Our Ocean Backyard — *Santa Cruz Sentinel* columns by Gary Griggs, Director, Institute of Marine Sciences, UC Santa Cruz.

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Fukushima Radiation–What's Going On Now?

Nearly five years ago, on March 11, 2011, a massive 9.0 magnitude earthquake off Japan generated a large tsunami, which struck the coastline of Japan in less than an hour. Waves reached elevations of up to 128 feet above sea level and moved inland as far as 6 miles, flooding over 200 square miles of low-lying coastal land. The earthquake and tsunami led to the deaths of nearly 21,000 people, mostly from drowning.

At the Fukushima Daiichi nuclear plant, tsunami waves overtopped a 33-foot high seawall protecting the backup cooling facility, flooding and disabling the system. This lead to the loss of cooling water, explosions, meltdown of three of the plant's six reactors and the uncontrolled release of radiation into the adjacent ocean.

A major effort was undertaken over the next several years to halt and collect the flow of groundwater beneath the damaged plant that was carrying contaminated water to the sea. In October 2015, contractors completed a one-half mile long shielding wall to reduce the amount of contaminated water leaking into the ocean. Sampling within one-half a mile of the coastline at the Fukushima plant in October revealed radiation levels that are thousands of times lower than immediately after the accident, but indicated that there was still continued release of contaminated water from the plant.

It is projected that complete clean up and decommissioning of the plant will cost tens of billions of dollars and take 10-30 years. What happened at Fukushima also had a chilling effect on existing and proposed nuclear power plants around the world.

Concerns about potential radiation exposure along the west coast of the United States arose soon after the release of radiation from the plant was reported.

While high levels of radiation were documented in the ocean off Japan almost immediately, movement of that radiation 5000 miles across the North Pacific to the west coast turns out to be a relatively slow journey.

A chemical oceanographer from Woods Hole Oceanographic Institution has been analyzing water samples intermittently since the March 11 disaster. Just a year ago, they announced the detection of trace amounts of radioactivity that could be used to fingerprint Fukushima because of the presence of cesium-134.

Surface water samples were collected along a 2000-mile long transect extending from the Aleutian Islands to Eureka, and along the length of the California coast. Cesium-134 was detected in 10 of the water samples analyzed along this transect, all but one of these were from the waters of the current heading towards the Gulf of Alaska. One sample off Southern Oregon in November 2014 did reveal the presence of cesium-134.

Continued monitoring over the past year indicates an increased number of sites off the U.S. West Coast showing signs of Fukushima radiation. This includes the highest detected level to date from a sample collected 1,600 miles west of San Francisco

While this sample had cesium-134 levels 50% higher than other West Coast samples, the concentration of this isotope is still more than 500 times lower than U.S. government safety limits for drinking water, and well below limits of concern for direct exposure while swimming, boating or other ocean activities. The 2015 values are consistent with those of Canadian scientists, who also recently reported that they have found no cesium-134 in fish collected off British Columbia.

The transit across the North Pacific has been quite slow, averaging just several miles a day. This has given the cesium from the damaged nuclear plant, which has a half-life of just two years, additional time to decay and dissipate.

Ken Buesseler, the oceanographer who has been conducting the study recently said the new data are important for two reasons, "First, despite the fact that the levels of contamination off our shores remain well below government-established safety limits for human health or to marine life, the changing values underscore the need to more closely monitor contamination levels across the Pacific. Second, these long-lived radioisotopes will serve as markers for years to come for scientists studying ocean currents and mixing in coastal and offshore waters."

This column is the 200th I’ve written over the past 7.5 years, and it seems like a good time to ask any interested reader to send an email with ideas or requests for future columns. Thank you for your input.