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Guides & Mentors

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Tell us about your job? What inspired you to pursue this career?

My job is a research scientist in oceanography. Right now, I work for the Pacific Northwest National Laboratory, which is a Department of Energy research laboratory working on clean-up of the environment. Oceanography covers all of the things that happen in and effect the ocean, and my specialty is the study of the circulation in the ocean (motion in the ocean, for short), and how the flow in the ocean distributes pollutants. I chose this career after I discovered in high school the fascinating world of physics and the really interesting environment of the oceans.

What are the major sources of marine pollution? Where does it go when it enters our bays and oceans?

The major sources of marine pollution come from our activities on, around, or near the oceans. Some examples are the following: when we use boats on the bays, or oceans, and even rivers, the engines leak a little fuel and oil, and sometimes, when we are filling the gas tank, it spills over and splashes into the water. This adds oils and gas to the water. Imagine this little spill multiplied by the billions of boats all around the world. Once oil and gas enter the water, they can wash up on the shore and you then have sticky, icky beaches; the oil and gas can get on the feathers of birds, and be eaten by the birds when they try to clean their feathers (this is toxic to the birds and will kill them) and also,

the plants and animals in the ocean will sometimes come in contact with the oil. Eventually, sunlight and bacteria will break down the oil into less harmful parts. Oil and gas are visible in the ocean and in their effects on the ocean, shore and animals but there are more dangerous, invisible pollutants.

When the sewage from our homes reaches the treatment plants, many of the toxic chemicals are removed, some are not. When we apply fertilizers or pesticides (bug killers) to our homes and lawns, some of these degrade and some do not. The rain washes the fertilizers, pesticides, and sometimes overflow of sewage out to rivers, bays and the oceans. Within this flow are substances called heavy metals, things like tiny amounts of copper, silver, arsenic, selenium, cadmium, mercury and lead. The fish and plants need tiny amounts of these to live and so will take them in and use them. They will keep taking them in and using them even after they have taken in too much. Too much of these metals then become toxic and harm the fish and people that eat the fish. Some of the fertilizers and pesticides leave other pollutants that are also taken into the fish and plants and accumulate in them to be toxic.

There is a large amount of pollution that comes from trash that people throw into rivers, bays, and oceans . . . from the shore and from boats. This trash, especially plastic wrappings and containers, never degrades or goes away and can harm the sea life. Marine mammals mistake plastics for jelly fish and can choke; the plastics become entangled on fish and mammals and cause great harm. Most trash does not sink so it is carried along with the currents and tides and becomes distributed along the coast. Because it does not sink, it is also a threat to seabirds.

How does marine pollution cross boundaries? What does this mean in terms of international relationships?

Within the ocean there are large strong currents, like rivers within the sea, that move the water, plants, and other drifting life along with the flow. The biggest currents are called gyres and they move water along the coasts of the continents, across the oceans and down the coasts of other continents. In some areas, there are small, more fast flowing, currents that go from one coast to another quickly. If a country is careless about the pollutants that enter their oceans, the currents will carry the pollutants from the coast of one country to another. These pollutants can harm the fisheries and the coastlines, so that it can cause tension between the two countries. We share currents and a connective coastline with Canada and Mexico. There is a need for all countries not to pollute the oceans and cause trouble with the local fisheries or the fisheries of our neighbors.

How can we best prevent marine pollution? What actions can individuals take to make a difference in this area?

We can best prevent marine pollution by personal responsibility and the support of legislation that protects the environment. Through personal responsibility, we must not throw harmful chemicals down our drains. This means 1) using more natural cleaning solutions around the house, 2) limiting the use of pesticides and fertilizers on our lawns and gardens, 3) when we change the oil in our cars and boats, collect every drop and recycle the oil, 4) don't overfill our cars or boats at the gas station. If we have to use cleaning solutions or fertilizers or pesticides, we need to follow the directions carefully. Minimize the use of plastics and packaging and never ever throw them into the oceans, rivers, or bays.

Why are non-native marine species a threat to bays around the world? What can be done about this problem?

Non-native species are a threat to the bays around the world because species from other regions can be established and can threaten the native sea life. In each bay and coast, there is a balance

between the plants, animals, and sea life as they compete for homes, food, and good relationships with the other animals. This balance is established over many, many years. Sometimes, a new species comes in, generally riding along with the ballast water of international ships. This new species may have no natural enemies and will out-compete the local species for food and homes, upsetting the balance and driving away the local populations.

To prevent non-native species, we can encourage legislation that has ship operators change their ballast waters far off the coasts. Another thing we can do is not dispose of home aquarium species into the waterways.

Compare and contrast the Tokyo Bay and San Francisco Bay from the perspective of their marine environments?

San Francisco and Tokyo Bay are similar because they both have large cities all around the bay. There is a great amount of commercial shipping and ocean activity. This means that both bays have similar pollution challenges. The circulation systems within the bay and the surrounding oceans are somewhat different and that means that the ability of the pollutants to leave the bay will be different.

What does it mean to you to live on a water planet?

Living on a water planet means that we have relatively small extremes in temperature (our drastic weather is nothing compared to the extremes of temperatures and winds on other planets). It also means an abundance of life on the planet. The oceans, atmosphere, and trees and other plants work together to keep our temperatures and other climate variables (rain and snow) tolerable. The balance that keeps our weather nice is very delicate and if disturbed, our climate will be less pleasant and less able to support humans, plants, and animals. In the same way that we can take individual actions to minimize pollutants, we can minimize our effects on the atmosphere so that the water on our planet can do its job.

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