http://www.sfgate.com/science/article/Bay-seals-contamination-with-chemical-puzzling-5300569.php

San Francisco Chronicle – March 8, 2014

Bay seals' contamination with chemical puzzling

Scientists stymied by marine mammals' contamination with substance 3M Co. agreed to stop making in 2002

Jane Kay, Environmental Health News

There's a mystery afoot in San Francisco Bay, where harbor seals are contaminated with high levels of a man-made chemical that was pulled from production 12 years ago, and scientists can't figure out why or what the effects are.

Perfluorooctanesulfonic acid - once the primary ingredient in Scotchgard - has remained elevated in harbor seals even though it has declined in sea birds that share their fish diet. San Francisco Bay's harbor seals have some of the highest PFOS levels in the world, and the chemical isn't following the pattern of slow decline of other persistent pollutants.

"It's a real conundrum," said Margaret Sedlak, a program manager at the San Francisco Estuary Institute, which tracks chemicals in the bay. "What are the sources of these compounds? How are they getting into the food web?"

PFOS is toxic, mobile and virtually indestructible. Hundreds of species from every part of the world carry the chemical, including whales, polar bears, sea turtles, bald eagles, pelicans and dolphins. It also accumulates in the tissues of humans.

Because the seals are top predators that feed on fish, they take up many contaminants and serve as barometers of the health of many other forms of marine life along the West Coast.

"We can't get rid of it," said Oregon State environmental chemist Jennifer Field. "It builds up in the environment. It's like filling a bathtub, turning on the water and walking away."

What makes perfluorinated chemicals so persistent is that they contain fluorine bonds, which are the shortest and strongest of chemical bonds. These same characteristics make them popular with manufacturers as coatings because they repel oil and water, stabilize heat, and act as leveling agents to ingredients in cookware, textiles, carpeting, paper and other products.

3M Co. began selling Scotchgard made with PFOS in 1956. After studies showed that it was accumulating in human tissues, the company agreed to stop making PFOS by 2002.

The halt was a boon to San Francisco Bay birds. Levels in eggs laid by double-crested cormorants on South Bay islands plummeted 70 percent from 2009 to 2012.

But the levels in the blood of South Bay harbor seals have remained high.

"We don't know how they're picking up the PFOS," said Denise Greig, a marine mammal biologist who took the blood samples from the seals. "Is it the food they're eating, the water they're swimming in, the mud they're resting on, the air they're breathing?"

Duke University chemist Craig Butt said the high levels are a strong sign that local sources of the chemical remain.

Effects are unknown

Virtually nothing is known about whether the chemical is harming the bay's seals and other creatures. Some scientists cite evidence in other animals - sea turtles, dolphins and sea otters - to suggest that it may be impairing their immune systems.

Biologists have long puzzled over why the harbor seal colony congregating in the bay's Mowry Slough has remained stable since the 1970s while other California populations are burgeoning.

But no one has evaluated whether PFOS, or other contaminants in the bay, could be to blame. Studying marine animals is difficult and costly, and there are no plans to test them for health effects.

There have been no die-offs, disease outbreaks or reproductive failures among the bay's seals. But their health could be compromised by PFOS in a serious yet subtle way, said Margie Peden-Adams, a research professor at University of Nevada at Las Vegas who has studied effects of PFOS on turtles and dolphins.

"We don't have a population where there is clearly something wrong," she said. "We're dealing with something that's ubiquitous, but not a spill. The data that we do have suggest it is possible that the bay seals' health may be impaired."

One of the rare studies that linked elevated PFCs to immune suppression leading to infectious disease in marine mammals was a case of female otter deaths on the California coast. Atlantic bottlenose dolphins and loggerhead turtles also showed evidence of altered immune response linked to PFOS.

Human studies

Studies of people may offer clues to other, hormone-related health effects. An investigation of people in neighborhoods drinking water contaminated by a DuPont plant in West Virginia linked PFOS to disrupted hormones in women, high cholesterol, and changes in thyroid and liver function.

There are many ways perfluorinated compounds enter San Francisco Bay. Thirty-nine sewage treatment plants discharge effluent into the bay that probably contains the compounds, which leach out of old rugs, clothing and furniture or newer products imported from developing countries. Rainstorms also send contaminated runoff to the bay. In addition, some industrial fluorinated compounds may be transformed in the environment to PFOS.

Sewage sludge spread onto land and firefighting foam previously used on military bases and airports also contain the chemical.

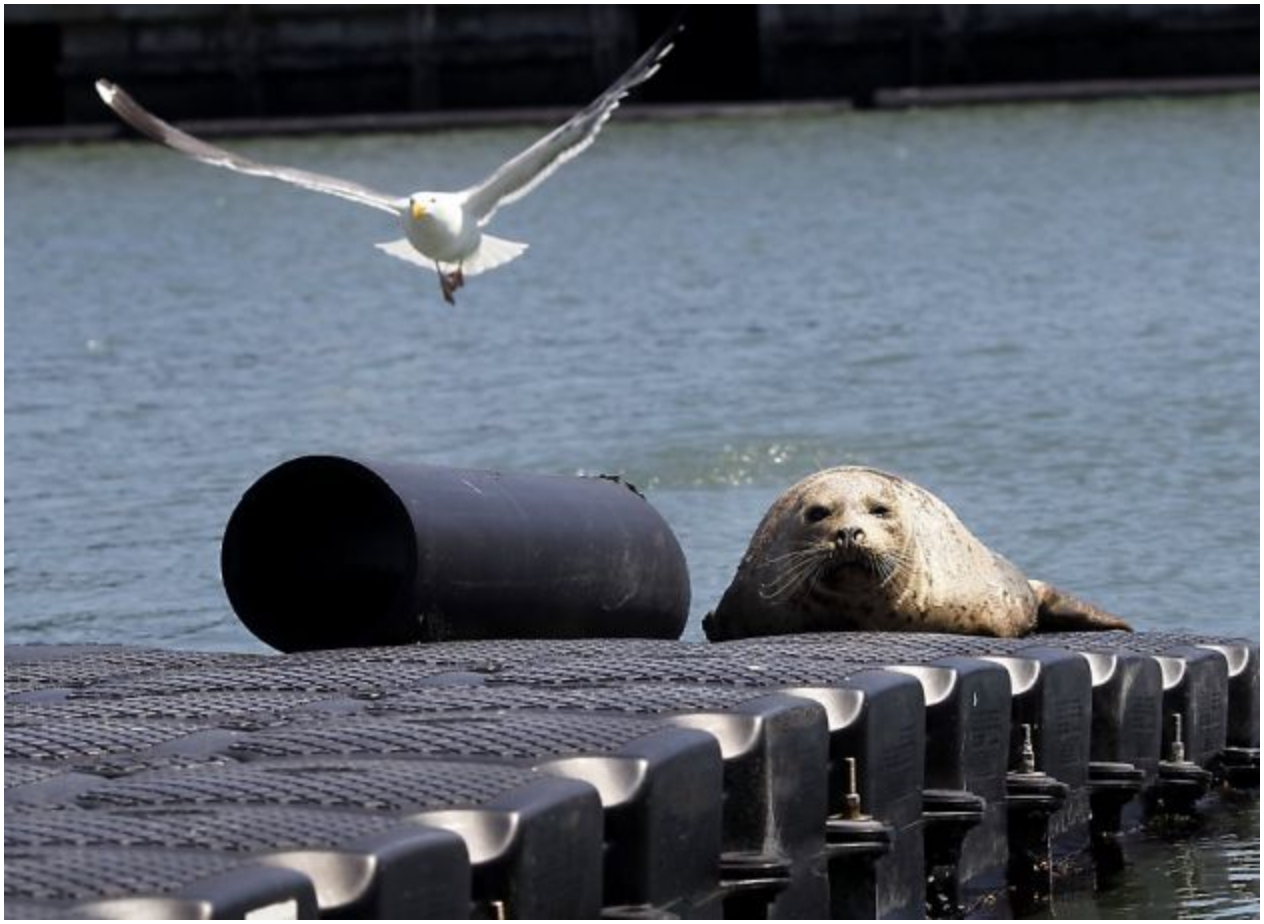
Little monitoring

Regulators don't require businesses to monitor perfluorinated compounds, and sewage plants aren't required to measure them in effluent, said Thomas Mumley of the San Francisco Bay Regional Water Quality Control Board.

San Francisco's seals seem destined to serve as living repositories of toxic legacies. More than a decade ago, studies of this colony revealed that flame retardants had increased 100-fold. The chemicals, banned in 2004, have now declined in the seals and in other wildlife around the world.

"It's a great lesson for people who manufacture a chemical," said Karin North, manager of environmental controls for Palo Alto. "Years after it's been phased out, it's still causing a problem."

Environmental Health News is a foundation-funded environmental news service. EHN publishes its own journalism and provides daily access to worldwide environmental news.

- 

  A harbor seal positions itself comfortably on a pier in the bay. In a scientific mystery, bay harbor seals have been found to be contaminated with a chemical that 3M Co. agreed to stop making 12 years ago. Photo: Brant Ward, The Chronicle