash into the ocean, they break up into smaller and smaller pieces. In the US alone, water treatment plants discharge almost 13 billion particles of microplastic every day.¹⁰

Some animals are unable to distinguish between food and microplastics. At least 700 marine animals are known to have eaten microplastic, including sea turtles, marine mammals, and seabirds.¹¹ These bits of plastic can damage the digestive tracts of marine life and can lead to starvation.

Every time we do laundry, our clothes shed tiny microfibers. These fibers come loose in the washing machine, and are flushed into wastewater. Many of them pass through wastewater treatment plants before being released into the environment, where they can be eaten or absorbed by marine animals. Hundreds of thousands of tiny microfibers can be released in a single load of laundry.¹² Many of our clothes are made from synthetic fabrics, which often contain plastics.

While it might sound like the marine debris problem is too big to solve, there are many things that you can do to make a difference. Below are a few ideas to help get you started.

MAKING CHANGE

Innovators and engineers are developing products to filter microfibers out of laundry. One example is the Cora Ball. This four-inch ball is made from 100% recycled plastic. It bounces around the washing machine, trapping microfibers in appendages that resemble coral. Another example is the GUPPYFRIEND Washing Bag. It protects synthetic garments and reduces the amount of microfibers that shed. The fibers can be cleaned out of the ball or bag and then dropped in the trash.



Take Action!

1

Pick Up and Report Marine Debris

Download the [Marine Debris Tracker](#) or [Litterati app](#) and take photos of litter that you find on the street or at the beach. Scientists use this data to learn about and educate the public about different sources of marine debris. After you've submitted your report, toss the trash into the appropriate bin.

2

Ditch Disposable Products

Trade in disposable products, such as plastic straws, cups, and bags, for reusable ones. If you must use disposable items, find ones that are commercially compostable or recyclable. Visit [Trash-Free Waters](#) from the EPA or [Zero Waste Week](#) from the National Marine Sanctuaries to learn more.

3

Recycle Fishing Line and Gear

Visit [Reel In & Recycle](#) to learn how to recycle fishing line so that wildlife does not get tangled up. Commercial fishers can recycle their gear through the [The Global Ghost Gear Initiative](#) or [Fishing for Energy](#).

Wildlife Interactions

*When you see an animal in the wild, do you want to get really close to take a photo?
We must remember to give wildlife space so that we don't disturb them.*

Whether it's watching a group of dolphins leaping across the water, seeing a sea turtle nesting on a beach, or encountering a colony of seals basking in the sun—viewing marine animals in their natural habitat is an exciting experience. Although it can be tempting to try to get close to marine animals, it's always best to view them from a respectful distance for their safety—and yours. Learning how to safely observe marine animals can help you make the right decisions when you encounter them by water, land, or air.

In the US, it is illegal to disturb, feed, or harass marine mammals and sea turtles. Marine mammals are warm-blooded animals that live in or near the ocean and use lungs to breath. This group includes whales, dolphins, seals, sea otters, and more.

When people interact with marine mammals, the animals may associate people with food, lose their natural wariness of humans or boats, and become conditioned to receiving handouts. They may also begin to take bait and catch from fishing gear. These changed behaviors may be passed on to their young and other members of their social groups. This puts the animals at increased risk of injury from boats, entanglement in fishing gear, and intentional harm by people who become frustrated with the animals.



Credit: CalPoly SLO and MBNMS

Take Action!

1

Keep Your Distance

For your safety and that of the animals, make sure you keep your distance. If an animal appears stressed, you are too close and need to back away slowly. Never approach, touch, or feed any wild animal. Download [NOAA's Ocean Etiquette: Marine Wildlife Viewing Guidelines](#) to help remember these tips.

2

Leave Only Footprints

Make sure you don't leave anything behind. Fishing line can entangle animals, and your plastic lunch bag does a pretty good impersonation of a jelly snack for a sea turtle.

3

Report Illegal Behavior

If you spot someone touching, feeding, or harassing marine animals in the wild, please call NOAA Fisheries' Enforcement Hotline at (800) 853-1964. You may leave information anonymously.

Wildlife Interactions



Credit: Steve Bower/Shutterstock.com

Although tide pool creatures can survive harsh conditions, human visitors can easily disturb them. A simple act like turning over a rock and exposing the animals to the sun can harm them. When visiting visit tide pools, do your part to preserve this special place:

Step lightly

Most rocks are covered with living animals and plants. Step carefully to avoid crushing them.

Look closely

Sit quietly and watch for a few minutes. You'll see and learn much more this way.

Touch gently

If you touch an animal or plant, touch it gently.

Leave everything as you found it

Strict laws govern collecting tide pool life. Enjoy seashore life in its natural environment and leave the plants and animals exactly as you found them.

These guidelines will help you stay safe while you explore the coast and beyond. Now that you know how to properly view these animals, share these directions with your friends and neighbors. This way, your whole community can protect themselves while they protect their marine friends.

MAKING CHANGE

Sea turtle hatchlings are guided to the water from their nest by the reflecting moon or setting sun. When bright city lights dot the shoreline, turtle hatchlings crawl towards roadways instead of toward the waves. The disoriented turtles are more susceptible to being run over by cars or eaten by predators on land.

After learning about these light pollution issues, the Whitecloud family in Fort Lauderdale, Florida, decided that they had to do something. At age seven, Teakahla Whitecloud became a founding director of Sea Turtle Oversight Protection (S.T.O.P.) along with her mother and father. S.T.O.P. is a group dedicated to stopping light pollution along beaches. S.T.O.P. was able to get the City of Fort Lauderdale to outlaw light posts on the beach. Every evening, seaside houses and business are required to turn off white lights in exchange for red or orange lighting. Now, the beacon of moonlight can guide baby turtles home.



Credit: Ricardo Medina/Shutterstock.com

Overfishing

Think about your favorite fish dish. Maybe it's sushi? Or fish sticks? Or fish and chips? Next time you are taking a bite, think about where the fish came from and how it made it all the way to your plate.



Credit: Jag_cz/Shutterstock.com

Overfishing occurs when more fish are caught than the population can replace through natural reproduction. Fishing as much as possible may seem like a profitable practice, but overfishing has serious consequences for fishers and ecosystems. Overfishing has been happening around the world for many decades, and its effects are being felt today. Today, there are half as many fish in the ocean as there were in 1970.¹³ Some popular species, such as tuna, mackerel, and bonito, have declined by as much as 75%.¹⁴

Overfishing hurts ecosystems by disrupting food webs. Some species, like tuna or sharks, are top predators in their food webs. Other species, like salmon and herring, form the base of food webs. When populations of these fish decline or disappear, entire ecosystems and fisheries can be affected. For example, when herring populations decline, so can populations of salmon, seabirds, sea lions, bears, and whales. To end overfishing, the US has implemented some of the strictest fishing standards in the world.

Aquaculture, also known as fish farming, is the practice of raising aquatic animals or plants. The plants or animals can be raised in pens inside the ocean or in tanks on land. Worldwide, there are nearly 600 species of plants and animals that are grown using aquaculture.¹⁵ Aquaculture is mainly used to raise plants and animals for food. It also helps rebuild endangered wild populations of many different species, including abalone, coral colonies, and salmon. When done sustainably, aquaculture farms gather young plants and animals responsibly; feed them in an environmentally-friendly way; and harvest or release them in ways that avoid harming wild populations, minimize pollution, and treat workers fairly.



Credit: Jag_cz/Shutterstock.com

MAKING CHANGE

You may have heard about the farm-to-table movement, but have you heard of the farm-to-school or sea-to-school movements? School cooks around the country are on a mission to cook healthier food and buy ingredients from local farms and fisheries. Chilmark and West Tisbury schools in Massachusetts, have embraced both the farm-to-school and sea-to-school models.

In 2016, the schools started Fish Fridays after their head chef, Jenny DeVivo, built relationships with local fishers. Each week, the fish is ordered from local fishers on Tuesday, the fish is caught on Wednesday, and it is delivered to the kitchen on Thursday. This fish arrives with a QR code on the packaging. After scanning the QR code, Jenny learns about the type of fish, who caught it, where it was caught, and what fishing method was used. Jenny shares that information with her students during Fish Fridays. Each week, Jenny's students are treated to fresh, sustainable seafood—such as fish tacos, fish chowder, or oysters—for just \$3!

Credit: Teri Virbickis/Shutterstock.com



Overfishing



Credit: Vladislav Gajic/Shutterstock.com

In the US, more than 80% of our seafood is imported from other countries.¹⁶ Half of the imports are from foreign aquaculture, much of which is unregulated. This means that our food may be coming from farms that don't have environmental standards. Aquaculture in the US is carefully regulated to ensure the safety of workers and the environment.

You can enjoy seafood and still be a sea steward, just be sure to follow the tips below.

Take Action!

1

Buy US Caught Seafood

Americans consume nearly five billion pounds of seafood every year,¹⁷ and more than 80% of it comes from countries without rigorous management laws. Seafood caught in the US is subject to some of the strictest standards in the world.

2

Ask for Sustainable Seafood

By asking if a store or restaurant serves sustainable seafood, you can help shape the demand for products that have been caught or farmed responsibly.

3

Visit FishWatch.Gov

Before buying fish at the market or ordering it at a restaurant visit [FishWatch.gov](https://www.fishbase.org/) to get the most up-to-date information on seafood harvested or farmed in the U.S. and help you make an educated choice.

Oil Spills

When you hear about oil spills, do you think of Deepwater Horizon or Exxon Valdez? While these big events capture news headlines, they are only part of the problem.



Credit: itman_47/Shutterstock.com

When people think of oil spills, they often imagine large oil tankers or deep sea drilling. But smaller-scale oil spills happen constantly. In North America alone, 110 million L (29 million gal) of oil are spilled into the ocean every year.¹⁸ The vast majority of this oil—85%—comes from minor spills and leaks.¹⁹ This includes cars that drip oil onto roads, lawnmowers that leak oil, and boaters that spill oil. Globally, only 30% of oil spilled in the ocean is attributed to fuel producers and shippers.²⁰

So, what happens once a large oil spill is reported? NOAA scientists enter the data into a computer model. This model takes in tide and weather data and estimates where the oil is going next and how fast. This tells the NOAA Office of Response and Restoration where the cleanup teams should go.

The kind of oil that is spilled matters both for the cleanup and the environmental impact. Light oils, like diesel and gasoline, evaporate quickly and don't stick around in the environment for very long. But these types of oils have toxic fumes that can poison or choke marine life. Heavy oils, like ship fuel, can be thick liquids that can hang around for years and smother plants and animals.

Oil spills can contaminate marshes or beaches; pollute marine or freshwater habitats; and harm plants, animals, and people. Spilled oil can cover marsh plants or beach sand and kill anything living there. The oil can also leave harmful chemicals behind that drive animals away from their habitat. Fur and feathers can become coated in oil, which prevents animals from regulating their body temperature and swimming, flying, or walking normally. The oil can even keep fish and bird eggs from developing properly.

MAKING CHANGE



Credit: Fix Car Leaks

Puget Sound is an important estuary off the coast of Washington State. Each year, vehicles driving around the Sound leak about 6.6 million L (1.75 million gal) of vehicle fluids, including motor oil and fuel into the watershed.²¹

The Washington State Department of Ecology, Seattle Public Utilities, and mechanics around the Sound are partnering to educate people on the importance of stopping car leaks. The Don't Drip and Drive campaign encourages drivers to maintain their vehicles in order to protect Puget Sound for future generations.

Through this program, individuals can take a vehicle maintenance class, learn how to identify leaks, and receive discounts on leak inspections and repairs.

Oil Spills



Credit: jukuraa/Shutterstock.com

It might not sound like individuals can do a lot to prevent oil spills, but that's not the case. Since small drips and leaks account for most oil spills, there's a lot you can do.

Take Action!

1

Drive Less

Walk, ride your bike, and use public transportation whenever possible. Driving less will reduce the amount of oil and other fluids that are dripped on the road.

2

Maintain Vehicles

Keep your car, lawnmower, and boat tuned to reduce oil use. Check for oil leaks regularly and fix them promptly.

3

Report Spills

Report large oil spills to the National Response Center by calling 1-800-424-8802. Never try to clean up oil yourself.

Ocean Acidification

*What happens to all the carbon dioxide (CO₂) that our cars, trucks, and busses emit?
Does it stay in the atmosphere?*

For more than 250 years, or since the Industrial Revolution, the concentration of carbon dioxide (CO₂) in the atmosphere has increased. This increase is from the burning of fossil fuels (e.g., driving cars, burning coal, cooking with natural gas) and from land use change (e.g., converting forests to farms, draining wetlands to make room for buildings, etc.). Trees and plants absorb carbon dioxide, release the oxygen, and store the carbon. As forests are cut down, more carbon collects in the atmosphere.

The ocean absorbs about 31% of the CO₂ that is released in the atmosphere.²² As levels of atmospheric CO₂ increase, so do the levels in the ocean. This is called ocean acidification. When CO₂ is absorbed by seawater, it reacts with water molecules through a series of chemical reactions, which result in an increased concentration of hydrogen ions. This increase causes the seawater to become more acidic (lower pH). The pH scale ranges from 0-14 and is used to measure the acidity of a substance, with 0 being the most acidic, 7 being neutral, and 14 being the least acidic.

Carbonate ions (CO₃²⁻) are an important building block of structures such as seashells and coral skeletons, which are made of calcium carbonate (CaCO₃). When there are more hydrogen ions in the water, carbonate ions try to buffer them to resist a change in the ocean's pH. More hydrogen ions in the water means it takes more carbonate ions to buffer. This competition for carbonate ions in the water can make building and keeping shells difficult for calcifying organisms. Examples of calcifying organisms include oysters,



Credit: NOAA Research

The pteropod is a sea snail as small as the head of a pin. It is found in the Pacific Ocean and provides food for salmon, sablefish, and rock sole. Because its shell dissolves in waters rich in carbon dioxide, it can be used as an indicator of ocean acidification.

MAKING CHANGE



Credit: SCUBAnauts International

Ocean acidification is pushing many coral reefs past their tipping point. A group of scientists, veterans, and teens are working to rebuild reefs throughout the Florida Keys. Members of the Combat Wounded Veteran Challenge (CWVC), SCUBAnauts International, and scientists from the Mote Marine Laboratory joined forces for a record-breaking mission. Together, they planted more than 1,600 corals—a world record—in an area unofficially named “Hero’s Reef” to honor members of the US Armed Forces.

CWVC works to improve the lives of wounded and injured veterans through outdoor challenges. SCUBAnauts International introduces young people to informal science education through underwater exploration and empowers them to lead innovative projects that positively affect our ocean.

Ocean Acidification

corals, and calcifying plankton. When the ocean becomes too acidic, they corrode, or dissolve, animals' shells and corals' skeletons.

These changes in ocean chemistry can affect the behavior of non-calcifying organisms as well. Certain fish, including salmon, are less able to detect predators and prey in more acidic waters due to changes in their brain chemistry. When these organisms are at risk, the entire food web may also be at risk. As smaller fish decline, larger fish, whales, sharks, and other animals higher on the food chain are affected.

Even though the ocean is huge, enough carbon dioxide can have a major effect. Before the Industrial Revolution, the ocean pH was 8.2. Now, it has dropped to 8.1. While this might seem like a small difference, these numbers represent a 30% increase in acidity. In the last 200 years, the ocean pH has changed faster than any known change in ocean chemistry in the last 50 million years! If people don't drastically reduce their carbon footprints, the ocean is expected to become 120% more acidic by 2100—creating an ocean that is more acidic than any seen for the past 20 million years or more.²³

Fortunately, there are many ways that you can lower your carbon footprint, reduce runoff, and restore ecosystems that sequester carbon.

FAST FACTS

Ocean acidification is affecting the entire ocean, including coastal estuaries. Many economies around the world are dependent on income from fishing and many cultures rely on seafood as their primary source of protein.

In the US alone, fishers landed \$5.3 billion of shellfish in 2016.²⁴ When ocean acidification makes it harder to build shells and skeletons, the shellfish economy will suffer as well as the ocean. And what does this mean for cultures dependent on shellfish?



Credit: Studioimagen73/Shutterstock.com

Take Action!

1

Shrink Your Carbon Footprint

When we use electricity, burn wood, and drive cars, carbon dioxide is released into the atmosphere, increasing ocean acidification. Visit the [EPA's Carbon Footprint Calculator](#) to find out more about your carbon footprint and how you can reduce it, such as biking or carpooling.

2

Reduce Nutrient Runoff

When excess nutrients from lawn fertilizers, soaps, and pet waste wash into our waterways, they can cause large plankton blooms. When these blooms collapse, they release carbon dioxide into the seawater. Learn how to reduce nutrient runoff by visiting [Nutrient Pollution - What You Can Do](#) from the EPA.

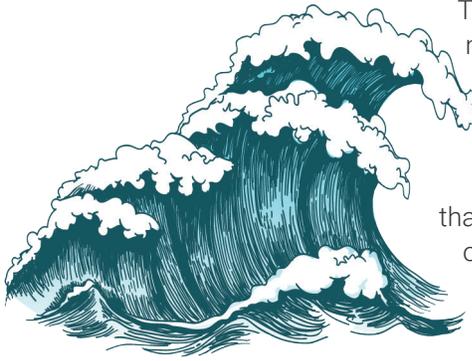
3

Restore Seagrasses

Volunteer with your local aquarium, coastal conservancy, or park service to restore native seagrasses. Seagrasses not only act as nurseries for young marine creatures, but they also sequester carbon.

Sea Level Rise

*When you look out over the ocean, what do you see?
Can you envision the ocean changing over time?*



To a person on the shore, a calm sea may look flat. But just like we know the Earth isn't flat, the ocean isn't either! Sea level, the average level of the surface of the ocean, is just that—an average. This means that the sea level is different depending on where you are. Gravity and tides, shoreline land formations, and ocean currents are just a few things that can make the sea level uneven.

CASE STUDY

The Federated States of Micronesia (FSM) is an island country in the Pacific Ocean. Small island nations, like FSM, are especially hurt by rising sea levels because there is little inland area to relocate people living on the coast. Experts think that the sea level will rise 1-2 m (3-6 ft) in this part of the world in the next 90 years.

Unfortunately, the rising waters are not just claiming empty land. Burial grounds used to be yards away from high tide, but now they are disturbed by the water. Farmland has been ruined by saltwater intrusion—even in the center of some islands. The drinking wells are contaminated, too. Food and water are becoming scarce.

United Nations ambassadors and local politicians are fighting to make the effects of climate change known abroad and at home. FSM was the first Pacific island nation to pass laws forcing government agencies to consider climate change in their future plans. FSM hopes that other nations will soon follow their lead.

Climate change is also altering the level of the ocean. Burning fossil fuels releases greenhouse gases into Earth's atmosphere. These gasses trap heat in the atmosphere. The trapped heat melts glaciers, ice sheets, and permafrost. Not only is melted ice adding volume to the water, but warmer water also has a larger volume than cold water. This is a process called thermal expansion.

Sea level rise is a big problem! About 40% of the US population lives in coastal areas that would be affected by sea level rise.²⁵ Nuisance flooding is when high tidewater comes into areas where people live. This occurs more often when the normal tide levels are higher.

Higher than normal tides can send stormwater farther inland and damage infrastructure, such as underground tunnels, bridges, oil or gas drillers, and power or wastewater treatment plants. Saltwater can also leak into freshwater drinking reservoirs or ruin agricultural lands. To counteract sea level rise, coastal cities will have to upgrade their infrastructure. For example, some wastewater treatment plants are already below sea level. When the sea level rises, communities will have to move the treatment plants or face sewage-contaminated water.

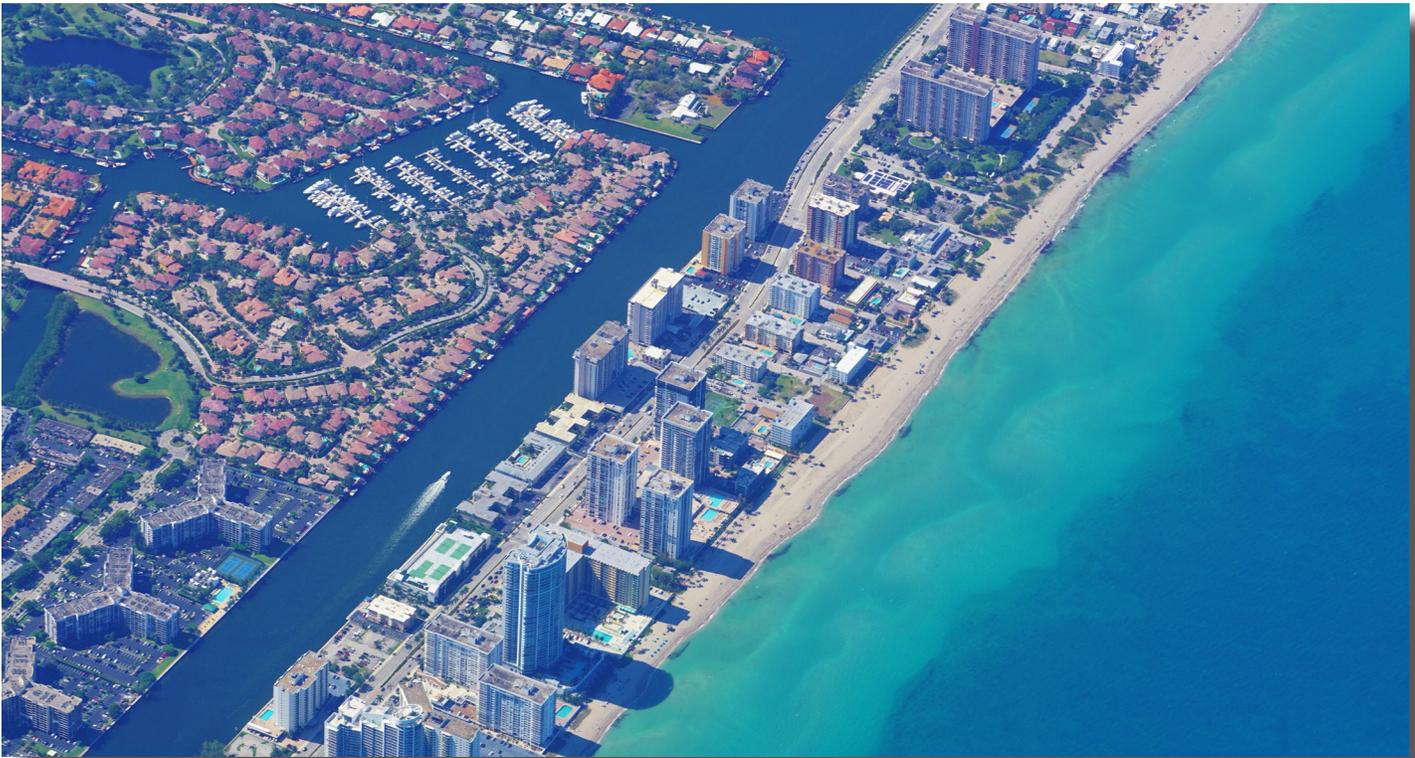
Computer models predict a sea level rise between 0.2-2.0 m (0.6-6.6 ft) by 2100, depending on where you live.²⁶ Predictions could be lower if we reduce greenhouse gas emissions.

Check on sea level predictions for your area by going to the [NOAA Office of Coastal Management website](#) and searching for "Sea Level Rise Viewer." The Viewer can show you what would happen to



Credit: evenfh/Shutterstock.com

Sea Level Rise



Credit: By EQRoy/Shutterstock.com

your community if the sea level were to rise from 0.3-3.0 m (1-9.8 ft).

Individuals will need to greatly reduce their greenhouse gas emissions in order to slow sea level rise. Here are a few ideas to get you started:

Take Action!

1

Eat More Plants

Growing food—especially meat—has a huge impact on the climate, mainly from deforestation and livestock methane emissions. When people move toward a plant-based diet, they can live longer and reduce greenhouse gas emissions.²⁷ Visit [Nutrition.gov](https://www.nutrition.gov) or [Healthfinder.gov](https://www.healthfinder.gov) for plant-based diet tips.

2

Walk, Bike, and Bus

When you choose to walk, bike, or ride the bus instead of driving, you can greatly reduce greenhouse gas emissions. When you must drive, combine errands, drive wisely, and never idle. Visit the [National Center for Safe Routes to School](https://www.nationalcenterfor-safe-routes-to-school.org) to learn how to start a walking school bus or biking campaign at your school.

3

Flip the Switch

Energy vampires are appliances and electronics that use electricity even while they are unused or turned off. Plug your appliances and electronics into power strips, and turn the strip off when the devices are not being used. Learn more electricity saving tips by visiting [Energyween](https://www.energy.gov/energy-ween) from Energy.gov.

Pharmaceuticals

*How are prescription drugs, caffeine, and antibiotic soaps related to the health of our ocean?
Keep reading to find out.*

Our fish are on drugs! Not really, but they are absorbing drugs from the water. After our bodies process medicine, the leftover drugs are excreted in urine. Some of this urine through treatment plants is filtered before it goes back into waterways treated to remove pharmaceuticals. In addition to excreting the drugs, we flush unused pills down the toilet. It is estimated that in the US alone, at least 25 billion pharmaceuticals are flushed every year!²⁸ These prescription, over-the-counter, and recreational drugs make their way into our waterways and ultimately into the ocean.

Once these drugs make their way into the water, they bioaccumulate in organisms. Bioaccumulation is when chemicals build up in organisms. Some of the drugs showing up in young salmon include antibiotics, antidepressants, and hormones.

- Antibiotics are not only found in drugs, but are also found in soaps and cleaners. Too many antibiotics can cause antibiotic resistance. When bacteria come in contact with an antibiotic, the weaker bacteria die, but stronger ones survive. When the strong bacteria multiply, more and more strong bacteria are produced that are resistant to the antibiotic. With stronger and stronger bacteria, it becomes harder for animals to fight infections.
- Antidepressants can reduce the natural shyness of some fish species. This can make them less wary of predators and more vulnerable to be eaten.²⁹
- Hormones are commonly found in medications like birth control pills and estrogen creams.



Credit: Ken Weinrich/Shutterstock.com

MAKING CHANGE

KEEP SALMON OFF DRUGS



PROTECT SALMON AND WATERWAYS

Take unused prescriptions to local law enforcement agencies or collection facilities for safe disposal

OREGON RESIDENTS:

<https://public.health.oregon.gov/HealthyEnvironments/DrinkingWater/SourceWater/Pages/takeback.aspx>



Flushing prescription drugs down the toilet puts aquatic life at risk. Salmon need clean water to survive, and these chemicals have harmful effects on behavior, growth, and reproduction. Dispose of drugs properly and keep salmon habitat healthy.



Stephanie J. Fogel is an artist based in Portland, Oregon. Her work is driven by research and her art revolves around political critique and environmental activism. Through her images, Stephanie seeks to promote community awareness and environmental responsibility. As a recipient of the 2015 Science in Studio Award, she designed a multi-media campaign that centers on clean watersheds. One product from this campaign, a poster, highlights the presence of pharmaceuticals in our water and the subsequent effects on salmon.

You can print Stephanie's "Keep Salmon Off Drugs" poster and ask pharmacies to display it: <https://goo.gl/nvch23>.

Credit: Stephanie J. Fogel

Pharmaceuticals

Once certain hormones make their way into waterways, they can cause male fish to display feminine traits and even produce eggs. Some hormones reduce the male fish's sperm quality and may make them less aggressive and competitive, which makes them less likely to breed successfully.³⁰

The types of pollutants in the water depend on the season. In the spring, scientists have found more bug spray and allergy medicine. Come summer, it's sunscreen. Even caffeine from coffee and tea finds its way back to the water.

The drugs come from many different sources. Drug manufacturing plants have pharmaceutical ingredients in their waste streams. Ingredients from perfumes, soaps, and sunscreens can wash down the drain and into the waves.³¹ Hospitals and nursing homes flush millions of unused pharmaceuticals down the drain.³² Some of the antibiotic and hormone treatments from livestock can get into the groundwater from agricultural runoff.

Your family can help keep fish off drugs by doing a few things:

Take Action!

1

Only buy what you need

Buying larger batches of medicine may be cheaper, but the waste can cost our environment.

2

Safely dispose of medicine

Never flush medicine down the toilet or sink. Visit [FDA.gov](https://www.fda.gov) and search "Safe Disposal of Medicines" to find out how you can safely get rid of old medicine.

3

Start a Drug Takeback Day

Partner with a local pharmacy or health center to educate people about the dangers of improper disposal and how to properly dispose of old medicines. The [Drug Takeback Day website](#) from the Drug Enforcement Administration provides tools for individuals to host a collection event.

FAST FACTS

In 2017, the Washington Department of Fish and Wildlife released a study about pharmaceuticals and other pollutants in mussels in Puget Sound. Mussels in this study tested positive for prescription opioids, chemicals from detergents and cleaning products, seven kinds of antibiotics, five types of antidepressants, antidiabetic drugs, and a chemotherapy treatment.³³

While scientists are beginning to understand how contaminants move through the food web of the greater Puget Sound, they are still unsure how people who eat shellfish might be impacted.



Credit: Bernd Juergens/Shutterstock.com

Shoreline Armoring

You may have noticed tall concrete structures or piles of large rocks on the beach. These structures are built to reduce erosion, but they can have negative side effects.

Although erosion is a natural coastal process, protecting shorelines from erosion is a big priority for coastal communities. Wind and wave energy continuously reshapes the shoreline and can threaten coastal property. Typically, communities have installed hard structures, such as breakwaters and bulkheads, to hold back the sea and prevent erosion. This is known as shoreline armoring.



Credit: By Evannovostro/Shutterstock.com

About 14%, or 23,000 km (14,000 mi), of US tidal shoreline is armored.³⁴ This number is projected to grow as sea levels rise, as storms grow more severe, and as more properties are built in shoreline locations that are vulnerable to erosion. If current trends continue, about 33% of US shorelines will be armored by 2100.³⁵

Shoreline armoring can change the shape of the shoreline, which changes how waves reach the shore. Some structures, like seawalls, reflect waves back into the ocean. The reflected wave carries sand with it, speeding up beach erosion. Breakwaters are designed to calm waters for harbors and artificial marinas. Over time, sand accumulates towards the breakwater and erodes sand elsewhere. While these and similar developments are designed to protect beaches and coasts, they end up causing harm in the long term.

Sometimes, cities and homeowners replace sand on beaches after they have eroded (beach nourishment). When sand is added to the beach, it can bury slow-moving organisms, such as worms, clams,

CASE STUDY

Seahurst Park, in Burien, Washington, is a 178-acre park on Puget Sound. In the 1970s, a large seawall was built along the beach to slow erosion. Over decades, the seawall caused the beach to drop about 1 m (3.3 ft). These changes harmed the habitat on which nearshore organisms depend.

When the seawall began failing, community members, the City, Puget Sound Partnership, and the US Army Corps of Engineers took action. Since 2004, 975 m (3,200 ft) of armoring has been removed and replaced with natural habitat.

The park is now one of the largest stretches of shoreline in central Puget Sound mainland that provide good habitat for salmonids. A variety of wildlife including bald eagles, osprey, great blue heron, and other shorebirds, being drawn in by schools of fish along the shallows, frequent the restored shoreline.



Credit: By GeorgeColePhoto/Shutterstock.com

Shoreline Armoring

and crabs. Many shorebirds depend on these organisms for a large portion on their diet. The new sand can also crush sea turtle eggs or make it harder for turtles to build new nests.

While hard armoring slows erosion, it comes at a cost. The walls can shrink beaches, destroy coastal habitat, and displace animals. Armored beaches generally have fewer drift logs, algae, seagrass, and other organic debris. In unarmored shorelines, this vegetation provides a daily feast for crabs, snails, and insects.

Sandy beaches that are hard armored will eventually change into coarse sediment beaches. Forage fish, such as surf smelt and Pacific sand lance, will not spawn in beaches with coarse sediment. These fish are the foundation of many food webs. If their populations decline, it will impact many animals higher in the food

webs, like salmon, seals, and killer whales.

A better way to slow erosion is to use soft armoring. Soft armoring is when the shoreline is lined with natural materials like soil, logs, and marine plants. These living shorelines mimic natural functions to provide erosion control. Unlike hard armors, they also improve water quality, enhance shoreline habitat, and help maintain coastal processes.

More people are realizing the impact of hard shoreline armoring, and many structures are being removed. In other cases, they are changed to soft armoring structures. If you want to get involved in converting your community's hard armoring to soft armoring, contact your state Department of Ecology or Department of Fish and Wildlife. Many offer grants to help homeowners cover the cost of removal.

NOAA
NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

LIVING SHORELINES SUPPORT RESILIENT COMMUNITIES

Living shorelines use plants or other natural elements—sometimes in combination with harder shoreline structures—to stabilize estuarine coasts, bays, and tributaries.

- One square mile** of salt marsh stores the carbon equivalent of **76,000 gal of gas** annually.
- Marshes trap sediments from tidal waters, allowing them to **grow in elevation** as sea level rises.
- Living shorelines improve **water quality**, provide fisheries **habitat**, increase **biodiversity**, and promote **recreation**.
- Marshes and oyster reefs act as natural **barriers** to waves. **15 ft** of marsh can **absorb 50%** of incoming wave energy.
- Living shorelines are **more resilient** against storms than bulkheads.
- 33%** of shorelines in the U.S. will be **hardened** by **2100**, decreasing fisheries habitat and biodiversity.
- Hard shoreline structures like **bulkheads** prevent natural marsh migration and may create seaward **erosion**.

Ocean Heroes



You don't need to wear a super hero cape to be an ocean hero!

What do you think of when you hear the word, “hero?” Do you think of a person wearing a cape? Or someone who chases down criminals? Maybe you envision a firefighter or a doctor?

Heroes can come in many different forms and can be inspired by many different causes—such as rescuing stray pets, feeding people who are homeless, or raising funds for communities impacted by natural disasters. A hero is simply someone who inspires us by their example. Take a look around your school, family, or neighborhood. Who inspires you to be a better person?

“We need to respect the oceans and take care of them as if our lives depended on it. Because they do.”

- Sylvia Earle
Marine biologist



Credit: My Good Images/Shutterstock.com

When you think of the major challenges facing our ocean—like overfishing, marine debris, and ocean acidification—you may think, “What can I do? I’m just one person.” While solving these problems alone might seem impossible, individuals around the world stepping up to be heroes for our ocean. Together, these heroes are

making a real difference for our ocean.

We hope the accomplishments of the following heroes will inspire you to preserve and protect the ocean, upon which all life depends. Let us know what you’re doing to make a difference with [#SeaSteward](#).



Boyan Slat

As a teenager, [Boyan Slat](#) started The Ocean Cleanup. This company builds and tests large-scale ocean cleanup devices. Slat estimates that these floating machines can gather half the plastic in the Great Pacific Garbage Patch in five years. After recovering marine debris, Slat’s company recycles it into cool, branded gear.

Captain Don Voss

As a wounded veteran, [Captain Don Voss](#) turned to swimming and SCUBA diving as a form of physical therapy. During his dives, Captain Voss would find marine debris everywhere along Florida’s central eastern coast. He and some friends started Marine Cleanup Initiative, Inc. to gather volunteers for cleanups. They have collected about 450 tonnes of trash (500 tons), at least a third of which is plastic.



Casey Sokolovic

[Casey Sokolovic](#) found her love of sea turtles after a childhood visit to the Karen Beasley Sea Turtle Rescue and Rehabilitation Center. She began to raise money for the Center by selling sea turtle-shaped cookies. Later, she founded the Love a Sea Turtle organization to help raise awareness of sea turtle entanglement in marine plastic debris. She takes members of the local Boys & Girls club on kayaking trips for her Upstream Downstream Connection summer camp. This camp exposes students to the merits of aquatic sports.



Credit: Casey Sokolovic



Credit: Glamour

Daniela Fernandez

[Daniela Fernandez](#) is a graduate of Georgetown University. On a visit to the United Nations, Daniela heard about ocean sustainability. She founded the Georgetown Sustainable Oceans Alliance. Her goal was to get millennials interested in taking care of the ocean. The Alliance held a Sustainable Oceans Summit, and people from 30 different schools showed up! The Alliance allows members to use their creativity to help save the ocean in their own way.

Kyle Thiermann

[Kyle Thiermann](#) is a professional surfer and filmmaker from Santa Cruz, CA. At age 18, he started Surfing for Change, a YouTube series devoted to showcasing environmental issues around the world, especially those affecting the ocean. Thiermann sees himself as the one who connects the people working to better the planet with the news and media coverage that they need to gain support.



Credit: Surfing for Change



Credit: Thaddeus Miller

Robert Kostecky

[Robert Kostecky](#) of Merced, CA, started a local cleanup effort using a Pokémon Go players' Facebook group. The game hosted a Pokéstop in a park near the city's courthouse. This park was often littered with garbage from overflowing trashcans—a potential source of marine debris. Kostecky and others began to clean the park after frequenting this Pokéstop. After cleaning this park, they continued to clean other parks in the area.



Sean Russell

Sean Russell started the Stow It, Don't Throw It initiative in Sarasota Bay, Florida. Russell repurposed old tennis ball bottles into personal fishing line recycling containers. He started distributing them to local fishers to provide an alternative to throwing the lines on the ground. Now, this group operates in ten states. They hand out these personal recycling bottles and educate fishers about marine ecosystems.

Sylvia Earle

Sylvia Earle is an internationally recognized marine biologist and ocean explorer. She has been on over 100 expeditions and set many records. Dr. Earle's work centers around finding areas across the world that house ecosystems vital to global biodiversity. Now, Dr. Earle travels the world speaking and writing about how valuable Earth's ocean is. She hopes that more people will realize just how connected we are to the ocean in everything that we do.



Credit: Bryce Groark



Ta'Kaiya Blaney

Ta'Kaiya Blaney is a singer, songwriter, actor, and speaker committed to the ocean. Blaney is a member of the Tla'Amin First Nation on the Salish Sea in British Columbia, Canada. Blaney supports Salish Sea Youth Foundation, which focuses on restoring wildlife populations to at least half of their historic levels. Her music calls attention to environmental issues surrounding marine ecosystems.

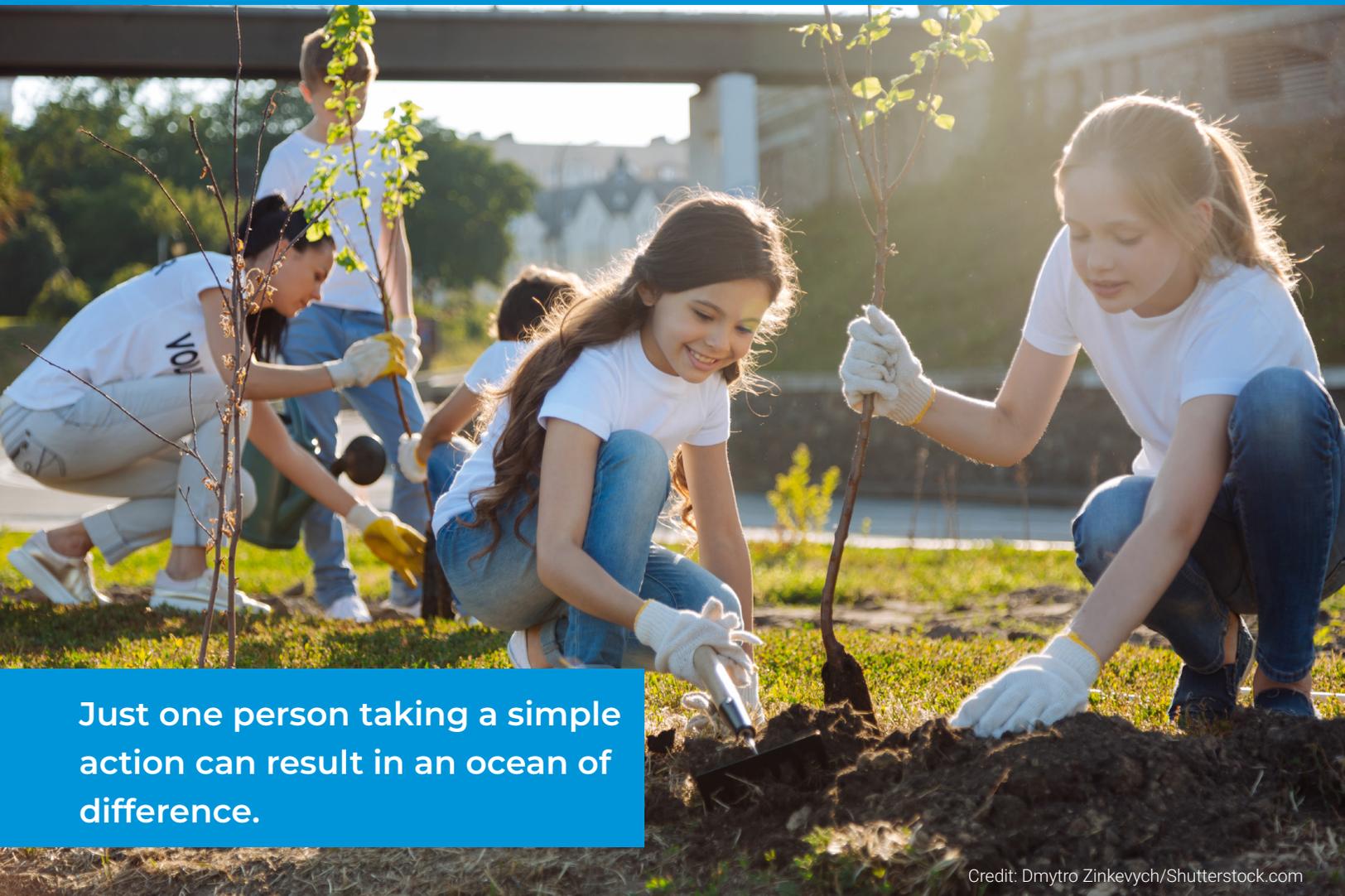
Tommy Remengesau

His Excellency Tommy Remengesau, Jr. is a former president of Palau, an island nation in the Pacific Ocean. Remengesau speaks on the effects of climate change on the Earth by focusing on how they affect his home country. Rising sea levels, coral bleaching, and drought threaten his low-lying island nation. He says, "The economy is our environment and the environment is our economy."



Credit: Richard W. Brooks

Get Involved!



Just one person taking a simple action can result in an ocean of difference.

Credit: Dmytro Zinkevych/Shutterstock.com

With your newfound knowledge, we hope you feel ready to become an ambassador for the ocean and feel equipped to make more ocean-friendly choices in your day-to-day life. And don't worry, there are many resources to support you throughout your ocean stewardship journey.

Sometimes news about the ocean can leave us feeling

*“Individually, we are one drop.
Together, we are an ocean.”*

- Ryunosuke Satoro
Writer

overwhelmed and powerless. Hearing about such big problems can make one action seem small. By becoming an advocate for the ocean, you can make a difference one step at a time. Over time, little changes—like refusing plastic straws, riding your bicycle, and educating others—can make a big difference. And small changes, when multiplied by many people, can truly transform the ocean.

We all have a responsibility to share what we have learned about the ocean with our communities. You can talk with your family and friends about the problem with single-use plastics. When ordering lunch at your school cafeteria,



Credit: Dmytro Zinkevych/Shutterstock.com

you can ask about the kind of fish being served. When you are grocery shopping, you can set a positive example by bringing a reusable grocery bag.

You can advocate for the ocean using your special talents. Are you the next Shakespeare? Design a play to put a spotlight on the connection between driving and urban runoff. Are you a shutterbug? Then use photography to profile people who are making a difference in your community. Are you a social media guru? Use Twitter and Instagram to share tips on what people can do to make a difference. Your interests and hobbies can help raise awareness about our ocean.

One of the biggest threats to the ocean is when people don't care. Every one of us can get stuck in our ways

and forget about the impact we make every day. We sometimes think that littering or using a disposable cups just one time won't hurt anything. But this thinking is wrong. You can make a positive difference by standing up for what is right, even just once. You're a Sea Steward now. It's your job to teach your community how to take care of our ocean. It's the only one we have.

The following projects and competitions are just a few examples of ways that you can get involved in your community and become an ocean steward. For additional opportunities visit websites such as [VolunteerMatch](#), [Create the Good](#), and the [Corporation for National and Community Service](#) or [contact your local NOAA outreach specialist](#).

Bow Seat Ocean Awareness Programs

Bow Seat

Bow Seat's annual Ocean Awareness Contest invites students to explore—through visual art, poetry, prose, film, and music—how humans' actions affect the health of our ocean and how to take action for our blue planet.



Cool School Challenge

The Cool School Challenge is hosted by the National Wildlife Federation. This challenge encourages classrooms to reduce their carbon footprint. Get your whole school involved and compete for the most eco-friendly classroom.



Future City Competition

In this annual competition, students spend approximately four months creating cities that exist at least 100 years in the future and represent the team's solution to a citywide sustainability issue.



Green Design Challenges

One way to make an item better is to use fewer raw materials to make it. In this hands-on challenge, students consider ways to repurpose materials and invent an environmentally-friendly prototype that improves upon the original design.



Lexus Eco Challenge

Featuring three separate challenges, the Lexus Eco Challenge gets students involved in project-based learning, teamwork, and skill building as they work to develop a solution to an environmental issue that affects their community.



Ocean Guardian School

An Ocean Guardian School makes a commitment to the protection and conservation of its local watersheds, the world's ocean, and special ocean areas, like national marine sanctuaries.



International Coastal Cleanup

Every year during International Coastal Cleanup, volunteers comb lakes, rivers, and beaches around the world for trash. For over three decades, more than 12 million volunteers have collected over 220 million pounds of trash.



National Ocean Sciences Bowl

This academic competition introduces students to ocean sciences and prepares them for ocean science-related and other STEM careers, and helping them become knowledgeable citizens and environmental stewards.



Ocean Heroes Bootcamp

At the Ocean Heroes Bootcamp existing and emerging youth leaders will have the chance to work with squad leaders and mentors to create their own campaign to take action against ocean plastic pollution.



Keep The Sea Free of Debris

Grab your art materials, be creative, and let the world know: How does marine debris affect the ocean and Great Lakes? What are you doing to help prevent marine debris? Winning entries will be featured in a NOAA calendar.



NEED

Through NEED, teachers and students reach out to the public to teach about smart energy decision making. An annual awards program honors participants who achieve excellence in energy education in their schools and communities.



Plastic Free Challenge

The Plastic Free Challenge asks people to refuse disposable plastic and lead by example by promoting to their circle of friends on social media.



Recycle Bowl

The annual competition encourages students to reduce, reuse, repurpose, and recycle during a friendly four-week competition, which begins on Oct. 15 and culminates on America Recycles Day, Nov. 15.



SchoolsNEXT Design

Students are challenged to design their learning environments to enhance learning, conserve resources, be environmentally responsive, and engage the surrounding community.



Solve for Tomorrow

Designed to boost interest and proficiency in STEM, this contest challenges public school teachers and students to show how STEM can be applied to help improve their local community.



Speak for the Ocean

The Woods Hole Oceanographic Institution encourages students to "give the ocean a voice" in the Speak for the Ocean video contest. Students can choose any theme for their 30-second video.



Trash-Free Lunches

Grades of Green's Trash Free Lunch Challenge is a year-long competition that challenges elementary and middle schools to see which school can reduce its lunchtime waste the most.



Trash on Your Back

During this five-day campaign, individuals carry all the trash they produce on their backs wherever go. This campaign aims to help people understand how much trash they really produce.



Upcycling Competition

This competition challenges beachgoers to take something that might be considered waste and create something that can be used in the ocean (e.g. surfboards, fins, skim boards, boats, etc.).



Young Reporters for the environment

Young Reporters

Participants investigate an environmental issue and report on it using journalistic techniques through writing, photography, or video.



Youth Making Ripples

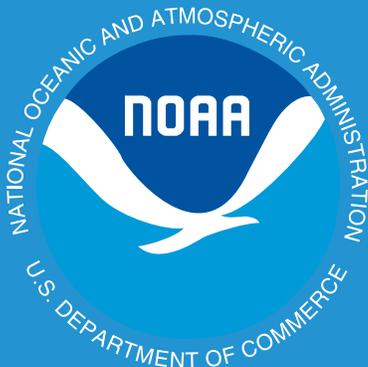
The Youth Making Ripples video contest invites students to submit marine-themed videos of five minutes or less. The intent is that the videos would "serve as a voice for our oceans."

Endnotes

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