

Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Distinguished Professor of Earth and Planetary Sciences, UC Santa Cruz.

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Cleaning Up the Plastic in the Ocean**

Captain Charles Moore brought attention to what quickly became known as the Great Pacific Garbage Patch 20 years ago. The press coverage and news stories that followed led to several oceanographic voyages traversing the gyre and sampling the water along the way. What the oceanographers onboard discovered was somewhat different than what had been described earlier in the media. There wasn't a big island or mound of plastic and other debris out in the North Pacific. They did recover plastic in virtually every net tow they took across 1500 miles of ocean, but most of the plastic was in small pieces, a few millimeters across, like confetti, and much of it was actually sinking beneath the surface.

The awareness and concern with the plastic in the Pacific, however, encouraged several different groups to develop a process or approach for cleaning up this giant patch of plastic, whether as big as Texas, or three times the size of France. An environmental engineering firm in Japan purportedly developed a desktop-size machine that converts waste plastic into fuels like gasoline and diesel, although there are many different types of plastic compounds and they all apparently don't lend themselves to this simple distillation process.

An organization was formed in Santa Cruz a decade ago, The Clean Oceans Project, which had a primary goal of using this distillation technology on board a vessel. Their goal was to combine this with some type of remote sensing to identify areas of high plastic concentration in the ocean, and then collect the plastic somehow, convert it to fuel and keep the vessel powered.

Another ambitious approach was announced in San Francisco in September (The Ocean Cleanup Project) as "the world's first ocean clean up system". This approach, developed in The Netherlands, consists of a 2,000 foot-long floating barrier with a 10-foot skirt that hangs below it, under the water. When it's deployed, the barrier is planned to curve into a U-shape as it is pushed by the wind and waves. The slow moving system is planned to gather the plastic floating on the surface, while fish and other ocean life can swim underneath.

After five years of research, engineering and testing, a large ship towing the barrier departed San Francisco on September 9th. In mid-October they had reached a location about 300 miles offshore for a two-week trial to make sure it operated as planned in the typically rough waters of the North Pacific before heading 1,100 miles further to the Great Pacific Garbage Patch. The plan is for smaller boats to come out and scoop up the plastic and take it back to shore where it can be recycled.

There are some very significant challenges involved with any effort to try to clean up the plastic in the ocean, however. Perhaps the largest is that there isn't a huge raft the size of Texas consisting of plastic bottles at the ocean surface. The plastic particles are mostly very small and not all concentrated at the surface. Any net or device used to collect all of these small particles will also be catching floating or swimming animals. This newest Dutch effort is only designed to collect plastic from the upper ten feet of ocean, which seems to be a small fraction of the total out there.

There is also the issue of the fuel and its combustion required for any vessels attempting to undertake such a massive effort, which will have their own emissions impacts. The National Oceanic and Atmospheric Administration (NOAA) did a cost calculation several years ago of a hypothetical clean up of the Pacific Garbage Patch. They used an area of 385,000 square miles, which is a little larger than the combined areas of California, Oregon and Washington. This is a very large area to sweep clean.

Their estimates were that it would take 67 large ships, working 10 hours a day, covering swaths 650 feet wide, one year to accomplish, with ship time alone costing between \$122 to \$489 million. They also expressed concerns with collecting marine life along with the plastic and that all the plastic isn't at the sea surface.

Despite the best intentions, cleaning up plastic from the middle of the ocean is extremely unlikely to ever be successful. We need to focus on other approaches-cutting plastic off at the source, reducing our use of plastic of all types and recycling all that we use. And this will take a global commitment, but we can set an example for the world in California like we do for so many other things.