

## Marine Debris: Let's Talk Trash!

Currently, there is no place on Earth that is immune from or untouched by marine debris. Every year, over 8 million metric tons of plastic enter our ocean and even as it breaks down, it will persist in the environment indefinitely as smaller pieces of microplastic. This presents a huge problem for marine life as they mistake the small plastic particles for food that then travels up the food chain. This program covers why marine debris has become a major issue for our planet and how it impacts every part of our ocean.

Students will discover how water travels from our homes to the sea and how trash influences aquatic life from microscopic plankton to giant whales. Students will also discover how long certain items, like plastic, take to break down in the ocean and how different animals, like albatross, are negatively impacted by marine debris. The session closes with a discussion about the need for protecting the ocean and its inhabitants from debris, as well as how students can be a part of the solution.



## Ocean Acidification: The Power of pH

The ocean is a natural carbon dioxide (CO<sub>2</sub>) sink, absorbing up to one-quarter of the manmade CO<sub>2</sub> from the atmosphere. The ocean converts carbon dioxide into carbonic acid, which ultimately lowers the pH of the ocean, making it more acidic. As the pH of the ocean decreases, it negatively impacts the biodiversity of the ocean by causing organisms that rely on a calcium carbonate exoskeleton to become weakened, which in turn disrupts food webs across many habitats. Organisms such as corals, oysters, clams, and lobsters are all directly impacted by ocean acidification as an ever decreasing pH works to erode and weaken their calcium carbonate based shells.

Students will observe and measure pH changes to water with the addition of carbon dioxide. Students will create a model of the ocean and introduce CO<sub>2</sub> via dry ice. Using pH indicators students will observe how CO<sub>2</sub> impacts the pH of the ocean and, ultimately, marine life and the people that rely on it.



## Sea Level: On the Rise

Greenhouse gases such as carbon dioxide, methane, nitrous oxide, and ozone are naturally occurring gases that serve to keep Earth warm and insulated, making it possible for life to exist. However, since the Industrial Revolution the amount of greenhouse gases, along with manmade aerosols, have significantly increased, resulting in greater heat absorption and retention. As the atmosphere warms, the global temperature also increases. One outcome of this is increasing sea levels due to melting of polar ice. As sea level rises, not only are coastal communities impacted, but marine ecosystems such as coral reefs, kelp forests, and mangroves are also at risk.

Students will create a model of the ocean to observe and measure how water level changes as ice melts. Students will measure the change in water volume based on melting land ice (glaciers) and sea ice (icebergs). Students will use this information to observe how sea level rise will impact not only coastal regions, but marine ecosystems as well. Additionally, students will recognize the various forms of ice that have the potential to impact sea level rise.



## Renewable Energy

Humans have historically obtained much of their energy and electricity from fossil fuels and wood burning sources, but we have begun to understand the negative effects that this is having on the earth. Over the past few decades there has been a shift to renewable energy resources such as water, wind, and solar power. The aim being to reduce greenhouse gases, avoid the environmental impacts of mining, and reduce overall air pollutants.

In this program, students will learn about the differences between renewable and nonrenewable energy, the negatives associated with non-renewable energy, and various sustainable energy sources. In a hands-on lab they will be able to design, build, and test their own blades for mini-wind turbines to power an LED light. This will allow them to see the principles of wind energy in action, as well as test their engineering skills.



## Land to Sea Connections: Exploring Watersheds

Every one of us lives within a watershed. We also depend on clean water every day, and understanding where this water comes from and how we impact it is incredibly important. This program explores the connections we all have with our water, nearby waterways, and our ocean, as well as discovers the functions of watersheds, types of pollutants found in waterways, and the importance of healthy watersheds for the well-being of all plants and animals.



Students will get to act out the water cycle, visualize the impacts of pollution through a watershed model, and even study the quality of local water samples. The session ends with a discussion on the importance of clean water for a healthy planet and how we can all help to protect our watersheds!

## Unsustainable Fishing



Humans have always relied on fish and other organisms from the sea for food. In fact, around 17% of the proteins in human diets worldwide comes from fish (and this is even higher in some countries). Many communities also rely on money obtained through fishing to feed their families, with about 56 million people directly employed in fisheries and aquaculture. However, unsustainable fishing can damage marine habitat to the extent that it will take years, if not decades, to recover and can cause the crash of fish populations if they are overharvested.

This program investigates several of the different types of unsustainable fishing methods, what these types of fishing mean for marine life, and what is being done to help harvest from our ocean more sustainably moving forward. And through a fishing game, the students will discover the challenges (and fun!) of working together as a community to protect our open ocean. The session ends with some tools we can all use to make the best choices in our eating habits and how to educate others on being a part of the solution.