NATIONAL WILDLIFE FEDERATION

Poisoning Wildlife: The Reality of Mercury Pollution

September 2006

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For more information about NWF or to view this report online, visit www.nwf.org/mercury.

Foreword

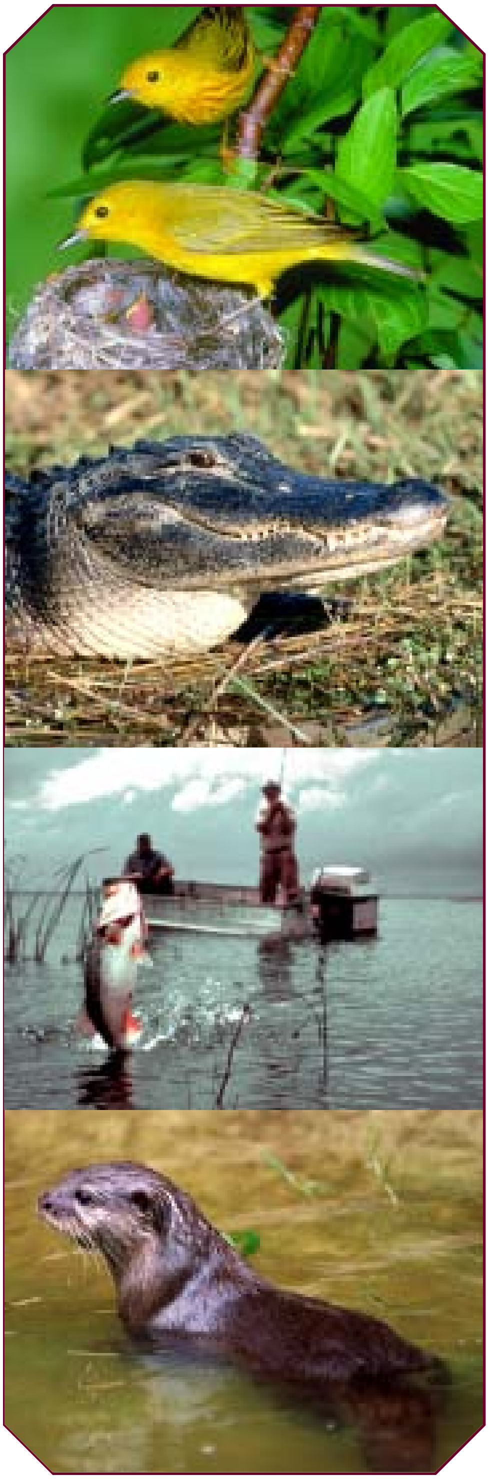
Stories about wildlife being affected by mercury contamination have been crossing my desk for several years now. And with each new story, it appears that a new species is being featured. First was the story of the loon, whose magical call is recognized by millions of us who live and vacation in the beautiful northern lakes stretching from Montana to Maine. Then we heard about a Florida panther that died with very high levels of mercury; the eagles found in Montana and Indiana with equally high levels; and songbirds in the Northeast that are being exposed to mercury through eating contaminated insects.

A story began to emerge from all the new science. Wildlife are at the front lines of the mercury contamination problem here in the United States and globally. From marine fish and aquatic birds to mammals and amphibians, these species are sending us an alarming message. Our dependence on coal, the use of consumer products that contain mercury, the dumping of mercury-laden waste from chlorine manufacturing and mining operations, have all left a legacy that is being documented in wildlife nationwide.

We hope this report will inspire the public, decision makers, and elected leaders to take swift and concrete action to eliminate mercury's threat from all sources. At a time when wildlife are already stressed from habitat change due to global warming, we have a collective responsibility to leave a better legacy for our children's future, and for wildlife.

Larry Schweiger
President and CEO
National Wildlife Federation

BACKGROUND AND LOWER RIGHT, FRONT COVER, ART EXPLOSION; FRONT COVER LEFT, TOP TO BOTTOM, USFWS, COREL, PHOTODISK, PHOTODISK, EYEWIRE; RIGHT TOP, PHOTODISK



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I. Executive Summary

Over the last decade, Americans have grown more aware of the toxic threat that mercury poses to people. The government now warns pregnant women and children to limit their intake of mercury-contaminated fish, and the news is peppered with stories about schools and other buildings that must be evacuated for days when an accidental mercury spill occurs. The human story of mercury pollution is truly devastating because of the many health impacts that result from harmful levels of mercury exposure—ranging from developmental and other neurological problems in children to cardiovascular impacts on adults.

In contrast, the impacts of mercury on wildlife have received relatively little attention in the media, yet the story is no less compelling. Animals do not have the luxury of choosing a food source that has lower mercury levels and are not aware of the danger lurking in their mercury-contaminated habitats. As a result, wildlife species are accumulating mercury at levels high enough to threaten their health. This is another devastating consequence of years of irresponsible mercury use and pollution.

While mercury is a naturally occurring element, human activities are responsible for the high levels of contamination that endanger wildlife in this country. Each year, we release over 100 tons of mercury pollution into the air that ends up in the lakes, rivers, and forests that wildlife depend on. Mercury is released from coal-fired power plants, waste incinerators, cement plants, wastewater treatment plants, and other sources.

Historically, scientists have believed that mercury only threatens species that live and feed in aquatic habitats. However, recent research is showing that mercury is accumulating at dangerous levels in terrestrial species as well. No longer is the threat of mercury exposure limited to fish-eating wildlife such as loons. Scientists are now finding that mercury is building up in insect-eating species such as forest songbirds. This new research has turned the conventional thinking about mercury contamination on its head—and the implications are a great cause of concern for wildlife biologists. As we begin to recognize that there is truly no link in the food chain untouched by mercury, we realize that mercury pollution is a far greater threat to our treasured biodiversity than previously thought.

This report provides a snapshot of the wide range of wildlife species and habitats known to accumulate mercury, and an overview of the health impacts scientists have associated with those high mercury levels. Species highlighted include fish, aquatic birds, forest birds, mammals, reptiles, amphibians, invertebrates, and marine life.

There are varying health impacts associated with high mercury levels in these different species, but the primary consequence is increased vulnerability due to reproductive and neurological problems (which can lead to behavorial abnormalities). In addition, some evidence indicates that elevated mercury levels can adversely affect immune systems. For example, fish have difficulty schooling and decreased spawning success; birds lay fewer eggs and have trouble caring for their chicks; and mammals have impaired motor skills that affect their ability to hunt and find food. All these effects combine to create a severe threat to wildlife survival.

This report seeks to illuminate the scale of the mercury contamination problem for wildlife, presenting a compelling case for action to reduce mercury pollution. Wildlife need to be as resilient as they can be in order to handle the challenges of surviving in a world that is dramatically changing because of global warming. Reducing mercury pollution is critical for bolstering wildlife's chances of survival in the face of climate change, and it is time for our leaders to take meaningful action to eliminate this toxic threat.

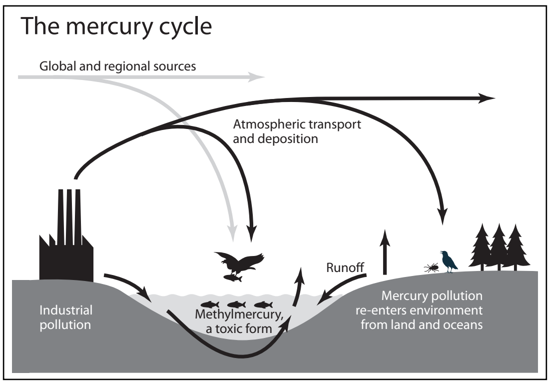
II. Background

What is mercury and why is it a problem?

Mercury is a toxic heavy metal that affects the function and development of the central nervous system in wildlife, resulting in a broad range of adverse health impacts such as reproductive and behavioral problems. Mercury can be found at high levels in the habitats and food sources of many wildlife species across the country, posing a severe threat to America's treasured biodiversity.

How does mercury get into the environment?

While mercury can be found naturally in the environment, human activities are largely responsible for the high levels that contaminate lakes, rivers, and coastal waters across the country. Mercury is mined from the Earth's crust for use in industrial processes as well as consumer products, and it is contained in coal and oil that is burned for energy. Most of the mercury pollution in this country results from industrial smokestacks that release mercury into the air, such as coal-fired power plants, waste incinerators that burn consumer and medical products containing mercury, and manufacturing plants that produce cement and chemicals. Each year, more than 112 tons of mercury are reportedly released from these sources in the United States. Coal-fired power plants are by far the largest contributor to the mercury problem, accounting for over 40 percent of total U.S. mercury emissions.



ART BY SAN FRANCISCO CHRONICLE, SOURCE NWF

When mercury pollution is released into the air, it ends up falling to the earth locally or downwind to neighboring regions. Mercury can then be converted by bacteria into a highly toxic form—methylmercury—which is more readily taken up by insects, fish, and other wildlife. Methylmercury builds up in the bodies of living things, and over time can reach dangerously high levels. Larger predatory species are most at risk, since mercury accumulates at ever-increasing concentrations with each step up the food chain.

What is the extent of mercury contamination?

The accumulation of mercury in fish has been well-known for years, leading 46 states in the United States to issue consumption advisories warning people to limit or avoid eating certain species of fish because of dangerous levels of mercury. At least 20 states have statewide warnings in place, indicating that none of those states' lakes or rivers are free of harmful levels of mercury contamination. Just last year, the state of Utah issued the first-ever consumption advisory for two duck species, the Northern Shoveler and the Common Goldeneye, because of high levels of mercury found in their bodies. Additionally, the state of Florida has issued a mercury consumption advisory for alligator meat.

Because the levels of mercury in fish have been so well-documented, scientific research into this problem has initially focused on species that eat fish such as loons, eagles, and egrets. As expected, wildlife species that consume large amounts of fish, especially those that eat predatory fish, have been found to accumulate high levels of mercury in their bodies. Scientists have in some cases linked severe adverse health impacts to these high levels of mercury, as described in Section III of this report.

More recently, thanks to the hard work of many scientists across the country, we have broadened our understanding of how pervasive mercury really is in the environment. The conventional thinking was that because mercury can easily be converted to methylmercury (the toxic form that accumulates in living things) in water, only species that live or feed in aquatic habitats were at risk of exposure. However, as the research began to indicate that mercury is also converted to methylmercury in terrestrial habitats and that the insect foodweb poses potential problems, scientists began looking at mercury levels in species that live in these areas. A recent example on a river stretch in Massachusetts demonstrated that wetland birds, such as the Red-winged Blackbird, have average mercury burdens that are five times higher than associated fish-eating birds such as the Belted Kingfisher.[1] Research is also showing high mercury levels in songbirds such as the Bicknell's Thrush—indicating that our forest habitats are accumulating harmful levels of mercury as well.

The results of these studies continue to come in, leading to the realization that the extent and effects of mercury contamination across the landscape are far more severe than scientists previously thought. This growing body of evidence demonstrates how broad and insidious a threat mercury is, one that is likely affecting a wide range of wildlife species.

III. Mercury & Wildlife: State of the Science

The following section highlights what we know about the many wildlife species and habitats that accumulate mercury, and provides an overview of the harmful health impacts linked with elevated levels of mercury. It is important to recognize that each species featured here has characteristics that are representative of countless others, indicating that many of our treasured wildlife species are potentially being subjected to harmful levels of mercury exposure. There is a range of wildlife health effects associated with high mercury levels, but the primary consequence is increased vulnerability due to reproductive and neurological problems (which can lead to behavioral abnormalities), as well as the potential for weakened immune systems.

1. Fish: Freshwater

Mercury accumulation in fish in freshwater lakes, rivers, and streams is well-documented. This is largely due to concerns about human health implications from consuming these fish, given that many of the most popular species for anglers are among those with the highest levels of mercury. However, the evidence is mounting that mercury levels in fish can affect their ability to reproduce, as well as survive. Not only does mercury contamination pose a threat to those who seek to catch and eat these fish—whether that's you or a great blue heron–but mercury also endangers the health of the fish populations themselves.

DOCUMENTED IMPACTS OF ELEVATED MERCURY LEVELS IN FISH

- **lower reproductive success:** *decreased spawning and increased embryo mortality*[2]
- **increased vulnerability:** *adverse effects on development and difficulty schooling*[3]
- **death:** *inability to survive extremely high levels of mercury*[4]

SPECIES SPOTLIGHT: LARGEMOUTH BASS

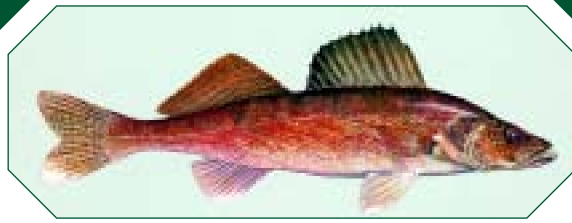
Largemouth Bass are a highly popular fish for recreational anglers, but they also serve as an important food source for many species of wildlife. Because of the public health concerns over high levels of mercury in bass, many studies have been conducted across the country to document how much mercury is accumulating in these fish. As a result, most states in the country have issued an advisory warning people, particularly pregnant women and children, to limit their consumption of these fish. Sadly, these warnings do nothing to protect the wildlife such as loons, otters, or eagles that prey on bass. And, studies have shown that bass with elevated mercury levels have altered hormone profiles, indicating that the mercury is also affecting the health of the fish themselves.[5]

USFWS

SPECIES: Brook Trout

U.S. RANGE: Northern U.S.

Studies in the northeastern US have found mercury accumulation at levels of concern in some Brook Trout. Studies with this species have shown that headwater streams can have surprisingly high mercury levels, particularly if they are within watersheds where logging occurred along riparian areas.[6]



SPECIES: Walleye

U.S. RANGE: Northern U.S.

Of all freshwater fish species studied, Walleye on average have some of the highest mercury levels documented. Studies in the Great Lakes have found that the walleye has a high energetic rate and consumes more fish and therefore more mercury compared to other predatory fish species. Elevated mercury levels in walleye have been shown to reduce juvenile growth rates.[7]

SPECIES: Northern Pike

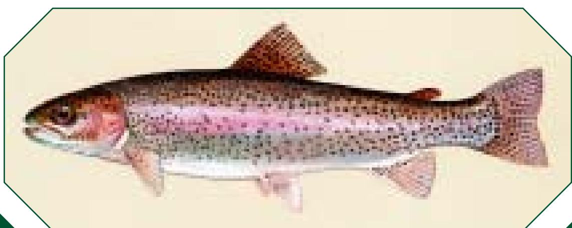
U.S. RANGE: Northern U.S.

This highly prized sportfish has been tested in many states and also has some of the highest mercury body burdens of any freshwater fish—particularly in areas where extensive logging has disrupted the natural mercury cycle.[8]

SPECIES: Rainbow Trout

U.S. RANGE: Throughout U.S.

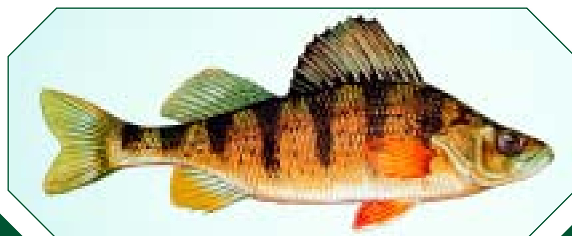
Scientists have connected elevated mercury levels in Rainbow Trout and other salmonids with depressed olfactory senses, potentially affecting their feeding, navigation, and breeding abilities. Many states have fish advisories in place for this popular species because of elevated mercury levels, and Maine warns pregnant women and children to avoid eating it all together.[9]



SPECIES: Yellow Perch

U.S. RANGE: Eastern U.S.

Scientists have found high levels of mercury in Yellow Perch in New England and the Great Lakes. This is cause for concern given the importance of these fish as prey for many fish and wildlife species.[10]



ALL IMAGES USFWS

2. Birds: Aquatic Habitats

Birds that feed and nest in lakes, rivers, streams, wetlands, and estuaries all across the country have been found to possess high mercury levels. Birds that feed on fish, as well as those that consume other aquatic prey, all accumulate mercury. Most of the research into how mercury levels affect wildlife health has been done on these birds, and the news is not good.

SPECIES: Bald Eagle

U.S. RANGE: Throughout U.S.

Scientists studying eaglets in New England have recently found a strong relationship between higher blood mercury levels and lower fledging success. Additionally, state biologists in Montana are concerned about a dozen eagles that have been found with elevated mercury levels and are launching a broader study of contamination levels in these treasured birds.[15]

SPECIES: Great Egret

U.S. RANGE: Southeastern U.S., Mississippi Valley

Declines of wild populations of Great Egrets in Florida have been linked with elevated mercury levels and a recent rebound in breeding success matches drastic cuts in local mercury emissions.[16]

DOCUMENTED IMPACTS OF ELEVATED MERCURY LEVELS IN BIRDS

- **lower reproductive success:** *fewer, smaller eggs; lower hatch rates; altered chick behavior and lower survival rates; and decreased nest attendance*[11]
- **behavioral abnormalities:** *less likely to hunt or seek shade; less time flying and pecking; increased preening; and exaggerated response to fright*[12]
- **neurological/physiological problems:** *tremors; difficulty flying, walking, and standing; reduced feeding and weight loss; wing and leg weakness; spinal cord degeneration; disrupted hormone levels; and feather asymmetry*[13]
- **death:** *inability to survive extremely high levels of mercury*[14]

SPECIES: Red-winged Blackbird

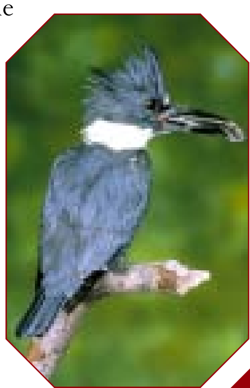
U.S. RANGE: Throughout U.S.

A recent study in Massachusetts found mercury levels in insect-eating blackbirds averaging 5 times higher than associated fish-eating birds.[17]

SPECIES: Belted Kingfisher

U.S. RANGE: Throughout U.S.

This common bird is one of the few species that occurs in a wide variety of aquatic habitats, from oceans to lakes to rivers, and therefore has been identified as an important indicator species for comparing mercury levels across ecosystems. Scientists have found the highest mercury levels in Belted Kingfishers in Maine lakes.[18]



CLOCKWISE FROM TOP LEFT, CORBIS; EYEWIRE/GETTY IMAGES; COREL; CORBIS

SPECIES: White Ibis

U.S. RANGE: Southeastern U.S.

Scientists have linked high mercury levels with the decline in Florida's wild White Ibis populations and are now actively studying such impacts.[19]

SPECIES: Common Tern

U.S. RANGE: Throughout U.S.

This small, fish-eating bird is a common sight on the US ocean coastlines and in the Great Lakes. Its wide range and the ease of sampling individuals make it a useful indicator species, and mercury levels of concern have been found in birds tested in New Jersey.[20]

SPECIES: Wood Stork

U.S. RANGE: Southeastern U.S.

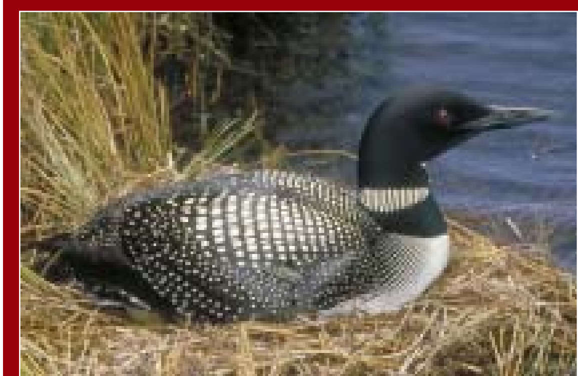
Scientists have documented elevated mercury levels in this large wading bird in Georgia. Wood storks are federally endangered, and threats such as mercury exposure are of particular concern given the potential impact on breeding success.[21]

SPECIES: Northern Shoveler

U.S. RANGE: Throughout U.S. (winter)

This species and other ducks found on Utah's Great Salt Lake were recently discovered to have far more elevated mercury body burdens than expected for non fish-eating birds. Because the shoveler is prized by waterfowl hunters for sport and food, there are also human health concerns about the high mercury levels found in this species.[22]

SPECIES SPOTLIGHT: COMMON LOON



The Common Loon is found in the lakes and reservoirs of the northern U.S., where its haunting call, striking plumage, and charismatic behavior make it one of the most treasured species of the north country. Sadly, loons tested in New England, New York, and the Great Lakes have often been found to have very high mercury levels. Scientists have tested loon feathers, eggs, and blood, and all tell the same story: these birds regularly carry a very heavy load of mercury in their bodies. They are long-living aquatic birds that feed primarily on fish, and are therefore exposed to mercury throughout their lifetime. Since 1989, scientists have looked into the impacts of these high mercury levels on individually-marked loons, and the research clearly suggests that mercury exposure is threatening the health of individual loons, and more importantly, loon populations in areas such as western and northern Maine.[23]

CLOCKWISE FROM TOP LEFT, USFWS; USGS; PHOTODISC/GETTY IMAGES; COREL; USFWS

3. Birds: Forest Habitats

Recently, scientists have discovered that birds living in our forests are also accumulating mercury, presenting a whole new twist on our understanding of mercury's pathways through the environment. Mercury is converted to methylmercury in forest soils, where it is then taken up by insects and other invertebrates such as spiders. Birds that feed along this food chain thus begin to build up mercury in their bodies.

The birds pictured here are among those that have been found with comparatively elevated mercury levels. Scientists are just beginning to understand that the threat of mercury contamination extends to insect-eating species, including those feeding strictly in terrestrial habitats.

While there is little scientific research available about the levels and impacts of mercury on these songbirds, the levels scientists are beginning to document are comparable to levels that have been found to adversely affect reproduction in laboratory studies with species such as the Tree Swallow and Common Grackle. [24]

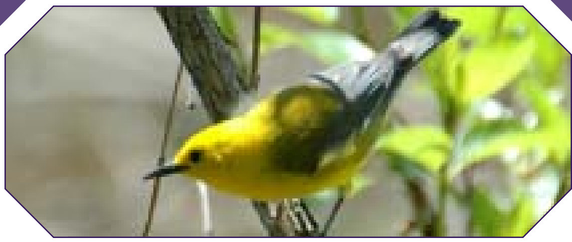
SPECIES SPOTLIGHT: WOOD THRUSH

The Wood Thrush lives in the interior forests of the eastern U.S., with a beautiful song and recognizable speckled breast. While common across the woodlands of the east, the Wood Thrush is a species of high conservation concern because of population declines across its range. For example, in New York, recently completed bird breeding surveys show a 45 percent decline in the breeding population from 20 years ago and document the near disappearance of breeding Wood Thrushes from the Adirondack Mountains.

Scientists have recently discovered unexpectedly high levels of mercury in Wood Thrushes tested in New York and Pennsylvania, and are beginning to wonder if the combined impact of mercury exposure and acid rain (which acidifies soils to a point where critical nutrients such as calcium are made less available for such needs as eggshell production) might be contributing to the decline of these birds.

Wood thrush feed primarily on invertebrates such as beetles, flies, millipedes, earthworms, and spiders, in the moist soil and fallen leaves of the forest. Scientists now recognize that toxic mercury accumulates on the forest floor and is taken up by these types of creatures, leading to a broader understanding of threats of mercury exposure for forest-dwelling species.[25]

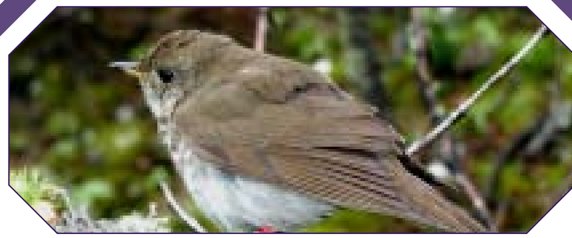
USFWS



SPECIES: Prothonotary Warbler

U.S. RANGE: Eastern U.S.

Research from Alabama has found high levels of mercury in this warbler. Because of its ability to use nest boxes, it is becoming an increasingly important species for studying mercury in southern floodplain forests.[26]



SPECIES: Bicknell's Thrush

U.S. RANGE: Northern U.S.

Scientists have found higher mercury levels than expected in the Bicknell's Thrush in the high elevation forests of New England and New York, as well as on their wintering grounds in the Caribbean. The surprising finding is that this species is generally not associated with feeding along aquatic systems.[27]

SPECIES: Red-eyed Vireo

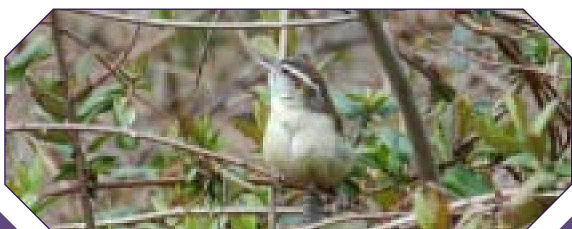
U.S. RANGE: Throughout U.S.

Considered one of the most common songbirds in deciduous forests of the eastern US, the Red-eyed Vireo also generally has the highest mercury levels of songbirds in upland areas of New York.[28]

SPECIES: Carolina Wren

U.S. RANGE: Southeastern U.S.

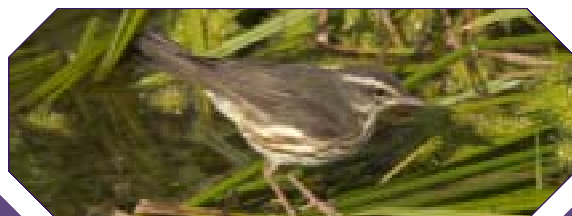
Although a common backyard bird, Carolina Wren populations living in certain watersheds may be at greater risk to mercury contamination than those in upland areas, and high mercury levels were found in Virginia.[29]



SPECIES: Louisiana Waterthrush

U.S. RANGE: Eastern U.S.

This songbird regularly feeds along riversides, and scientists in Virginia have discovered mercury levels of significant concern in this species. Since the early 1980s, the Louisiana Waterthrush has experienced a significant population decline across much of New York that cannot be explained by habitat loss alone.[30]



CLOCKWISE FROM TOP LEFT, KEVIN MACK; T.B. RYDER/VINS; USFWS; KEVIN MACK

4. Mammals

Mercury is also accumulating in a variety of carnivorous mammals, as might be expected given their place near the top of the food chain. From otters to raccoons to larger predators such as the Florida panther, mercury has been documented at levels capable of affecting the health of some of our most treasured wildlife species. Similar to the situation with bird species, most research to date has been done on mammals that feed on fish.

However, in recent years scientists have begun to look more closely at mammals that do not eat fish, such as bats, and elevated mercury levels have also been discovered. These findings contribute to a better understanding of the pathways of mercury contamination in the environment, and beg the question: How many other mammal species are accumulating harmful levels of mercury?

DOCUMENTED IMPACTS OF ELEVATED MERCURY LEVELS IN MAMMALS

- **physiological/reproductive problems:** *impaired sensory and motor skills; weight loss*[31]
- **death:** *inability to survive extremely high levels of mercury*[32]

SPECIES SPOTLIGHT: RIVER OTTER

The River Otter is an endearing mammal that inhabits rivers and streams across the U.S. They are playful, energetic creatures that feed primarily on fish, but also catch crayfish and other aquatic prey. As a result, otters consume a steady diet of mercury-laden food throughout their lives. Mercury levels in otters have been studied in New England, New York, Georgia and Ontario, and very high mercury levels have been found. In many cases, mercury levels were found above the threshold believed to result in harmful effects on the health of the otters.[33]

USFWS

SPECIES: Mink

U.S. RANGE: Throughout U.S.

Mercury research on mink from New England, Georgia, Florida, and Ontario all tell the same story – these mammals have high mercury levels, in many cases well above the threshold believed to result in adverse health effects.[34]

SPECIES: Raccoon

U.S. RANGE: Throughout U.S.

Raccoons tested in Florida and Georgia were found with high mercury levels.[35]

SPECIES: Florida Panther

U.S. RANGE: Florida

A Florida panther was found dead with acute mercury toxicity in Florida. Compared to other land mammals, this highly endangered species feeds at a very high level of the food chain and continues to be at risk of mercury exposure.[36]

SPECIES: Indiana Bat

U.S. RANGE: Eastern U.S.

Recent research has found extremely high levels of mercury in Indiana Bats and several other bat species in Virginia.[37]

INDIANA BAT - MERLIN D. TUTTLE, BAT CONSERVATION INTERNATIONAL, INC.; FLORIDA PANTHER - SOUTH FLORIDA WATER MANAGEMENT DISTRICT

5. Reptiles/Amphibians/Invertebrates

Scientists have found mercury accumulation in reptiles, amphibians, and invertebrates–a range of species that live in a variety of habitats. While little research is available about the impacts of mercury on species such as frogs, salamanders, and crayfish, concentrations have been found at high enough levels to spark concern because of their importance as prey for a multitude of other species.

SPECIES: Crayfish

U.S. RANGE: Throughout U.S.

Crayfish are a key food source for many fish and wildlife, and research from New England's rivers and streams shows that their mercury levels are in part responsible for high mercury body burdens in the bass, raccoons, and loons that eat them.[38]

SPECIES: American Alligator

U.S. RANGE: Southeastern U.S., Gulf Coast

Research from the Southeastern U.S. has found high mercury levels in this large predator and indicates the need for further investigations into other large predatory reptiles.[39]

SPECIES SPOTLIGHT: BULLFROG

Scientists have recently started to test mercury levels in frogs, and the first round of results is cause for concern. Researchers in Maine's Acadia National Park have found elevated levels of mercury in bullfrogs and other frog species, a discovery that is leading scientists to wonder if mercury could be a contributing factor in some amphibian population declines that have been documented across the country.

Mercury-contaminated habitats are yet another potential stressor on our frog populations, a situation that does not bode well for these amphibians or for the many species that rely on frogs as a food source, such as bass, herons, and mink.[40]

CLOCKWISE FROM TOP LEFT, USFWS; CORBIS, PHOTODISK

SPECIES: Two-lined Salamander

U.S. RANGE: Appalachian mountains

Research from the Appalachian Mountains of New England south to Virginia has documented higher than expected mercury levels in the Two-lined Salamander. The Appalachian Mountains have a large number of endemic salamander species that should now be investigated for their mercury content to better understand potential impacts.[41]

SPECIES: Snapping Turtle

U.S. RANGE: Throughout U.S.

This species is common across much of the country and is used as a local food source by some people. Muscle mercury levels can regularly exceed the U.S. EPA risk threshold for human consumption.[42]

Spotlight on the Research: Dr. David Evers

"Scientific understanding of the extent of mercury contamination in wildlife has expanded significantly in recent years. Mercury levels in fish are just the tip of the iceberg, and the more places we look for mercury, the more places we find it. We are finding mercury accumulation in far more species, and at much higher levels, than we previously thought was occurring. This poses a very real threat to the health of many wildlife populations, some of which are highly endangered."

Dr. David Evers, BioDiversity Research Institute

A wildlife biologist and toxicologist, Dr. Evers is one of the leading scientists studying mercury levels and impacts on wildlife. His research into the extent and effects of mercury levels in fish and wildlife around the world has greatly advanced our understanding of this toxic threat.

Visit BioDiversity Research Institute at:
www.briloon.org

CLOCKWISE FROM TOP LEFT, GENE OTT, SOUTH CAROLINA REPTILES AND AMPHIBIANS; FORESTYIMAGES; DR. EVERS - BIODIVERSITY RESEARCH INSTITUTE

6. Marine Life

So far this report has focused on freshwater and terrestrial habitats, but what about our oceans? We know that many marine fish (such as shark and swordfish) are unsafe for children and women of childbearing age to eat, and that many other species (such as tuna) are only safe for consumption in limited quantities. However, in addition to finding high mercury levels in these large fish, researchers have documented mercury accumulation in other marine life as well. Scientists have found elevated mercury levels in all the species shown here. While there has been very limited research into how mercury might affect these particular species, we may find some clues in what we know about mercury's impacts on terrestrial mammals and freshwater fish.

SPECIES: Tiger Shark

U.S. RANGE: All coasts

Research in the U.S. and elsewhere consistently shows that sharks, particularly predatory ones like the Tiger Shark, have highly elevated mercury levels in their bodies. Additionally, the U.S. Food and Drug Administration has consistently found levels of mercury in shark meat high enough to issue a blanket advisory warning pregnant women and children against eating it.[43]

SPECIES: Sperm Whale

U.S. RANGE: Worldwide

Recent studies of dead Sperm Whales have revealed relatively high levels of mercury in these and other toothed whales. This discovery is leading scientists to look more closely at mercury levels in Sperm Whales as an indicator of mercury accumulation in marine ecosystems.[44]

SPECIES SPOTLIGHT:
POLAR BEAR

Polar Bears are the world's largest land predators and the largest of the eight bear species. It is the only bear that eats mostly meat—primarily seals, but also walrus, fish, and birds. Given that their food sources are known to accumulate mercury, it is not surprising that Polar Bears have been found with high mercury levels. In eastern Greenland, scientists have compared mercury levels in polar bear fur to pelts collected over a hundred years ago, and found that mercury levels are over 11 times higher today. Polar Bears are already under intense pressure due to the impact of global warming on their Arctic habitat, and elevated mercury levels further compound the challenge of survival for these bears.[45]

TIGER SHARK - NEIL HAMMERSCHLAG/WWW.NEIL4SHARKS.ORG; SPERM WHALE - CHRIS JOHNSON/OCEAN ALLIANCE; POLAR BEAR - DIGITAL VISION

SPECIES: Striped Bass

U.S. RANGE: Atlantic Seaboard

Mercury levels of concern have been found in Striped Bass along the east coast of the U.S., causing several states to issue advisories warning people to limit their consumption of this popular sportfish.[46]

SPECIES: Narwhal

U.S. RANGE: Arctic

This toothed whale, as others, regularly has been found by researchers to have mercury body burdens that exceed levels considered safe for human consumption. Although the skin and muscle tissues have the highest mercury levels, even the blubber of these whales contains mercury.[47]

SPECIES: Loggerhead Sea Turtle

U.S. RANGE: Worldwide

Elevated mercury levels have been found in individual sea turtles along near shore areas of the southeastern US. Scientists have associated this finding with mercury levels in the large rivers that flow into the ocean.[48]

SPECIES: Ringed Seal

U.S. RANGE: Arctic

Many seal species are likely at risk of accumulating mercury. Scientists have increasingly been testing seals for mercury in the Arctic, and levels of concern have been found.[49]

SPECIES: Beluga Whale

U.S. RANGE: Arctic

Scientific studies in northern Canada have found very high mercury levels in Beluga Whales, and the western populations of this species are accumulating mercury at significantly higher levels than eastern populations.[50]

STRIPED BASS - CHRIS GIBSON; SEA TURTLE - CHRIS MOROCCO\NOAA

IV. Solutions: Protecting Wildlife From Toxic Mercury

Meeting the Challenge

Mercury contamination is a serious threat to wildlife that needs to be addressed. The situation becomes increasingly grave when we consider the dire consequences for wildlife resulting from global warming. Wildlife need to be strong and resilient to survive in the changing climate, and eliminating stresses that affect their long term health is crucial.

But what can we do to reduce mercury levels in the environment?

Since mercury builds up in the environment over time, the only way to protect wildlife and ourselves from exposure is to virtually eliminate mercury pollution. Several states have already taken action to reduce mercury from some sources, and the results are very promising. In places where mercury emissions have been cut, mercury levels in fish and wildlife downwind dropped in a matter of years–not decades as scientists previously thought. We can tackle this challenge, but we need our state and federal leaders to address the problem of mercury contamination with the level of urgency it requires.

Fortunately, there are a range of solutions available to prevent releases of mercury into the environment. To effectively reduce mercury levels in our wildlife, we need to take the following actions, all of which are currently being pursued by some state governments today:

- **Encourage clean energy technology**
Our mercury-contaminated landscape is a well-known consequence of our dependence on coal to produce electricity. We need a new vision in this country that promotes cleaner, safer energy technologies that are not environmentally devastating. It is time to start creating and using energy in a way that does not lead to global warming or mercury contamination. Energy efficiency and conservation programs are key parts of the solution, since the "greenest" energy source is one that's not used in the first place.

- **Significantly reduce mercury air emissions**
Affordable, effective technology exists to control mercury emissions from all sources that contaminate the air, including power plants, waste incinerators, and cement plants. Given the current lack of federal leadership in addressing mercury emissions, state governments must take the initiative to require sources within their jurisdiction to clean up mercury pollution. State action is especially critical to address the largest source of mercury air emissions, coal-fired power plants.

- **Phase out mercury-containing products**
Mercury-free alternatives exist to replace the many mercury-containing consumer products on the market today, including thermostats, electronic equipment, and children's toys. Many states have already passed laws to prohibit the sale and use of mercury-containing products within their borders, creating a trend that must continue in order to eliminate this unnecessary source of mercury pollution.

- **Promote safe disposal of mercury waste**
Mercury waste is generated as a result of mercury use in consumer products, industrial processes, and dental facilities, as well as through cleanup of mercury-contaminated locations. Keeping mercury waste out of landfills, incinerators, and wastewater is a sure way to prevent unnecessary releases to the environment. Many states have

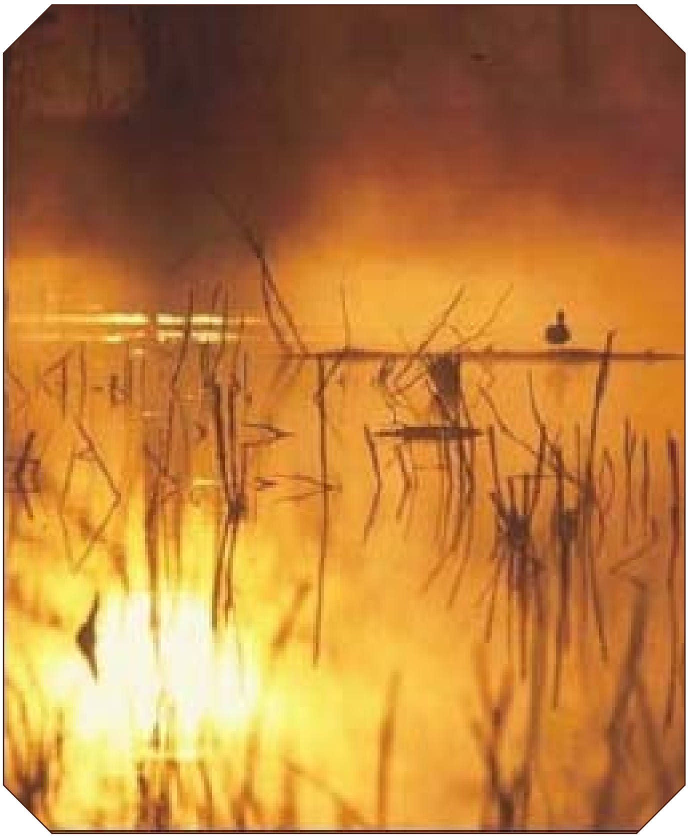
FROM TOP: U.S. BUREAU OF LAND MANAGEMENT; MAINE DEPTARTMENT OF INLAND FISHERIES passed laws to prohibit the disposal of mercury-containing items into the waste stream for this reason. These types of commonsense solutions are essential for preventing mercury pollution. Additionally, there are many mercury-contaminated sites across the country resulting from historic mercury use, including San Francisco Bay, the gold mines of Nevada, and the Superfund sites of Virginia. These poisoned habitats endanger wildlife. We need to prioritize cleanup of these sites and advocate for responsible management of the resulting mercury waste in order to protect wildlife from the dangers of mercury exposure.

You Can Help Protect Wildlife from Toxic Mercury!

We have the tools necessary to prevent mercury pollution in this country, but unfortunately they are not being utilized sufficiently. Let your elected leaders know that you want to see mercury pollution reduced, from all sources, as quickly as possible. It is simply inexcusable for more generations of people and wildlife to suffer from high levels of mercury in the environment.

Visit **www.nwf.org/mercury** and find out how you can help protect yourself and wildlife from mercury.

The national listing of mercury fish consumption advisories can be found at:
www.epa.gov/mercury/advisories.htm.



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