

Reducing toxic pollution



FACTSHEET

While Casco Bay may look pristine, toxic pollution is present in its waters, in its sediments, and in the tissues of its living organisms, including clams, fish, birds, and marine mammals. Toxins like heavy metals and organic contaminants can pose a threat to the health of aquatic life and humans.

How do toxins end up in Casco Bay?

Prior to the passage of the federal Clean Water Act in 1970, water pollution from industrial sources – like shipyards, tanneries, and textile factories – had a major impact on the quality of water and sediments in Casco Bay and its watershed. As those polluters were regulated and cleaned up in the decades following passage of the Clean Water Act and other environmental laws, it became clear that a legacy of toxic chemicals remained in the sediments of the watershed and the Bay itself. Today, a few licensed discharges continue to deliver toxic pollutants to the Bay.

Nonpoint source pollution in the form of contaminated stormwater is a major contributor of toxic chemicals to the Bay. As rainfall and snowmelt run over paved surfaces, they pick up pollutants and wash them into streams, rivers, and eventually into coastal waters. Pesticides applied to lawns, fuel spilled at gas stations, oil dripping from cars – all of those toxic compounds can end up in Casco Bay, affecting wildlife and accumulating in marine sediments. Atmospheric deposition is another major nonpoint source of pollution; air pollutants generated both locally and in distant regions can be incorporated into rain or dust and find their way to the Bay.

What toxic substances are in the Bay?

The various toxins found in Casco Bay can be grouped into two main categories:

- **Heavy metals** are metallic elements such as lead, mercury, arsenic, cadmium, chromium, zinc, and copper. Because they do not break down, metals released by human activities accumulate in the environment. They enter the Bay from various sources, including vehicle emissions, industrial and wastewater discharges, and historic industrial sites.
- **Organic compounds** are chemicals made up of carbon, hydrogen, and other elements. Many occur naturally, while thousands of others have been developed for use in oils, paints, pesticides, cleaners, solvents, insulation, fire retardants, and other products. Organic chemicals eventually break down into hydrogen and oxygen, but breakdown can be slow; in the interim, they remain toxic.

The work of the Casco Bay Estuary Partnership is guided by the *Casco Bay Plan*, which identifies five priorities for watershed protection:

1. *Minimize pollution loading from storm-water and combined sewer overflows*
2. *Open and protect shellfish beds and swimming beaches*
3. *Protect and restore habitat*
4. **Reduce toxic pollution**
5. *Promote responsible stewardship*



Sources of Toxic Pollution in Casco Bay

- Polluted stormwater
- Untreated sewage from combined sewer overflows
- Treated sewage from wastewater treatment plants
- Leaching from old industrial sites
- Improperly stored pesticides, oils, and chemicals leaching into groundwater
- Emissions and discharges from industrial and municipal operations
- Deposition of atmospheric pollution from urban sources in and upwind of Maine
- Oil and fuel leaks from automobiles in the watershed
- Fuel spills in Maine waters
- Household chemicals that enter the waste stream

Effects of toxic contamination

Toxic organic chemicals and some metals have the potential to increase in concentration as they move up the food chain from the algae and seagrasses that convert sunlight and carbon into food, to fish, birds, and mammals, including humans.

Mammals and birds that feed on bottom-dwelling organisms or on fish from contaminated waters may absorb toxic pollutants, concentrating them in liver, fat, and muscle tissues. Toxic organic chemicals have the potential to disrupt the normal activity of hormones, causing cancer, adverse reproductive effects, birth and developmental effects, and effects on immune systems.

Studies have shown that the mercury levels in Maine's fish, loons and eagles are among the highest in the country. Levels of mercury and some organic chemicals found in freshwater and certain marine fish have led Maine to issue fish consumption advisories and guidelines on safe fish and lobster consumption practices. Those are especially important for the most vulnerable consumers, including children and pregnant women.

Despite evidence that toxic chemicals are found throughout Casco Bay and its watershed, there is some good news. The levels of mercury, PCBs, dioxins, and many pesticides entering the environment have declined greatly over the past two decades (see CBEP's 2007 report *Toxic Pollution in Casco Bay*). Levels of most heavy metals, pesticides, tributyltin, PCBs and low molecular weight PAHs have decreased in the sediments of the Bay since 1991.

CBEP's efforts to reduce toxic pollution

Reducing toxic pollution is one of five priority areas identified in the *Casco Bay Plan*, the document that guides the work of the Casco Bay Estuary Partnership. To aid the continued decrease in toxic chemical loading, CBEP supports a variety of tools, including regulatory enforcement, monitoring and assessment, development of new approaches to reduce the use and release of toxic chemicals, and vigorous environmental stewardship at every level.

Monitoring and assessment of sources, risks, and impacts

CBEP and its partners have been monitoring toxic contaminants along Maine's coast in recent years. These programs include:

- National Coastal Condition Assessment, funded by the U.S. Environmental Protection Agency and administered in Maine by CBEP
- Maine Department of Environmental Protection's Surface Water Ambient Toxics Monitoring program (SWAT)
- CBEP's long term sediment monitoring program, which has sampled sediments at 70 locations around the Bay

Common forms of organic toxins found in Casco Bay

Polynuclear aromatic hydrocarbons (PAHs): PAHs are the most prevalent toxic pollutants in Casco Bay. They come primarily from the combustion of fossil fuels and wood but also from fuel spills.

Polychlorinated biphenyls (PCBs): Used in electric transformers and other industrial applications, PCBs are potent carcinogens. They were banned in the 1970s but are still found in old landfills and dumps and are present in high levels in the Fore River.

Pesticides are mainly carried from lawns and fields to water bodies via stormwater runoff. Although it has been banned since 1972, the pesticide DDT and its toxic breakdown products still persist in the environment.

Dioxins and furans are formed when organic material is burned in the presence of chlorine. Incineration, pulp paper manufacturing, coal-fired utilities, diesel vehicles and metal smelting are all sources of dioxin in the environment. Although the pulp mill industry stopped discharging pulp waste into Casco Bay in 2000, dioxins and furans still reach the Bay via atmospheric deposition.

Butyltins: Toxic organometallic compounds, butyltins are molecules in which an atom of tin is bonded to carbon atoms in an organic molecule. Butyltins get into the Bay's sediments primarily from marine anti-fouling paints.



In 1996, the *Julie N* oil tanker spilled almost 180,000 gallons of fuel oil into the Fore River after striking the former Million Dollar Bridge while entering the harbor.



- Maine DEP Air Toxics Monitoring Program, including the Breathing Easier through Monitoring program in Portland, and the two Mercury Deposition Network sites in the watershed, located in Freeport and Bridgton
- Gulf of Maine Council on the Marine Environment Gulfwatch mussel monitoring program

In addition, CBEP has supported the tracking of organic chemicals and metals in the Bay's sediments, in lobsters, fish, clams and blue mussels, and in the precipitation that reaches the Bay. Toxic contamination studies conducted by the Biodiversity Research Institute and the Wise Laboratory of Environmental and Genetic Toxicity have also received CBEP support. To assess current sources of contamination, CBEP supports the monitoring of discharges, stormwater runoff, and atmospheric deposition for toxic contamination.

Case studies

Monitoring Blue Mussels for Toxic Chemicals

CBEP supports the Marine Environmental Monitoring Program, a long-term study to assess the levels and locations of toxic contaminants along the coast, using the common blue mussel as an indicator species. Because regional and national programs also sample mussels, those larger data sets help to provide a context for assessing the conditions in Maine.

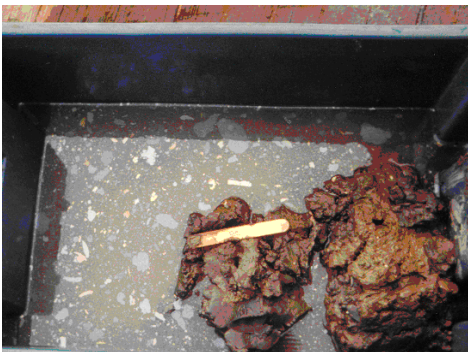
Sampling at several Casco Bay sites suggests that while there was an initial increase in lead levels from 1988 to 2002, there has been a decline in lead levels in more recent samples. A regional decline in lead over the past decade has also been observed in the mussel sampling program.



The Casco Bay Estuary Partnership and its partners sample Casco Bay sediment for the presence of toxic pollutants.

Detecting Toxic Residues in Osprey Eggs

CBEP funded a study to measure levels of toxic compounds in the eggs of ospreys, a bird of prey that nests and feeds throughout the watershed. The study, conducted by the Biodiversity Research Institute, analyzed osprey eggs for the presence of toxic compounds, including those found in substances like organochloride pesticides, stain repellants, and flame retardants. The majority of eggs sampled contained toxic residues — in some case, in very high concentrations.



Sediment pollution can result from past industrial activities. At the site of a former coal gas works plant, which operated in Portland for almost a century, coal tar can still be seen oozing into the Fore River estuary. Remediation is planned at the site.

Identifying Areas of Emerging Concern

Over the past several years, CBEP has added a new class of contaminants to monitor. These “contaminants of emerging concern” include: persistent organic chemicals like polybrominated diphenyl ethers (PDBEs) and perfluorinated chemicals (PFCs); as well as pharmaceuticals and personal care products (PPCPs) which include drugs, soaps, hairspray, and sunscreen. Monitoring studies are finding contaminants of emerging concern throughout the aquatic environment worldwide, including in Casco Bay.

Toxic pollution strategies

CBEP established the following goal and objectives to protect the Casco Bay watershed from toxic pollution.

Goal: Minimize the loading of pathogens, toxics, nutrients, and sediments from stormwater and combined sewer overflows

Objectives:

1. Support efforts to develop a comprehensive management strategy for dredged material
2. Develop biological indicators for marine waters
3. Develop sediment quality thresholds for assessment of contaminated sediments
4. Research the feasibility of and best approaches to monitoring “emerging contaminants” like pharmaceuticals, personal care products, caffeine, fire retardants and insect repellents

Partners

As with all of CBEP’s efforts, collaboration is critical to its work on toxics. Partners include Friends of Casco Bay; the Maine State Planning Office; the Maine Board of Pesticides Control; Maine Departments of Environmental Protection, Marine Resources, Conservation, and Transportation; the Portland Harbor Dredge Committee; Portland’s Waterfront Alliance; the U.S. Army Corps of Engineers; the U.S. Environmental Protection Agency; the U.S. Fish and Wildlife Service; and the U.S. National Marine Fisheries Service.

For more information

For more information on CBEP’s toxics work, please see the 2007 report, *Toxic Pollution in Casco Bay: Sources and Impacts*, visit the website, or call 780-4820.

How You Can Help

- When fueling your car, boat, or lawnmower, take care to avoid spills
- Keep your vehicles tuned up
- Have your oil, brake, and transmission fluid changed at a service station that recycles used products
- Conserve electricity: coal-fired power plants are a major source of atmospheric mercury. Energy-saving tips can be found at www.efficiencymaine.com
- Save gasoline by ride-sharing, taking public transit, walking, or cycling. When you do drive, maximize fuel efficiency by traveling at a medium, steady speed
- Use pesticides and fertilizers sparingly and properly, if you must use them at all. You can learn about environmentally friendly landscaping techniques through the Maine Board of Pesticides Control’s YardScaping Program
- Use nontoxic household cleaners and products whenever possible
- Dispose of household hazardous waste (including fluorescent light bulbs, house paint, pesticides, antifreeze, and waste oil) at a transfer station, or on a household hazardous waste collection day in your area
- If you have a woodstove or fireplace, use dry, well-seasoned wood and keep your chimney clean. Wood burning releases PAHs, acrolein, and other toxic chemicals

Protecting & restoring the ecological integrity of the Casco Bay watershed



The Casco Bay Estuary Partnership works to preserve the ecological integrity of Casco Bay and to ensure compatible human uses of the Bay’s resources, through public stewardship and effective management.