Timetable for Puget Sound restoration suffers setback

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The slow natural restoration of hazardous sediments mired beneath the Puget Sound is progressing, thanks to Mother Nature and a stiff dose of federal environmental regulations.

But, researchers at the Department of Energy's Pacific Northwest National Laboratory warn that this recovery process may take 10 to 30 years longer than first predicted, because of increased urban growth and its associated untreated runoff.

"An analysis of sediment core samples retrieved over several decades provides us with empirical evidence that environmental regulations have had a positive impact on the overall water quality of the Puget Sound," said PNNL marine chemist and co-project lead Jill Brandenberger. She noted that some pollutants have returned to pre-industrial concentration levels.

"Unfortunately, our data also suggest that although pollution coming from a specific source or location may be decreasing, non-point sources, such as storm water discharges, are becoming more significant," she said.

PNNL marine scientists, along with the Texas A&M University research team, documented the evidence from a centimeter-by-centimeter dissection of several Puget Sound sediment cores. A recent article in *Environmental Science and Technology* detailed their findings from data collected over more than 23 years.

The complex Puget Sound waterway connects the Seattle metropolitan area and neighboring communities of about four million residents with the Pacific Ocean.

Scientists collected and analyzed 10-foot-long sediment cores in 1982, 1991 and, most recently, 2005, from a location near Seattle and adjacent to Tacoma, Wash. This careful chemical analysis of the sediment layers provided a historical rap sheet of toxins including lead, arsenic and copper. Like the concentric rings of a tree, each centimeter of mud delicately displayed a historical biography of environmental conditions.

Higher concentrations of lead and arsenic found in the sediment reflect past human activities. The study found accumulations of the hazardous metals first showed up in Sound sediments around the 1890s when metal smelting began near Tacoma.

"We find a rise in concentrations during the first and second World Wars," said PNNL marine scientist and co-project lead Eric Crecelius. "Our core analysis detected reductions during the Great Depression when smelting production stopped, but increased again during World War II."

Scientists observed a steady decline in contaminant concentrations after federal regulations, like the Clean Water Act in the late 1960s, were adopted. Similar findings were observed in other marine systems near major urban centers, such as San Francisco Bay and Chesapeake Bay, according to Crecelius.

Metal concentrations in sediments decreased more rapidly after major point sources, like the Tacoma smelter, were closed. For example, arsenic concentrations in sediments near Seattle have returned to preindustrial levels, after the Tacoma smelter closed in 1986.

"This historical record for arsenic is a perfect example of the Puget Sound's ability to recover from past pollution insults following removal of the smelter point source, as well as how quickly this process occurs," said Crecelius.

Natural recovery competes with urban growth

More recently, however, regulation of point sources has grown less and less effective at restoring the health of the nation's waters. In 2005, the U. S. Environmental Protection Agency determined that runoff was the leading source of water quality pollution affecting coastal systems across the nation. This is partly due to urban growth and an increasing number of toxic non-point sources, such as storm water that rinses highways of oils and pollutants and carries this burden into sensitive coastal systems.

Crecelius notes that these diffuse sources of toxics are more difficult to regulate, because they are not associated with a specific process or responsible party. The EPA recognizes the need to develop new controls. However, population growth in coastal counties around the Puget Sound has nearly doubled in the last 50 years.

Recovery dates bumped out

Scientists found that sediment recovery slowed significantly after the late 1980s, due in part to increased settlement and urban growth, and their associated non-point sources. These have delayed expected recovery for some metals by 20 to 30 years.

The PNNL study conclusions confirm that new approaches to regulating non-point sources are necessary and that priorities should be set to identify nonpoint sources both regionally and globally. The study also recommends a unified water-quality monitoring program be developed

to ensure that the ecological health of the Puget Sound is sustained.

Source: Pacific Northwest National Laboratory