

## **SOCIETY'S IMPACT ON COASTAL ECOSYSTEMS: PROBLEMS AND SOLUTIONS**

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**ABSTRACT:** Toxic chemicals have been discharged to coastal areas from a variety of sources for decades. These chemicals include trace metals and organic contaminants, such as polychlorinated biphenyls (PCBs), pesticides, and polycyclic aromatic hydrocarbons (PAHs). Natural biogeochemical processes that influence contaminant persistence and bioavailability control the fate and effects of these contaminants in coastal marine environments.

Accumulation of contaminants in biological resources may occur through aqueous, sedimentary or dietary pathways. In the long-term, chemical contaminants of ecological and human health concern, such as metals and organic contaminants, are associated with particulate matter.

Transport of particle-bound contaminants within coastal areas coincides with sediment transport processes and, thus, there are numerous examples around the world where sediment deposits in coastal areas reflect waste disposal histories.

Transfer of contaminants to marine organisms and humans and disturbance of ecological systems are dependent on the availability and persistence of contaminants within sediments and transport within benthic ecosystems.

There are many sites in coastal marine environments where removal or remediation of contaminated sediments will be necessary within the next decade. In addition to the ecological concerns of contaminated sediments and their removal, there are also significant economic and political concerns as controversies over risks and costs associated with sediment removal and disposal are balanced with the economic viability of US ports.

Recent examples of coastal dredging projects in many US cities illustrate the complexity of the scientific and political concerns of management and disposal of contaminated sediments.

[Summary by Ruth Gustafson]

Dr. McDowell began her talk with some interesting statistics on the coastal environment: more than 54% of the U.S. population lives on the 10% of U.S. land defined as coastal and this is similar to world population statistics. In addition, 33-50% of U.S. jobs are located in coastal areas and 33% of the U.S. GNP is produced by the fishing, transportation, recreation and other industries dependent on sustainable coastal ecosystems.

What are coastal concerns? The most important are: eutrophication or excess nutrient runoff; habitat loss or modification; toxic chemicals; coastal erosion and storm damage; pathogens (from sewage and effluents); (over)exploitation of resources; and global climate change. To achieve sustainability of coastal ecosystems, we need to develop innovative technologies and management strategies. One of the first U.S. programs which became a landmark for coastal environmental monitoring was the NOAA Mussel watch program. Mussels accumulate contaminants, especially trace metals, including Hg, Cr, Cu, Pb, and Ag, and do not metabolize them.

The areas of greatest environmental concern on the Northeast coast were those exposed to agricultural or industrial runoff. Dr. McDowell's research team decided to conduct research in one of the most highly contaminated areas in the Northeast -- the New Bedford Harbor. In this harbor, the PCBs were off the scale, mainly due to the wastes from two electronic parts companies who manufactured transistors. Of all PCBs ever produced, 1% were in delivered into New Bedford Harbor. At some places in the harbor, 2% of the dry weight of sediment was PCBs. Although U.S manufacture of PCBs stopped in 1985 (and worldwide manufacture was halted in 1990), these compounds do not decay. The research team that set out to work on this project included physical oceanographers, analytical chemists and biologists. Their study focused on endocrine dysfunction (endocrine disruptors) or hormone disruption.

The New Bedford site was the first MARINE SuperFund site. The goal of the funding was the removal of the highly contaminated sediments with over 200 forms of PCBs. Two organisms were chosen for this study: *Mytilus edulis*, the mussel, which would provide assessment of the effects in the female but not the male; and *Mya arenaria*, the steamer clam, which showed very little effect on ovarian development. The blood cells of these clams have the interesting property of being amoeboid with a genetically transmitted retroviral leukemia.

Dr. McDowell concluded that coastal politics/planning must implement long-term agendas as well as short-term solutions.