9 Overview and Next Steps: What are CBEP and our partners doing to reduce the loading of toxics to the Bay and its watershed?

The voluntary Clean Marinas and Boatyards program is reducing toxics by promoting best management practices at participating facilities.

Summary of Report Findings

Toxic chemicals generated through human activities have entered and continue to enter Casco Bay and its watershed via multiple routes including outfall pipes, industrial smokestacks, internal combustion engines, stormwater runoff, oil spills, and atmospheric deposition. While most of these sources are local, atmospheric deposition is contributing toxic chemicals, including mercury and PAHs, both from local and distant sources through the movement of polluted air masses. As a result of past and ongoing activities both here in Maine and in other parts of the United States, toxic chemicals are found throughout Casco Bay and its watershed. Both heavy metals and organic contaminants have accumulated in the sediments of the Bay and, in many cases, in the tissues of aquatic organisms.

The levels of toxic chemicals found in the waters and sediments of the Bay are below the levels that would cause negative biological effects throughout most of Casco Bay. The exceptions are the elevated levels of PAHs found in the sediments in some inner parts of the Bay, and the levels of PCBs and some metals, including mercury, in the sediments of the Fore River.

While low levels of toxic contaminants are found in most parts of the Bay, these chemicals are becoming concentrated in the tissues of organisms, including predatory aquatic organisms, through the processes of biomagnification and bioaccumulation. Blue mussels, which serve as an indicator organism for Maine DEP,

Dave Menke

Bald eagles, like these chicks, are exposed to mercury through their fish diet.

CBEP and the Gulf of Maine Council on the Marine Environment, show elevated levels of metals including lead and the organic pollutants PCBs and PAHs at some sites in the Bay with an industrial history in harbors, commercial ports, at the mouths of river watersheds and in locations adjacent to population centers.

Elevated body burdens of mercury have been found in predatory species from insect-eating birds to fish-eating birds and mammals. Studies have shown that the mercury levels in Maine's fish, loons and eagles are among the highest in the country and that the productivity of Maine's loons and eagles is being impacted by mercury. As top-level predators, seals are especially vulnerable to bioaccumulation. Research indicates that seals from southern Maine have elevated body burdens of mercury and the organic chemicals PCBs and DDE (a metabolite of DDT). Casco Bay seals, especially the pups, are likely at risk of health impacts to their livers and to their neurological and endocrine systems.

As consumers of fish, humans are also at the top of the food chain and are potentially at risk of health impacts from bioaccumulated toxic chemicals in fish. Levels of mercury and some organic chemicals found in freshwater and certain marine fish have led the State to issue fish consumption advisories and guidelines on safe fish and lobster consumption practices. These are especially important for the most vulnerable consumers, including pregnant women and children.

Despite the clear evidence that toxic chemicals are found throughout Casco Bay and its watershed, impacting both the ecosystem and our ability to safely eat certain fish, 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 (US EPA 2005). *State of the Bay* (CBEP 2005) reported that levels of most heavy metals, pesticides, tributyltin, PCBs and low molecular weight PAHs decreased in the sediments of the Bay between 1991/1994 and 2000/2001.

CBEP's state, federal and local partners are using a variety of regulatory and non-regulatory tools to reduce the overall loading of toxics to the Bay and its watershed. A summary of state and federal programs follows.

Oksana Lane

Insect-eating Saltmarsh Sharp-Tailed Sparrows from southern Maine have elevated body burdens of mercury.

Cynthia Stroud

Harbor seals hauled out on pupping ledges. Seals in Maine, including Casco Bay, are likely at risk for contaminant-related health effects from mercury and persistent organic pollutants.

Federal and State Programs that Reduce Toxics Loading

US EPA New England and Maine DEP are helping to reduce toxics loading through enforcement of environmental laws and regulations. Inspections of facilities that produce pollutants, reporting, and sampling and monitoring programs are tools that help to determine compliance. Violations can result in civil or criminal penalties. Through compliance assistance programs, US EPA helps business and industry to understand and meet regulatory requirements (US EPA 2006a). State and US EPA pollution prevention (P2) programs provide guidance, tools, and resources to promote pollutant elimination/reduction through more efficient use of materials, energy, water, and land (US EPA 2006b, Maine DEP 2005a). Some of the programs that regulate toxics are included below.

Water Enforcement Programs:

- US EPA is nationally responsible for compliance monitoring under the **Clean Water Act (CWA)**, first passed in 1972. CWA enforcement programs include the **National Pollutant Discharge Elimination System (NPDES)**, which regulates point-source discharges to the waters of the United States, and, recently began regulating stormwater discharges as well. The State is delegated by US EPA to oversee the NPDES program in Maine. Through Maine DEP, permits are issued to facilities that discharge to the surface waters of the State. Compliance monitoring is used to ensure that State water quality standards are not violated.

- Other CWA programs include the **Pretreatment Program**, which regulates discharges to publicly-owned treatment works; the **Combined Sewer Overflow (CSO) Control Policy**; and the water discharge aspect of the **Pulp and Paper "Cluster Rule"** (US EPA 2006a). The CSO Control Policy has resulted in the elimination of twenty combined sewer overflows in the Casco Bay Watershed (see *State of the Bay,* CBEP 2005a). The federal **Pulp and Paper "Cluster Rule"** is significantly reducing the amount of pollutants in wastewater from mills, mandating a 95% reduction in dioxin and furan (US EPA 1997). Maine also has a strict **dioxin wastewater discharge law** and has developed an inventory of dioxin discharges to the State's water (see Maine DEP's dioxin website http://www.maine.gov/dep/dioxin/)

- In September of 2005, the Maine Board of Environmental protection voted to adopt new State rules (the **Water Toxics Rule**) which contain numeric surface water quality criteria for toxic pollutants for the protection of aquatic life and human health. These revisions were approved by US EPA in July 2006. Chapter 584 also includes testing requirements, data evaluation and impact assessment (Maine DEP 2005b).

- Every two years, Maine DEP reports to the U.S. Congress and the Maine Legislature on the health, current status, and trends of the State's waters. The **Integrated Water Quality Monitoring and Assessment Report** satisfies reporting requirements under the Clean Water Act and Maine statutes. The report includes a list of impaired waters that require development and submission to US EPA of **total maximum daily load (TMDL) assessment reports**. When specific toxics have been identified as pollutants of concern in a particular water, Maine DEP develops TMDLs, or chemical-specific limits for a certain waterbody, for those toxics. If the source of toxics is wastewater discharge, water quality-based effluent limits are then incorporated into the discharge permits. Reduction in toxics from diffuse sources such as stormwater or nonpoint source runoff are achieved by implementing best management practices (BMPs) that are effective in promoting infiltration of stormwater to the groundwater. Low impact development strategies are BMPs that allow runoff from paved surfaces to flow over pervious or vegetated surfaces where they naturally infiltrate the ground or are treated before entering a drainage collection system.

- In 1972, Congress passed the **Marine Protection, Research, and Sanctuaries Act (MPRSA),** or Ocean Dumping Act to control ocean dumping and to protect the marine environment and human health. The MPRSA bans radiological, chemical, and biological warfare agents, high-level radioactive wastes, medical wastes, sewage sludge, and industrial wastes from ocean disposal. Anyone seeking a permit to dump other types of waste must show that the dumping will not pose a danger to human health or the environment, and that there are no better alternatives for reuse or disposal. Most of the material dumped in US ocean waters today is sediment dredged from the bottom of water bodies to maintain the nation's navigation system. US EPA has issued stringent environmental criteria, including bioaccumulation and toxicity testing, for evaluating materials proposed for ocean dumping (US EPA 2006c). If it is determined that dredged material has the potential to cause unacceptable, adverse environmental effects, it may not be disposed of in the ocean.

Air Enforcement Programs:

- Since 1970 when the **Clean Air Act** was first enacted, US EPA and Maine DEP have implemented control programs that have significantly reduced air pollution, including air toxics from mobile sources, stationary and area sources. The State is delegated by US EPA to oversee certain federal regulations such as the New Source Performance Standards and the National Emission Standards for Hazardous Pollutants which control emissions of air toxics and criteria pollutants. The **Clean Air Mercury Rule** (2005) is intended to cap and reduce mercury emissions from coal-fired power plants with the goal of reducing utility emissions of mercury by nearly 70% (US EPA 2005). The **Clean Air Act Amendments** of 1990 directed US EPA to identify sources of dioxin emissions and to implement regulations to reduce dioxin emissions to the environment. As a result of federal, state, and industrial efforts, there has been an overall 90% reduction in emissions of dioxin from industrial sources in the US since 1987 (US EPA 2003). The 1998 **Pulp and Paper "Cluster Rule"** is also significantly reducing toxic air pollutant emissions, including dioxin, from mills.

Hazardous Waste & Toxics Use and Release Programs:

- Maine's **Toxic and Hazardous Waste Reduction Law** encourages Maine businesses to reduce toxics use, toxics release, and hazardous waste generation. Regulated businesses must develop a Pollution Prevention plan, set company-specific reduction goals, report to the Maine DEP biennially on their progress, and pay an annual fee to the Maine DEP's Toxics Program (Maine DEP 2003). The law sets non-binding statewide reduction goals which include a statewide reduction of toxics releases of 60% by 2006.

- The 1986 federal **Emergency Planning and Community Right-to-Know Act (EPCRA)** helps to increase the public's knowledge of the presence of hazardous chemicals and their releases into the environment. The provisions of this regulation include a requirement that facilities quantify and submit releases of toxic chemicals into a national database, the **Toxics Release Inventory** or TRI. The data is a valuable tool for state, federal and local regulatory and emergency planning.

- The **Toxic Substances Control Act (TSCA)** is a federal law that protects the pubic from exposure to toxic substances by regulating the importation, manufacture and distribution of listed toxic chemicals in the US. The TSCA PCB Program prohibits the manufacture of PCBs (production ceased in 1977), controls the phase-out of existing uses, and oversees their safe disposal. TSCA lead regulations focus on protecting the public from lead-based paint hazards.

- The federal **Oil Pollution Act** requires facilities that store large quantities of oil to prepare spill plans and to adopt measures to keep any accidental spills from reaching waterways. See Chapter 3 to learn more about what the State of Maine is doing to reduce the impacts of oil spills, including the *Maine Oil Spill Contingency Plan*.

- **Pesticide Enforcement**—The use of DDT was banned in the US in 1972. US EPA works in partnership with the State of Maine to regulate the use of legal pesticides through inspections and certification training for applicators. Under federal and State regulations, the use of tributyltin, a toxic anti-fouling ingredient added to marine paints, is banned in Maine (except for vessels over 25 meters in length or vessels with an aluminum hull).

- The **Superfund Enforcement Program** implements the federal **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** and the **Resource Conservation and Recovery Act (RCRA)**. Under CERCLA, US EPA responds to releases or threatened releases of hazardous substances and negotiates with the responsible parties to conduct the clean-up. Under RCRA, US EPA works with the State of Maine to regulate businesses that generate, transport, treat and store hazardous wastes. Any release to the environment requires the business to conduct clean-up and monitoring.

Toxics Source and Risk Assessment Programs:

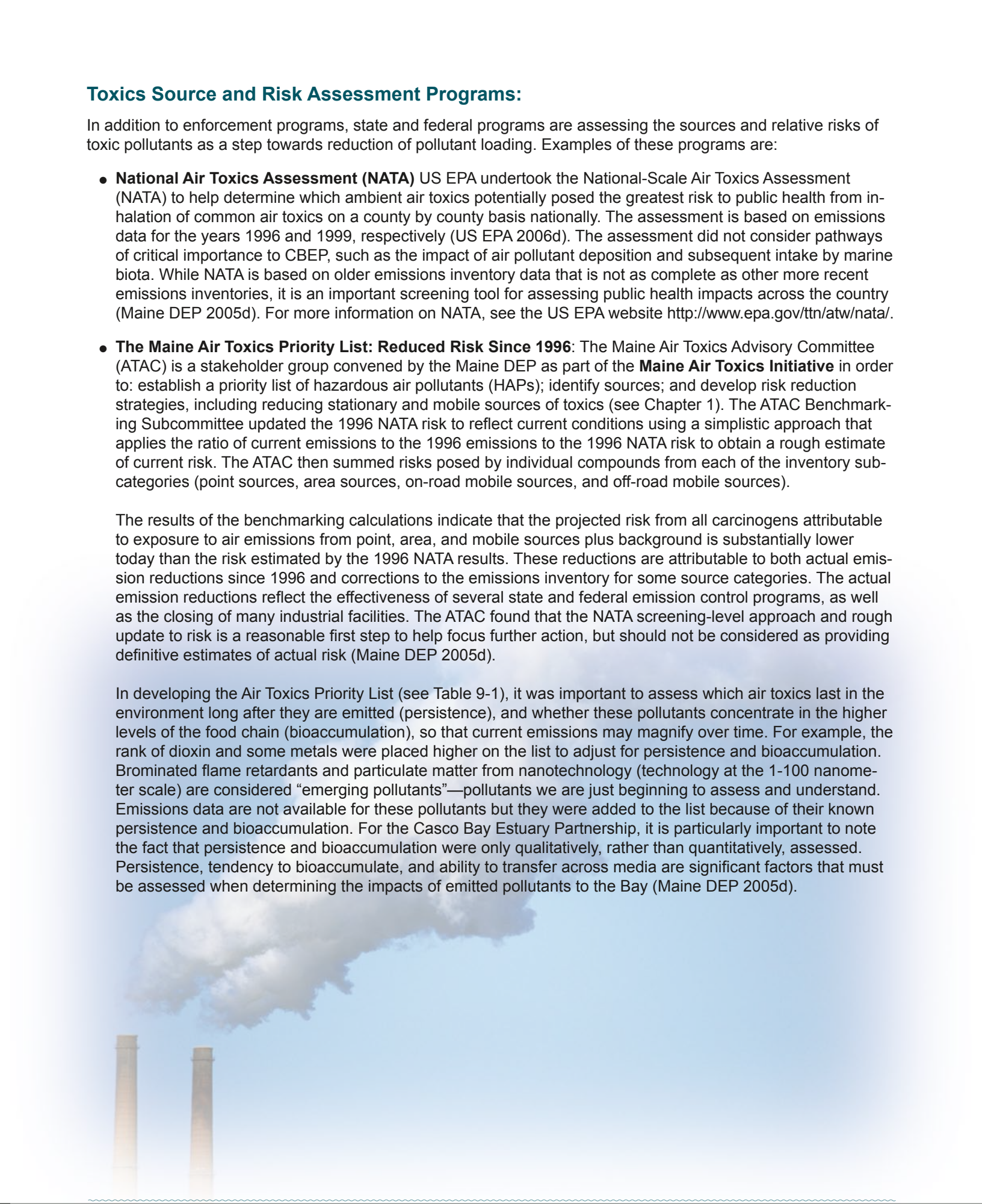
In addition to enforcement programs, state and federal programs are assessing the sources and relative risks of toxic pollutants as a step towards reduction of pollutant loading. Examples of these programs are:

- **National Air Toxics Assessment (NATA)** US EPA undertook the National-Scale Air Toxics Assessment (NATA) to help determine which ambient air toxics potentially posed the greatest risk to public health from inhalation of common air toxics on a county by county basis nationally. The assessment is based on emissions data for the years 1996 and 1999, respectively (US EPA 2006d). The assessment did not consider pathways of critical importance to CBEP, such as the impact of air pollutant deposition and subsequent intake by marine biota. While NATA is based on older emissions inventory data that is not as complete as other more recent emissions inventories, it is an important screening tool for assessing public health impacts across the country (Maine DEP 2005d). For more information on NATA, see the US EPA website http://www.epa.gov/ttn/atw/nata/.

- **The Maine Air Toxics Priority List: Reduced Risk Since 1996**: The Maine Air Toxics Advisory Committee (ATAC) is a stakeholder group convened by the Maine DEP as part of the **Maine Air Toxics Initiative** in order to: establish a priority list of hazardous air pollutants (HAPs); identify sources; and develop risk reduction strategies, including reducing stationary and mobile sources of toxics (see Chapter 1). The ATAC Benchmarking Subcommittee updated the 1996 NATA risk to reflect current conditions using a simplistic approach that applies the ratio of current emissions to the 1996 emissions to the 1996 NATA risk to obtain a rough estimate of current risk. The ATAC then summed risks posed by individual compounds from each of the inventory subcategories (point sources, area sources, on-road mobile sources, and off-road mobile sources).

  The results of the benchmarking calculations indicate that the projected risk from all carcinogens attributable to exposure to air emissions from point, area, and mobile sources plus background is substantially lower today than the risk estimated by the 1996 NATA results. These reductions are attributable to both actual emission reductions since 1996 and corrections to the emissions inventory for some source categories. The actual emission reductions reflect the effectiveness of several state and federal emission control programs, as well as the closing of many industrial facilities. The ATAC found that the NATA screening-level approach and rough update to risk is a reasonable first step to help focus further action, but should not be considered as providing definitive estimates of actual risk (Maine DEP 2005d).

  In developing the Air Toxics Priority List (see Table 9-1), it was important to assess which air toxics last in the environment long after they are emitted (persistence), and whether these pollutants concentrate in the higher levels of the food chain (bioaccumulation), so that current emissions may magnify over time. For example, the rank of dioxin and some metals were placed higher on the list to adjust for persistence and bioaccumulation. Brominated flame retardants and particulate matter from nanotechnology (technology at the 1-100 nanometer scale) are considered “emerging pollutants”—pollutants we are just beginning to assess and understand. Emissions data are not available for these pollutants but they were added to the list because of their known persistence and bioaccumulation. For the Casco Bay Estuary Partnership, it is particularly important to note the fact that persistence and bioaccumulation were only qualitatively, rather than quantitatively, assessed. Persistence, tendency to bioaccumulate, and ability to transfer across media are significant factors that must be assessed when determining the impacts of emitted pollutants to the Bay (Maine DEP 2005d).



The Maine Air Toxics Priority List

The final Air Toxic Priority list is shown below. This list is based on the best information available in 2006, but due to uncertainties in this information, it is only a rough estimate of rank (with acrolein ranked highest), and pollutants will be added and deleted as new information comes to light and emission reductions are implemented. The Air Toxics Advisory Committee finds that every six months, it should re-evaluate whether any previously unknown pollutants should be added to the list (Maine DEP 2005d).

Note that many of the pollutants on the list (like acrolein) are primarily a concern due to human inhalation risks rather than potential impacts to the aquatic environment .

Table 9-1. Final Maine Air Toxics Priority List

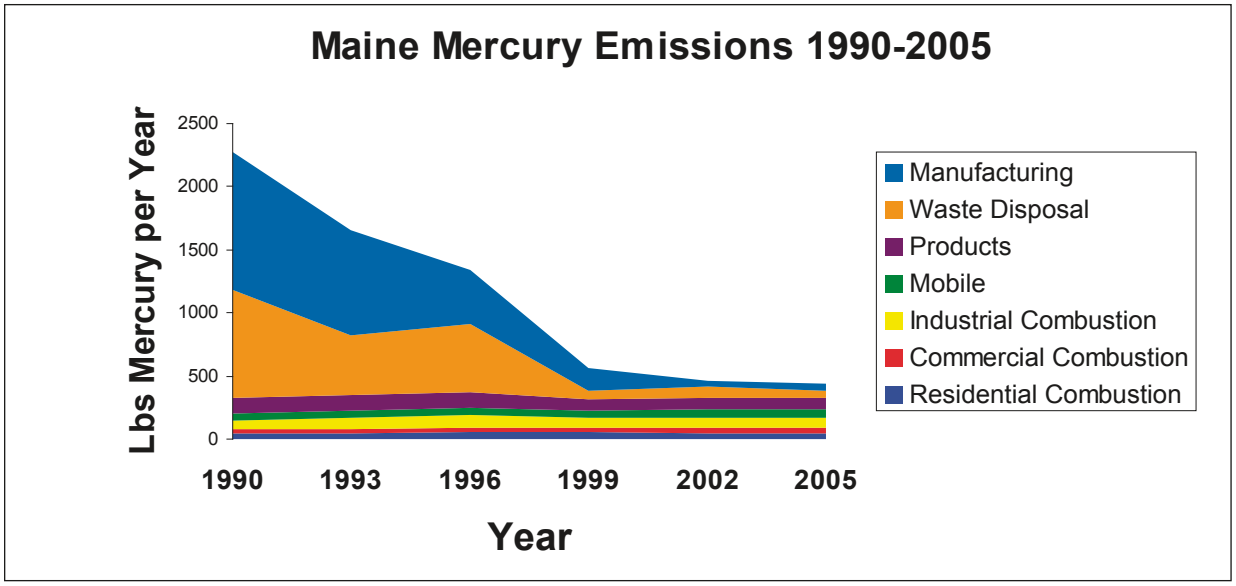
Rank	Pollutant Category
1	Acrolein
2	Polycyclic Organic Matter
3	Manganese
4	Formaldehyde
5	Nickel
6	1,3-Butadiene
7	Diesel PM
8	2,4-Toluene Diisocyanate
9	Sulfuric Acid
10	Benzene
11	Lead
12	Cadmium
13	Dioxins
14	Chromium
15	Arsenic
16	Cyanide & Compounds
17	Mercury
18	Brominated Flame Retardants
19	Particulate Matter from Nano-Technology
20	Acetaldehyde
21	Tetrachloroethylene (Perchloroethylene)
22	Chloroform
23	Carbon Tetrachloride
24	Ethylene Dichloride
25	Ethylene Dibromide
26	Methyl bromide
27	Chlorine
28	Hydrochloric acid
29	Chlorine dioxide

Source: Maine DEP 2005d

Focus on Mercury Reductions in Maine

Historically, mercury has been the compound of greatest concern to the Maine DEP in terms of persistence and bioaccumulation (Maine DEP 2005d). The effects of mercury on wildlife were explored in Chapter 7 and the resulting impacts to human consumers of fresh and saltwater fish were discussed in Chapter 8. Regulatory efforts by the Maine DEP have substantially decreased emissions of mercury in Maine during the past 15 years, as shown in Figure 9-1 below.

Figure 9-1 (Maine DEP 2005d)



There have been many major steps taken in Maine to reduce mercury loading from all sources. These include:

1989 Mercury discharges to State waters prohibited; ambient water quality criteria set.

1994 First in the nation statewide fish consumption advisories issued by Maine.

1998 New England Governors and Eastern Canadian Premiers adopt a landmark goal to "virtually eliminate" releases of mercury from human activities into the environment. Action plan called for elimination of 50% of mercury emissions by 2003.

2000 State statute lowered mercury emissions standards. Also, HoltraChem Manufacturing Company chlor-alkali plant in Orrington, Maine was closed down. It was the last plant in New England that used a mercury-cell process to produce chlorine gas and caustic soda.

2001 Maine bans the sale and distribution of thermostats containing added mercury.

2002 The Natural Resources Council of Maine and US EPA worked with businesses to ensure the removal and storage of 185,000 pounds of surplus mercury from HoltraChem. Maine achieves 65% mercury emissions reductions since 1998. Law passed that requires automobile manufacturers to recover mercury-containing switches from vehicles before they are scrapped.

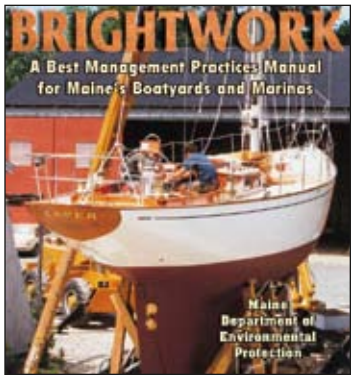
2003 Maine bans the sale of most switches, relays, and measuring devices containing added mercury. After a dialogue begun in its Portland, Maine store, Wild Oats becomes the first national chain to post mercury levels in fish. Law passed that requires dentists to separate mercury from dental wastewater.

2006 Law passed banning the sale of button-cell batteries with added mercury and products containing such batteries after January 30, 2011. Mercury-free alternatives will replace these batteries (NRCM 2006).

How Citizens and Businesses Can Reduce Toxics Loading

The following are a few examples of the many ways that citizens and businesses can act as stewards of the environment by helping to reduce the loading of toxic chemicals to the Bay and its watershed.

Businesses can:



- **Participate in voluntary toxics reduction approaches:** For example, marinas and boatyards across the state are now participating in the Maine Clean Boatyards & Marinas Program first piloted in Casco Bay on a voluntary basis. Guidance for environmentally sound practices can be found in *Brightwork: A Best Management Practices Manual for Maine's Boatyards and Marinas* (2005c). Golf courses can participate in Audubon International's Golf Course Certification Program, which includes management approaches to reduce the use of chemicals. In 2003, CBEP helped to sponsor training in the program for Maine golf course superintendents and continues to work with courses in the watershed toward certification through its Presumpscot Watershed Initiative.

Everyone can:

- **Manage lawns and gardens in a more environmentally sustainable way:** Educational programs such as Maine Board of Pesticide Control's Yardscaping Program (http://www.yardscaping.org/), Friends of Casco Bay's Bayscaping program (http://www.state.me.us/agriculture/pesticides/bayscaper/), and the Maine DEP's Lakesmart program (www.maine.gov/dep/blwq/doclake/lakesmart/index.htm) teach and promote the reduction of toxic chemical use and other environmentally friendly techniques for maintaining an attractive landscape.

- **Minimize impacts from driving**: Combustion engines are a significant source of pollution. Minimize driving by ride-sharing whenever possible. Don't idle the engine unnecessarily. Avoid gasoline spills and the release of fumes from your car, boat, or lawnmower. Make sure that your car's catalytic converter is functioning well. One of its functions is to reduce the release of PAHs and other hydrocarbons and volatile organic compounds produced from unburned fuel. Maximize fuel efficiency by traveling at a medium, steady speed. Trade in old car batteries for recycling when buying a new one. Also, have your oil, brake and transmission fluid changed at a service station that recycles.

- **Conserve electricity:** The generation of electricity by coal-fired power plants is a major source of atmospheric mercury. Tips for saving on electricity can be found at http://www.efficiencymaine.com/energytips.htm.

- **Reduce & properly dispose of household hazardous waste:** Reduce the use of toxic chemicals in your home by replacing them with less toxic substitutes. Dispose of solid and liquid household hazardous wastes properly (*e.g.,* fluorescent tubes and old thermostats containing mercury, house paint, solvents, pesticides, waste oil). To determine when there is household hazardous waste collection day in your area, visit http://www.state.me.us/spo/recycle/hhw/collections.php

- **Use woodstoves and fireplaces sparingly and wisely**: Use dry, well-seasoned wood and keep your chimney clean. Wood burning releases PAHs, acrolein, and other toxic chemicals.

Friends of Casco Bay

Casco Bay Estuary Partnership (CBEP) Efforts to Reduce and Monitor Toxics in the Bay and its Watershed

Beverly Bayley-Smith

Some of the CBEP Board members and staff gather at a Casco Bay marina.

In addition to the many enforcement activities and voluntary programs of our government and citizen partners, CBEP has developed specific actions in the *Casco Bay Plan* that are focused on reducing toxic pollution. CBEP will continue to monitor the levels of toxic chemicals in the sediments of the Bay and in the tissues of mussels, two of our suite of environmental indicators. CBEP is also supporting continued reductions in the number and volume of combined sewer overflow discharges into the Bay. By supporting the ongoing efforts of the 14-community Casco Bay Interlocal Stormwater Working Group (ISWG), CBEP is helping to reduce the loading of toxics via stormwater runoff. One of the 1996 *Casco Bay Plan* action recommendations was to "research the contribution of deposition of pollutants from the air." The results of CBEP's atmospheric deposition studies are described in Chapter 2. In partnership with Maine DEP, CBEP is continuing to assess the contribution and sources of mercury and trace metals to the Bay and its watershed through atmospheric deposition.

Four new recommended actions in the updated 2005 *Casco Bay Plan* (CBEP 2005b) are:

- ***Casco Bay Plan* Toxics Action #1: Support efforts to develop a comprehensive management strategy for dredged material.**
  In order to facilitate sound dredge material disposal as a result of necessary dredging in the Bay, CBEP will support efforts to develop a comprehensive approach to management of dredged materials by providing input to policy dialogues of state and federal governments and by working in partnership with other groups and agencies to provide state-of-the science information and guidance for dredgers on alternatives for dredge disposal.

- ***Casco Bay Plan* Toxics Action #2: Develop Biological Indicators for Marine Waters**
  CBEP will work with Maine DEP and others to develop scientifically sound biological indicators as a foundation for developing marine biological standards to regulate Maine's marine waters. Biological indicators can integrate and reflect multiple water quality impacts to an ecosystem and are already being used by Maine DEP to ensure that the state's freshwaters meet their designated uses.

- ***Casco Bay Plan* Toxics Action #3: Develop Sediment Quality Thresholds for Assessment of Contaminated Sediments**
  CBEP will work with EPA, Maine DEP and others to develop sediment quality thresholds for contaminated sediments in Maine. The sediment thresholds will be used to interpret sediment quality data, to report on contamination levels in the State of the Bay Report, and to help inform other agencies and partners in their development of thresholds as well.

- ***Casco Bay Plan* Toxics Action #4: Research the Feasibility of and Best Approach to Monitoring New Environmental Analytes**
  Tens of thousands of chemicals are now known or suspected to be present in marine and freshwater bodies as a result of their use by humans. These so-called "emerging contaminants" include pharmaceuticals and personal care products, (such as antibiotics, steroids, hormones and other endocrine disruptors), and a variety of chemicals such as caffeine, cholesterol, fire retardant and insect repellents which may have or, in some cases, have been shown to have detrimental effects on aquatic organisms and ecosystems. As a starting point for a monitoring program for emerging contaminants in Casco Bay, CBEP will conduct research on potential methods for monitoring and prioritizing these contaminants.

CBEP is committed to the implementation of these new *Casco Bay Plan* actions. In 2006, CBEP began working on the implementation of Toxics Action #2: Develop Biological Indicators for Maine's Waters. The Tiered Aquatic Life Uses (TALU) framework relates the declining health of an aquatic ecosystem to increasing human disturbance (including toxic pollution) along a gradient and associates tiers along the gradient with designated water body uses. TALU has already been used to develop biological criteria for rivers and streams in Maine. In partnership with Maine DEP, USEPA and other National Estuary Programs, CBEP is helping to develop biological criteria for estuarine waters by exploring application of the TALU approach in Casco Bay.

Summary/Conclusions

Toxic chemicals are found throughout Casco Bay and its watershed: in the air, in the sediments, in the aquatic environment, and in the tissues of many types of wildlife, in some cases at levels that threaten ecosystem health. Through the dedicated efforts of state, federal, and local government, businesses and citizens, the loading of many toxic chemicals, including mercury, PCBs, dioxin, tributyltin, and pesticides, has declined dramatically over time.

Continued decreases in the loading of toxic chemicals will require an ongoing commitment from government agencies and the citizens of the Casco Bay watershed to use all of the available tools, including: regulatory enforcement; monitoring and assessment of sources, risks, and impacts; development of new approaches to reduce the use and release of toxic chemicals; and vigorous environmental stewardship at every level.

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