MaryPIRG Foundation

Mercury Pollution in Maryland

A Comprehensive Look at Contamination of Fish in Local Waterways

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Table of Contents

Executive Summary

Mercury pollution from coal-fired power plants threatens the health of thousands of Maryland newborns each year. We examined data from nearly 2,000 fish tested by state agencies; 59 percent of the fish contained enough mercury to present a potential health risk. The state could dramatically reduce the problem by curbing emissions from power plants.

Mercury is a neurological toxicant that slows development in children and may impair the cardiovascular and immune systems in adults.

- Children who are exposed to mercury—whether in the womb or during their early years—may develop problems concentrating, display worse fine motor skills, and learn to walk and talk at a later age.
- Adults with more mercury in their bodies may be at an increased risk of experiencing a heart attack.
- In Maryland, an estimated 6,000 to 12,000 fetuses are exposed to levels of mercury that exceed federal safety standards and may later lead to a loss of intelligence.

Municipal and medical waste incinerators, industrial facilities and coal-fired power plants are the largest sources of mercury pollution in Maryland.

- Local sources of mercury have a significant impact on the amount of mercury in Maryland's environment. Five of the six largest sources of deposition into the Chesapeake Bay are Maryland-based facilities. A recent study of mercury deposition in eastern Ohio found that 67 percent of collected mercury came from coal-fired power plants and that most of it was from sources within 400 miles.
- Once the mercury enters waterways, it can be transformed to an organic form, which then can accumulate in fish.

Eating contaminated fish is the primary route by which people are exposed to mercury pollution. Fish caught in the Chesapeake Bay and in streams, lakes and reservoirs across the state contain unsafe levels of mercury.

- Since 2000, 59 percent (1,141 of 1,939) of freshwater and marine fish that were tested in Maryland contained more

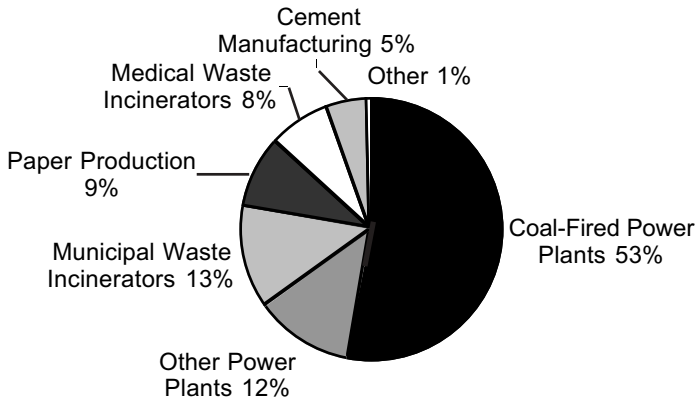
than 30 parts per billion of mercury (ppb), the level above which the EPA and FDA recommend people begin limiting their consumption.

- Nearly 9 percent (178 fish samples) contained mercury at a concentration of 300 ppb or greater. Maryland issues species-specific consumption advisories when a fish species in a given waterbody has an average mercury contamination of 300 ppb or more. The advisories vary by species and waterbody, and range from slightly limited consumption to a warning against eating any fish.

To address the problem of mercury contamination in fish, Maryland must reduce mercury pollution. The state recently adopted standards that will reduce mercury pollution from coal-fired power plants by 90 percent by 2013. However, more work needs to be done. The state should:

- Phase out versions of products that contain mercury, such as car switches and blood-pressure cuffs, and replace them with safer products.
- Establish collection programs for consumer products containing mercury.
- End municipal and medical waste incineration.
- Advocate for reducing pollution from power plants in other states.

Figure ES-1. Sources of Mercury Pollution in Maryland[1]



Introduction

In 1965, the Maryland General Assembly designated rockfish as Maryland's state fish. The declaration included this statement:

> "Whereas, The people of Maryland as long time and appreciative residents of the productive Chesapeake Bay area know of it first hand the recreational and gastronomic delights of this wonderful land, and
>
> Whereas, Not the least among the good reasons for living in Maryland is the abundant and unexcelled delicacy of the Chesapeake Bay striped bass or rockfish, and
>
> Whereas, In the judgment of the members of the General Assembly of Maryland, it is a simple act of justice and of equity that this fine old Maryland fish should be honored by being designated as the official fish of the State of Maryland . . ."[2]

Rockfish—also known as striped bass because of the stripes that run from their gills to tails—live in the Chesapeake Bay for the first three to five years of their lives before migrating to the Atlantic Ocean. Roughly 70 to 90 percent of all Atlantic rockfish come from the Chesapeake Bay. Rockfish can live as long as 30 years, returning repeatedly to the bay and its tributaries to spawn.[3]

But Marylanders must now reduce their consumption of this "unexcelled delicacy." Rockfish contain dangerous amounts of mercury, as well as PCBs.

Richard Gunion

Mercury is emitted in Maryland and surrounding states from coal-fired power plants and incinerators burning items containing mercury. Eventually the mercury settles out of the air into water, where it

can be transformed to an organic form and concentrate in fish. Big, long-lived fish such as rockfish consume thousands of small fish—and the mercury they contain—over the course of a lifetime. Thus, rockfish have high concentrations of mercury and other pollutants.

As a result, rockfish are unsafe for people to eat more than twice per month. According to the Maryland Department of the Environment, women of childbearing age and children should limit their intake to one monthly meal or less, depending on the size of the fish.[4]

Rockfish are not the only species contaminated by mercury. Smallmouth and largemouth bass and five other species of fish consistently have enough mercury to present a risk to human health, and Maryland residents are warned to limit their consumption of those fish.

Continued mercury pollution will add to the contamination of fish and the danger to Maryland consumers. Maryland has just committed to reducing emissions from coal-fired power plants, the biggest source of in-state pollution, and now should address other sources of pollution. Doing so will help reduce mercury levels in fish, allowing more of the state's residents to once again enjoy the "gastronomic delight" of rockfish and reducing the serious threat mercury contamination poses to the health and welfare of children in Maryland.

Health Impacts of Mercury

Mercury harms children as they grow and develop, both *in utero* and after birth. In addition, mercury may cause damage to adults, increasing the risk of heart attacks and perhaps compromising the immune system.

Impacts on Children

Mercury's greatest impact is on fetuses and young children. A neurological toxicant, methylmercury can cause developmental delays, impaired motor skills and lowered IQ in children.[5] (Methylmercury, the organic form of mercury, accumulates through the food chain and is the form to which people are most often exposed.)

Children are exposed to methylmercury through the contaminated fish they or their mothers eat. Some of the mercury a woman eats will stay in her body for her entire life, and levels of contamination in the body can increase over time. When a woman becomes pregnant, the child growing inside her is exposed to the mercury in her body, as well as mercury from fish that she eats while pregnant. Exposure does not end at birth. Mercury is present in breast milk, and children may also ingest mercury by eating polluted fish.

Hundreds of thousands of American children are exposed to dangerous levels of mercury. A 2004 study by U.S. Environmental Protection Agency scientists found that one in six American women of reproductive age had levels of mercury high enough to damage a developing fetus.[6] A separate analysis estimated that each year between 317,000 and 637,000 newborns are exposed *in utero* to levels of mercury that exceed federal safety standards and may lead to a loss of intelligence.[7] Applying this national estimate to Maryland suggests that 6,000 to 12,000 fetuses in the state are exposed to unsafe levels of mercury each year.[8]

Children are more vulnerable to mercury pollution than are adults. They consume more food per pound of body weight than do adults and thus experience higher concentrations of mercury in their bodies. Mercury can interfere with a child's growing brain, preventing brain cells from traveling to the correct place in the brain and even stopping brain growth.[9]

This has impacts on behavior and mental function. Children exposed to mercury have problems concentrating, display worse fine motor skills and cannot draw as well.

Children may learn to walk and talk at a later age. The National Academy of Sciences Committee on the Toxicological Effects of Methylmercury summarizes mercury's impact as leading to children "who have to struggle to keep up in school and who might require remedial classes of special education."[10]

Mercury's effects can be so subtle as to go undetected, but the cumulative impact on society is huge. If a pregnant woman doubles the amount of mercury-tainted fish she consumes, effectively doubling the dose her developing child receives, the child may learn to walk and talk two months later than would otherwise be the case.[11] Because this is within the range of variation among children, it may not be noticeable. But the impacts of mercury pollution add up across the nation. By one estimate, the diminished intelligence and lost productivity caused by mercury pollution costs the nation $8.7 billion annually.[12]

A study by researchers at Harvard's Center for Risk Analysis in 2005 calculated that reducing mercury pollution would translate to significant financial benefit to society. The study concluded that reducing mercury pollution could lessen neurological and cardiac damage and save nearly $5 billion annually nationwide.[13]

Impacts on Adults

Mercury's impact is not limited to children's development. Adults are also at risk because mercury may damage the cardiovascular, nervous and immune systems.

Consumption of mercury may contribute to an increased risk of cardiovascular disease. Researchers in Finland found that the one-third of men with the most mercury in their bodies were more than twice as likely to have a heart attack or to die from cardiovascular disease than other men in the study.[14] Similarly, a study by Dr. Eliseo Guallar of Johns Hopkins and other researchers in 2002 found that patients with higher concentrations of mercury in their bodies were more likely to have suffered from a heart attack.[15] The researchers concluded that the presence of mercury could counteract the beneficial components of fish (e.g., certain fatty acids) in preventing heart disease.

Adults who were exposed to mercury in their youths may experience new health impacts later in life. Researchers studied the health of older Japanese adults who had been diagnosed with mercury poisoning decades earlier. Adults who had been exposed to mercury aged more quickly—struggling with sensory disturbances and aspects of daily living—than people without mercury exposure.[16]

Animal studies of the impact of mercury have suggested that mercury may impair immune system function in adults long after exposure.[17] *In utero* exposure to mercury may also be a risk factor for higher blood pressure later in life.[18]

Mercury in Maryland's Environment

Maryland has a significant mercury pollution problem. Pollution from coal-fired power plants enters waterways, where it accumulates in aquatic animals. As a result, fish and shellfish in the state contain unsafe levels of mercury.

Contamination of Maryland's Fish

How Mercury Gets Into Fish

Mercury pollution is released primarily by coal-fired power plants, both in Maryland and around the country. Airborne mercury is deposited into waterways, where it is converted by aquatic organisms into its organic form, methylmercury. Methylmercury is more readily absorbed by animals in water than is inorganic mercury and is more likely to accumulate in tissue. Animals acquire methylmercury directly from the water or through the food they eat. Methylmercury accumulates in tissue, resulting in bio-magnification through the aquatic food chain, from tiny plankton through small fish and up to the larger fish that humans typically consume. At each step of the food chain, methylmercury becomes increasingly concentrated in animal tissue, such that large fish can accumulate significant amounts within their bodies—enough to cause health problems for the birds and mammals (including people) that consume the fish.

Methylmercury does not accumulate as significantly through the non-aquatic food chain. Fish and shellfish contain 1,000 to 10,000 times more methylmercury than other foods.[19] As a result, fish consumption is the most important pathway for mercury exposure in humans.

How Much Mercury Is Too Much

To protect people from mercury exposure through fish consumption, the U.S. Environmental Protection Agency and the Food and Drug Administration have established fish consumption guidelines. Though there is considerable evidence that those standards are not adequately protective of human health, they provide a starting point for evaluating how much mercury makes fish unsafe for human consumption.

The EPA has determined that people should not consume more than 0.1 microgram of methylmercury per kilogram of

Measuring Mercury Pollution

Mercury contamination is measured in parts per million or parts per billion. One part per billion (ppb) is equal to one microgram per liter or 0.0000001 percent. To visualize how small this is, imagine a 130,000 gallon Olympic-sized swimming pool. One drop of water is equal to 5 ppb in the pool. Another way to consider one ppb is to think of it as 1/32 of a second out of a year.[23]

body weight per day.[20] For a typical adult, this means consuming less than 2.5 ounces of fish with mercury levels of 100 parts per billion (ppb) each day. For comparison, a typical fish meal is eight ounces. People who eat more fish or eat fish with higher mercury concentrations may build up mercury in their bodies at unsafe levels.

Only when fish contain less than 30 ppb of mercury do the agencies consider it safe for people to consume unrestricted amounts.[21] The agencies recommend that pregnant women not eat shark, swordfish, king mackerel or tilefish because they consistently have high levels of mercury, and to limit consumption of other, lower mercury fish to two meals per week.[22]

However, the EPA's and FDA's recommended fish consumption levels fail to protect the health of developing fetuses. An analysis by the Environmental Working Group (EWG) found that if pregnant women followed the federal guidelines and consumed two meals of approved fish per week, one million babies, or one quarter of those born each year, could be exposed to unacceptable levels of mercury for a full month during pregnancy.[24] According to the EWG study, the federal guidelines are not protective enough because the FDA and EPA assume that women have no mercury in their bodies before pregnancy, the guidelines do not restrict consumption of all fish that have high mercury levels, and the agencies fail to account for the variation in how different women absorb mercury. EWG suggests that more species should be added to the list of fish that pregnant women should not consume and that the agencies update their model to more realistically represent the population.

The EPA and FDA guidelines apply to commercially available fish and are supplemented with rough guidelines for noncommercial fish. Consumers should eat no more than one meal of noncommercial fish per week unless there is a specific advisory recommending further restrictions. State

Table 1. EPA Consumption Guidance for Non-Commercial Fish[25]

Fish Meals per Month	Mercury Concentration (ppb)
Unrestricted	0-29
16	29-59
12	59-78
8	78-120
4*	120-230
3	230-310
2	310-470
1	470-940
0.5	940-1,900
None	above 1,900

* This is equal to the recommendation that consumers eat no more than one meal of noncommercial fish per week unless a state advisory says otherwise.

governments are responsible for issuing separate fish consumption advisories for fish caught from local waterbodies. The EPA's explanation of how it arrived at its recommendation of one meal of noncommercial fish per week suggests some guidelines to states for what mercury contamination levels should trigger listing a fish on a consumption advisory (see Table 1). States are free to establish more or less cautious fish consumption advisories.

Mercury Levels in Maryland Fish

Fish caught in lakes, rivers and reservoirs across Maryland contain enough mercury that they present a health risk. A comprehensive look at all fish testing data conducted in the past several years shows that fish across Maryland contain unsafe levels of mercury.

The Maryland Department of the Environment (MDE) and the Department of

Table 2. Top Ten Species with Highest Tested Mercury[28]

Species Name	Waterbody	Mercury (ppb)	Type	Number of Fish in Sample
Largemouth Bass	Lake Lariat	2,077	MHg	1
Walleye	Savage River Reservoir	1,677	Hg	5
Smallmouth Bass	North Branch Potomac	951	Hg	1
Rock Bass	Savage River Reservoir	845	Hg	5
Channel Catfish	Jennings Randolph Lake	677	Hg	1
White Sucker	Savage River Reservoir	531	Hg	1
Crappie	Lake Lariat	526	MHg	1
Bluegill	Frostburg Reservoir	394	MHg	1
Striped Bass	Chesapeake Bay	349	MHg	1
White Perch	Liberty Reservoir	217	MHg	5

Table 3. Top Ten Waterbodies with Highest Mercury Concentrations in Fish[29]

Waterbody	Fish name	Mercury (ppb)	Type	Number of Fish in Sample
Lake Lariat	Largemouth Bass	2,077	MHg	1
Savage River Reservoir	Walleye	1,677	Hg	5
St. Mary's Lake	Largemouth Bass	1,514	MHg	1
Frostburg Reservoir	Largemouth Bass	968	MHg	1
North Branch Potomac	Smallmouth Bass	951	Hg	1
Rocky Gorge Reservoir	Largemouth Bass	868	MHg	1
Loch Raven Reservoir	Largemouth Bass	824	MHg	1
Tuckahoe State Park Dam	Largemouth Bass	724	MHg	1
Prettyboy Reservoir	Largemouth Bass	722	MHg	1
Liberty Reservoir	Largemouth Bass	709	MHg	1

Natural Resources (DNR) test fish from waterbodies across the state for mercury contamination. We combined data from MDE's mercury fish testing data with data from two DNR reports to create a full list of mercury contamination testing since 2000.[26]

Since 2000, the departments have tested 1,939 fish from 36 species and 67 waterbodies across the state.[27] (In some cases, MDE combined multiple fish into a single sample. The 1,939 fish were combined into 940 samples, with tissue from as many as six fish or 25 oysters combined into a single sample. See appendices for list of species and waterbodies.) Of those 1,939 fish, 1,141 (59 percent) were in samples containing more than 30 ppb of mercury, the level above which the EPA and FDA recommend people begin to limit their consumption. The most contaminated sample had a mercury level of 2,077 ppb. (See Tables 2 and 3 for most contaminated species and waterbodies.)

Approximately 140 samples with 259 fish (13 percent) contained mercury at a concentration of 300 ppb or greater. Maryland issues a species-specific consumption advisory—a recommendation that consumers limit their intake of these fish beyond the EPA and FDA's default recommendation of one meal per week of noncommercial fish—when fish from a given waterbody have an average mercury contamination of 300 ppb or more.[30] (The degree of restriction depends on the species and waterbody.) The samples were of 9 different species from approximately 23 waterbodies. (See Table 4 for list of species.)

Based on testing data from Maryland waters, the state has issued fish consumption advisories since 2001. Maryland warns the general population to limit consumption of seven species of fish from across the state (see Table 5). For each species caught from each waterbody, the Maryland Department of the Environment (MDE) has established the maximum amount of fish that the general population, women of child-bearing age, and children can safely consume. Though the guidelines are based on the maximum number of meals per year, MDE recommends spacing them out to avoid spikes in mercury exposure. To further reduce exposure, women and children are advised to eat smaller servings.[32]

For example, children should not eat any smallmouth or largemouth bass caught in Lake Lariat, Frostburg Reservoir, Savage Reservoir or the Potomac River at Spring Gap, while women of childbearing age may consume one 6-ounce meal each month and the general population may eat one 8-ounce meal monthly.

The problem of mercury contamination is not limited to Maryland. Fish testing data from Pennsylvania and Virginia show that those states have similar problems. In addition to warning residents not to consume fish caught from the state's waterways more often than once a week, Pennsylvania has

Table 4. Species of Tested Fish that Contained More than 300 ppb of Mercury[31]

Species Name	Included in State Consumption Advisory?
Bluegill	Yes
Channel Catfish*	Yes
Crappie*	Yes
Largemouth Bass	Yes
Rock Bass	No
Smallmouth Bass	Yes
Striped Bass	Yes
Walleye	Yes
White Sucker	No (not considered edible or a game fish)

*Channel catfish have high concentrations of mercury and PCBs. Because PCBs are the bigger concern, MDE bases the fish consumption advisory on PCBs. Crappie is contaminated with mercury, PCBs and pesticides, with the latter two providing the basis of the consumption advisories.

Table 5. Maryland Fish Consumption Advisory for Mercury Contamination[33]

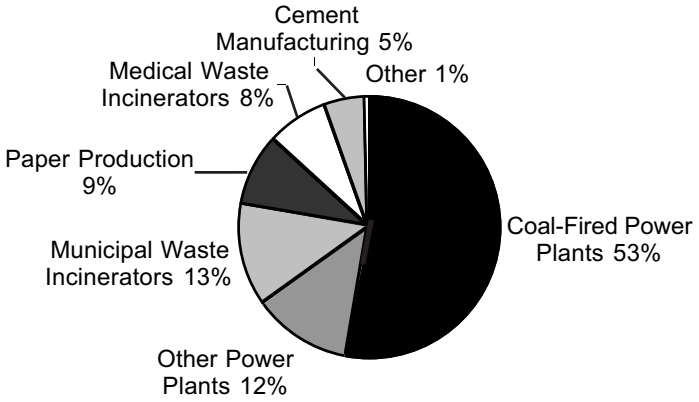
Species	Location
Smallmouth bass	all publicly accessible impoundments, several lakes and reservoirs, all rivers and streams
Largemouth bass	all publicly accessible impoundments, several lakes and reservoirs, all rivers and streams
Bluegill	all publicly accessible impoundments and lakes
Pickerel	all publicly accessible impoundments and several lakes and reservoirs
Northern pike	all publicly accessible impoundments and several lakes and reservoirs
Walleye	all publicly accessible impoundments and several lakes and reservoirs
Striped bass (rockfish)	Chesapeake Bay and tributaries
Yellow perch	Frostburg Reservoir and Deep Creek Lake

listed more limited consumption advisories for a total of 16 species of fish from 70 different lakes, reservoirs, rivers and streams.[34] Virginia has similarly expansive fish consumption advisories.[35] This mercury contamination means that Maryland residents who go on out-of-state fishing trips will be exposed to mercury there, also.

Sources of Mercury Pollution

More airborne mercury comes to rest in Maryland than in most states.[36] Power plants are the biggest source of mercury in Maryland, followed by municipal waste incinerators, paper production, medical waste incinerators, and cement manufacturing.

Figure 1. Sources of Mercury Air Pollution in Maryland[39]



Power plants release 2,100 pounds of mercury annually, or 65 percent of in-state mercury emissions. Municipal and medical waste incinerators release 650 pounds, or 21 percent of all emissions.[37]

These in-state sources of pollution are responsible for much of the mercury found in Maryland's waterways. In 1999, five of the six largest sources of mercury deposition into the Chesapeake Bay were Maryland-based facilities.[38] The single largest source of mercury deposition into the Chesapeake Bay was the Phoenix medical waste incinerator. That facility has since reduced its emissions, but medical and municipal waste incinerators remain a large source of mercury pollution. Four coal-fired power plants in the state were also among the top six sources. Those plants will have to reduce their emissions by 80 percent by 2010 and 90 percent by 2013 under standards adopted this year by Maryland.

Pollution sources in neighboring states add to mercury pollution in Maryland. A study conducted by EPA scientists examined mercury deposition in a town near the Ohio-Pennsylvania border. The researchers found that 67 percent of the mercury deposited came from coal-fired power plants and that most of it had traveled for no more than three days, or at most 400 miles.[40] This suggests that pollution from power plants in nearby states is a major contributor to Maryland's mercury problem.

Reducing Mercury Pollution

Mercury emissions can be reduced from every source, and cuts in emissions will reduce the amount of mercury in fish. Maryland has committed to cutting pollution from coal-fired power plants in the state. Now, it should address other major sources of pollution in the state and push for stronger standards on power plants in the region.

Mercury Products

The state should phase out the use of mercury-containing products to reduce their presence in the waste stream.

Maryland recently committed to ending the sale of mercury-containing thermostats by 2008. Household thermostats typically contain 3 grams of mercury that is released to the atmosphere if the thermostat is broken or thrown away.[41] Ending new sales of this product will eventually reduce the amount of mercury that enters the waste stream and is released.

Automatic light switches, anti-lock brakes, back-lit dashboards and high-intensity lights in vehicles frequently contain mercury. When a car is scrapped, mercury is released. Mercury-free alternatives to these components exist and can be installed in new and used cars. Maryland should require manufacturers to replace mercury-based switches in all new and used vehicles. Arkansas already requires automakers to pay $5 to replace mercury switches in vehicles, and legislation requiring a more comprehensive program has been introduced in New York.[42]

Medical devices such as blood pressure cuffs and weighted esophageal dilators also contain mercury.[43] Mercury-free versions of these products are available and many hospitals have largely eliminated the use of mercury through mercury-free purchasing policies. Kaiser Permanente, a large national health care provider, began phasing out mercury products in the late 1990s. In Maryland, the Johns Hopkins Hospital has not used mercury-based blood pressure cuffs for several years.[44]

Maryland's ban on the sale of mercury thermostats will keep the problem of mercury contamination from getting worse, but does nothing to deal with the problem of the existing 2.7 million thermostats with 9 tons of mercury already installed in Maryland homes.[45] When homes are renovated or a

broken thermostat is replaced, the old mercury-based device may be thrown away. If the trash is burned at an incinerator, mercury will be released to the atmosphere. Mercury that is added to a landfill may also present a hazard. The same problems exist with other mercury-containing devices that are no longer useful to consumers.

Maryland should establish public collection points for proper disposal of products that contain mercury. A list provided by MDE of private recycling companies includes only one in-state location that accepts mercury-containing products.[46] Existing public drop-off locations for electronics could be expanded to accept mercury. In addition, residents of every county need access to such facilities.

Waste Incineration

To further reduce mercury pollution, Maryland should end the practice of waste incineration.

At least 17 percent of the waste produced in Maryland is burned each year.[47] Mercury in fluorescent lights, thermostats and other trash enters the waste stream as municipal waste. Tens of thousands of tons of medical waste, which often contains mercury-based products, are incinerated at medical waste incinerators around the state.

Though banning mercury-containing products and improving waste sorting can help reduce the amount of mercury sent to incinerators, the surest way to eliminate mercury pollution and the release of other hazardous air pollutants is to end waste incineration. Increased recycling can divert many plastics and other materials found in municipal waste from landfills helping to alleviate concerns about increasing volumes at dumps. Medical waste does not need to be burned, but rather can be disinfected in high-temperature and high-pressure autoclaves or in special microwaves.

Lowering mercury emissions will reduce the concentration of mercury in fish. When Florida cut emissions from incinerators in the mid-1990s, mercury levels in fish dropped. The state established limits on pollution from incinerators, causing mercury deposition rates in the Everglades to decline by 60 percent from 1990 to 2001. The amount of mercury in fish fell, dropping 75 percent from the mid-1990s to 2002.[48] In Massachusetts, municipal waste incinerators have reduced mercury emissions by 90 percent since 1998 and medical waste incinerators in the state have closed. As a result, mercury contamination of fish has dropped by 32 percent.[49]

Power Plants

Technology to reduce mercury pollution from power plants is readily available, and thus it is entirely reasonable for Maryland to advocate reductions from power plants in neighboring states through its role in the Ozone Transport Commission.

Power plants in other states have already installed scrubbers or filters to reduce mercury emissions. Alabama Power's Gaston plant, which burns bituminous coal, has reduced mercury emissions by as much as 90 percent by using activated carbon injection and a fabric filter. In a test at Holcomb Station, owned by Sunflower Electric in Kansas, several types of activated carbon injection combined with the existing particle control equipment reduced mercury emissions by more than 90 percent from subbituminous coal.[50] The fabric filters that many plants already have installed for controlling soot pollution can capture 72 to 90 percent of mercury emissions, depending on the type of coal.[51]

Policy Recommendations

Maryland can and should do a better job of protecting the public from mercury pollution. Steps the state should take include reducing mercury pollution and providing better information to residents about how to avoid exposure to mercury.

To address the root of the problem, Maryland should limit releases of mercury into the environment. The state should:

- Seek emission reductions from power plants in other states. Maryland should encourage the Ozone Transport Commission, a 15-state organization that works to address multi-state air pollution problems, to include mercury in its upcoming rules on pollution from power plants. The Commission should establish strong caps on mercury pollution and not allow trading of emission credits. This would reduce mercury pollution in states from Virginia to Maine.
- Phase out products, such as switches in cars and trucks, that contain mercury.
- Establish collection programs to prevent mercury-containing products from entering the waste stream.
- End incineration of municipal and medical waste.

To minimize the amount of mercury that Maryland residents consume, the state should improve fish consumption advisories. The state should:

- Post mercury contamination warnings for fish sold in supermarkets so that consumers have a clearer understanding of all sources of mercury exposure.
- Continue to test fish for mercury contamination and promptly issue warnings if new waterbodies or species are found to be contaminated.

Appendix I. Frequency of High Mercury Concentrations by Species

Numbers represent total number of fish measured both singly and in composite samples.[52]

Fish Name	Number of Fish Above 30 ppb	Number of Fish Above 300 ppb	Total Number of Fish Tested
American Eel	15	0	21
Atlantic Croaker	1	0	7
Blue Catfish	1	0	1
Blue Crab	70	0	123
Bluefish	5	0	7
Bluegill	167	31	177
Brown Bullhead Catfish	20	7	28
Brown Trout	13	3	13
Carp	5	0	5
Chain Pickerel	5	0	8
Channel Catfish	93	12	118
Common Rangia	0	0	4
Crappie	46	10	52
Crayfish	5	1	7
Croaker	0	0	6
Duck Clam	2	0	15
Fall Fish	3	0	3
Golden Shiner	2	0	2
Largemouth Bass	407	76	541
Longear Sunfish	15	15	15
Oyster	0	0	50
Pumpkinseed Sunfish	9	4	18
Redhorse Sucker	15	10	15
Rock Bass	10	5	10
Silverside	1	0	1
Smallmouth Bass	37	19	38
Softshell Clam	7	0	24
Spot	3	0	20
Striped Bass	78	3	152
Walleye	20	5	20
Weakfish	0	0	1
White Crappie	6	0	6
White Perch	232	37	318
White Sucker	43	18	43
Yellow Bullhead Catfish	13	2	13
Yellow Perch	28	1	57

Appendix II. Highest Tested Mercury Concentrations by Species

Some tests measured mercury (Hg) and others measured methylmercury (MHg). The risk levels are treated the same.[53]

Fish name	Waterbody	Mercury (ppb)	Type	Number of Fish in Sample
American Eel	Potomac River	42	Hg	2
Atlantic Croaker	Chesapeake Bay	28	MHg	1
Blue Catfish	Potomac River	33	MHg	1
Blue Crab	Chesapeake Bay	38	MHg	4
Bluefish	Potomac River	30	MHg	1
Bluegill	Frostburg Reservoir	394	MHg	1
Brown Bullhead Catfish	Deep Creek Lake	104	Hg	3
Brown Trout	North Branch Potomac	151	Hg	5
Carp	Lake Roland	26	Hg	5
Chain Pickerel	Deep Creek Lake	169	Hg	5
Channel Catfish	Jennings Randolph Lake	677	Hg	1
Common Rangia	Chesapeake Bay	3	Hg	1
Crappie	Lake Lariat	526	MHg	1
Crayfish	Frostburg Reservoir	45	MHg	1
Croaker	Chesapeake Bay	5	MHg	6
Duck Clam	Chesapeake Bay	5	Hg	1
Fall Fish	North Branch Potomac	156	Hg	3
Golden Shiner	Liberty Reservoir	46	MHg	1
Largemouth Bass	Lake Lariat	2,077	MHg	1
Longear Sunfish	Potomac River	146	Hg	5
Oyster	St. George's Creek	0	Hg	25
Pumpkinseed Sunfish	Anacostia River	43	MHg	4
Redhorse Sucker	Potomac River	105	Hg	5
Rock Bass	Savage River Reservoir	845	Hg	5
Silverside	Loch Raven Reservoir	24	MHg	1
Smallmouth Bass	North Branch Potomac	951	Hg	1
Softshell Clam	Chesapeake Bay	6	Hg	1
Spot	Chesapeake Bay	6	MHg	5
Striped Bass	Potomac River	429	Hg	1
Walleye	Savage River Reservoir	1,677	Hg	5
Weakfish	Chesapeake Bay	1M	Hg	1
White Crappie	Potomac River	146	MHg	1
White Perch	Liberty Reservoir	217	MHg	5
White Sucker	Savage River Reservoir	531	Hg	1
Yellow Bullhead Catfish	Jennings Randolph Lake	129	Hg	1
Yellow Perch	Gunpowder River	64	Hg	5

Appendix III. Highest Tested Mercury Concentrations by Waterbody

Some tests measured mercury (Hg) and others measured methylmercury (MHg). The risk levels are treated the same.[54]

Waterbody	Fish name	Mercury (ppb)	Type	Total Number of Fish Sampled (all species)
Anacostia River	Pumpkinseed Sunfish	43	MHg	23
Back River	White Perch	32	Hg	16
Big Pool	Largemouth Bass	348	MHg	5
Blair Valley Lake	Largemouth Bass	235	MHg	15
Broadford Lake	Largemouth Bass	616	MHg	14
Bush River	Largemouth Bass	592	MHg	28
Bynum Run Community Lake	Channel Catfish	13	Hg	4
Cash Lake	White Perch	30	Hg	15
Centennial Lake	Largemouth Bass	185	MHg	7
Chesapeake Bay	Largemouth Bass	399	MHg	364
Chester River	Striped Bass	321	Hg	4
Choptank River	White Perch	69	Hg	43
Clopper Lake	Largemouth Bass	385	MHg	36
Colgate Creek	Channel Catfish	22	Hg	6
Conowingo Reservoir	Largemouth Bass	216	MHg	32
Cunningham Falls Lake	White Perch	104	Hg	25
Deep Creek Lake	Largemouth Bass	530	MHg	48
Fairlee Creek	White Perch	37	MHg	12
Frostburg Reservoir	Largemouth Bass	968	MHg	53
Gilbert Run Lake	Largemouth Bass	26	MHg	29
Greenbelt Lake	Largemouth Bass	120	MHg	10
Gunpowder River	Yellow Perch	64	Hg	40
Jennings Randolph Lake	Channel Catfish	677	Hg	23
Johnson's Pond	Largemouth Bass	500	MHg	19
Lake Elkhorn	Largemouth Bass	63	MHg	33
Lake Frank	Largemouth Bass	72	MHg	19
Lake Habeeb	Largemouth Bass	198	MHg	13
Lake Kittamaquandi	Largemouth Bass	51	MHg	34
Lake Lariat	Largemouth Bass	2,077	MHg	12
Lake Linganore	Largemouth Bass	229	MHg	29
Lake Roland	Carp	26	Hg	10

Waterbody	Fish name	Mercury (ppb)	Type	Total Number of Fish Sampled (all species)
Leonard Mill Pond	Largemouth Bass	286	MHg	27
Liberty Reservoir	Largemouth Bass	709	MHg	38
Loch Raven Reservoir	Largemouth Bass	824	MHg	22
Magothy River	White Perch	20	Hg	12
Middle River	American Eel	26	MHg	27
Millington Wildlife Management Area (Pond 1)	Largemouth Bass	462	MHg	15
Monocacy River	Bluegill	114	Hg	15
Myrtle Grove Lake	Largemouth Bass	64	MHg	9
Nanticoke River	White Perch	54	Hg	19
North Branch Potomac	Smallmouth Bass	951	Hg	31
Northeast River	White Perch	25	MHg	26
Patapsco River	White Perch	66	Hg	55
Patuxent River	White Perch	52	Hg	20
Pokomoke River	Channel Catfish	207	Hg	16
Potomac River	Smallmouth Bass	656	MHg	166
Prettyboy Reservoir	Largemouth Bass	722	MHg	23
Rhode+West Rivers	White Perch	37	Hg	8
Rocky Gap	Largemouth Bass	198	MHg	17
Rocky Gorge Reservoir	Largemouth Bass	868	MHg	14
Sassafras River	White Perch	38	Hg	18
Savage River Reservoir	Walleye	1,677	Hg	31
Schumaker Pond	Bluegill	108	MHg	23
Severn River	White Perch	44	MHg	29
Smithville Lake	Largemouth Bass	134	MHg	34
South River	White Perch	23	Hg	15
St. George's Creek	Oyster	0	Hg	25
St. Mary's Lake	Largemouth Bass	1,514	MHg	11
Susquehanna River	Channel Catfish	64	Hg	18
Tred Avon River	White Perch	52	MHg	10
Triadelphia Reservoir	Largemouth Bass	426	MHg	20
Tuckahoe State Park Dam	Largemouth Bass	724	MHg	20
Unicorn Lake	Largemouth Bass	192	MHg	15
Upper Bear Creek	Blue Crab	20	Hg	10
Upper Curtis Creek	White Perch	15	Hg	16
Urieville Community Lake	Largemouth Bass	63	MHg	19
Wye Mills Community Lake	Largemouth Bass	139	MHg	30
Youghiogheny River Lake	Walleye	422	MHg	14

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