Rough Waters Ahead

The Impact of the Trump Administration's EPA Budget Cuts on the Great Lakes

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A previously published version of this report contained incorrect data in Table ES-2 and Table 1. "Estimated Lost Funding for Water Pollution Control Grants" has been corrected for New York and Pennsylvania, and the total in that column updated.

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Executive Summary

The Great Lakes are critical to the health and welfare of our families, our communities, and wildlife. Lakes Erie, Ontario, Huron, Michigan and Superior make up the largest system of freshwater lakes in the world and supply more than 40 million people with drinking water.[1]

Today, many areas of the Great Lakes are clean enough for fishing and swimming. But, it wasn't always that way. In the mid-20th century, fish were often unsafe to eat and key wildlife populations were declining. It took the dedicated work of local, state and federal governments – along with local residents – to turn the tide and begin the long process of restoring the Great Lakes to health.

The U.S. Environmental Protection Agency has been essential to those efforts – supporting and working with state and local efforts to keep pollution out of our waterways, hold polluters accountable, restore degraded waterways to health, and study and monitor the Great Lakes to ensure their future health and safety.

That progress is now in jeopardy. The Trump administration has proposed deep and devastating cuts to the EPA's budget. Even if the president's proposed cuts are scaled back by Congress, they would still have profound negative impacts on the agency's ability to deter pollution from industrial facilities, agriculture, sewage treatment plants, runoff and other sources, while undercutting efforts to restore iconic waterbodies such as the Great Lakes.

America can't go back to the bad old days. We need a strong EPA with sufficient resources to support local cleanup efforts and partner with states and communities to protect and restore the Great Lakes.

The Great Lakes are being protected and restored to health with funding and effort from the EPA. The EPA has worked to:

- **Restore waterways to health:** Industrial pollution contaminated Waukegan Harbor on Lake Michigan with cancer-causing PCBs, creating what the EPA identified in 1981 as the "highest known concentrations of uncontrolled PCBs in the country" and triggering a recommendation that people avoid eating fish caught in Waukegan Harbor.[2] **The EPA-funded cleanup has removed many tons of polluted sediment from Waukegan Harbor and other pollution hotspots in the Great Lakes.** Today in Waukegan Harbor, after more than 20 years of cleanup, people may now safely consume many of the fish they catch. Cleanup of 27 remaining pollution hotspots across the Great Lakes depends on funding from the EPA.

- **Hold polluters accountable:** When a pipeline owned by Enbridge Energy Partners LLP spilled more than a million gallons of heavy tar sands oil into Michigan's Kalamazoo River, the EPA coordinated the cleanup and then pursued Enbridge for Clean Water Act violations. The company paid $62 million in penalties and agreed to spend $110 million on spill prevention measures and

operational improvements across the Great Lakes region. Funding allows the EPA to continue responding to new oil spills, and enforcing clean water laws more generally.

- **Conduct research and educate the public:** Agricultural runoff is one of the main culprits behind Lake Erie's yearly algal blooms that can make water unsafe for drinking or swimming.[3] The EPA funded researchers working with farmers to demonstrate the effectiveness of cultivation practices that reduced nitrogen and phosphorus pollution, **showing that shifts in agricultural practices can reduce pollution that causes algal blooms in the Great Lakes** while increasing yields for farmers.[4] Continued research into better methods to prevent pollution relies on a well-funded EPA.
- **Protect waterways from new threats:** If Asian carp, an invasive species with no local predators, become established in the Great Lakes, they could decimate underwater grasses, reduce plankton that provide food for native fish, and overwhelm native fish populations.[5] **The EPA is working with other agencies to keep Asian carp out of the Great Lakes, helping to erect barriers and monitor waterways for carp.** Since 2010, the Great Lakes Restoration Initiative, funded through the EPA, has spent $56.6 million to control, monitor and research Asian carp and their potential impacts on the Great Lakes.[6] Continued funding is essential to the EPA's continued success at keeping Asian carp out of the Great Lakes.

The Trump administration's proposed cuts to the EPA budget put these and other critical functions in danger – threatening the future health of the Great Lakes.

- Under the administration's proposal, water-related programs run directly by the EPA would be slashed by 34 percent, hobbling efforts to prevent runoff pollution, monitor water quality,

Table ES-1. How Clean Water in the Great Lakes Depends on the EPA

The Great Lakes Are Cleaner Because the EPA:	The EPA Continues to Protect Clean Water by:
Is working to keep Asian carp from entering the Great Lakes	Monitoring for invasive species
Led cleanup of oil spill in the Kalamazoo river, fined the company that caused the spill and improved company practices	Responding to new spills across the region
Reduced raw sewage pollution by a major Ohio water utility	Overseeing infrastructure upgrades to limit releases of raw sewage
Cleaned up PCB contamination in Waukegan Harbor and made fish safer to eat	Cleaning up 27 other pollution hotspots
Modified a dam and restored the Middle Cuyahoga River	Funding removal of additional dams across the region
Supported research to develop faster water quality testing at beaches	Supporting research into new threats to water quality
Supported research to reduce nutrient pollution from agriculture	Supporting research into new pollution control methods
Slashed mercury pollution, making more fish safe for people to eat	Pursuing reductions in mercury emissions from international sources

establish pollution limits, protect watersheds and wetlands, and pursue polluters.

- In addition, many federal grants from the EPA to state governments for clean water would be slashed by 30 percent or more – making it more difficult for already cash-strapped state agencies to do their jobs and delaying important locally led cleanup efforts.[7] For example, the proposed budget would end grants to state governments and tribal agencies to address pollution from farms, stormwater runoff and other dispersed sources.[8]
- Research and development funding would be cut by 47 percent, limiting support for scientists, residents and local communities trying to understand the ever-changing threats facing their waterways.[9] For instance, the EPA's Safe and Sustainable Water Resources research program, which supports science and technology research to protect drinking water, would be cut by more than a third.
- Funding for the Great Lakes Restoration Initiative, which supports cleanup efforts like that in Waukegan Harbor and extensive other efforts to protect clean water, would be eliminated.
- Overall, the EPA budget would be reduced by 31 percent.[10]

Even if Congress makes some of these budget cuts less drastic, the Great Lakes will still suffer without full funding of EPA programs.

The job of cleaning up and protecting the Great Lakes is not done. Continuing pollution from sewer systems, industrial facilities and runoff – along with the emergence of pollution threats from new classes of industrial and household chemicals – call for continued vigilance and action. A well-funded EPA is critical to continuing progress in cleaning up the Great Lakes and ensuring that they are healthy and safe for us and future generations to enjoy.

Table ES-2. Estimated EPA Grant Funding Losses to Great Lakes States if Trump Administration's Proposed Budget Is Enacted (table shows selected programs)[11]

State	Estimated Lost Funding for Water Pollution Control Grants	Estimated Lost Funding for Nonpoint Pollution Control Grants	Estimated Lost Funding for Drinking Water Protection and Enforcement Grants
Illinois	$1,569,900	$6,397,000	$912,600
Indiana	$859,200	$4,237,000	$584,700
Michigan	$2,637,300	$1,987,970	$1,234,500
Minnesota	$1,379,400	$2,711,850	$743,700
New York	$2,271,300	$5,799,513	$1,320,600
Ohio	$1,541,400	$4,388,897	$793,800
Pennsylvania	$1,795,200	$4,653,006	$1,226,100
Wisconsin	$1,929,600	$4,023,001	$1,041,600
TOTAL	$13,983,300	$34,198,237	$7,857,600

Note: Estimates are calculated assuming EPA budget cuts affect all states by the same percentage. Reductions are based on grants from most recent fiscal year.

The Great Lakes Provide Drinking Water and Recreation Opportunities for Millions of Americans

The Great Lakes supply drinking water to millions of people and also offer extensive swimming, boating and fishing opportunities. But the Great Lakes bear the scars of more than a century of manufacturing, shipping and agriculture, which have left behind contaminated sediment, degraded ecosystems and polluted waters. The EPA has been vital to restoring and protecting the Great Lakes, coordinating with Canada and the eight Great Lakes states to work towards clean water in the Great Lakes for all.

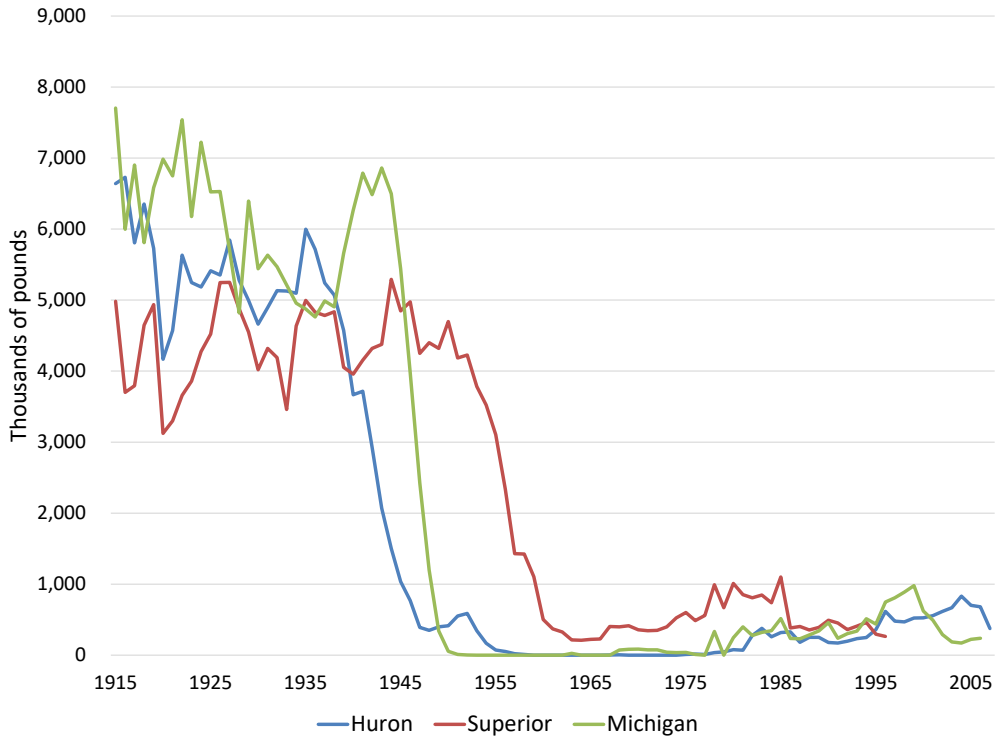
The Great Lakes are the largest system of freshwater lakes in the world, containing one-fifth of the planet's freshwater and nine-tenths of the United States' fresh surface water.[12] The lakes supply more than 40 million people with drinking water in the United States and Canada.[13]

The Great Lakes teem with wildlife, providing a home to 150 of North America's 177 species of fish.[14] More than 1.8 million anglers come to the Great Lakes each year to fish for lake trout, salmon, walleye, steelheads and other game fish.[15] Overall, the Great Lakes attract more than 37 million anglers, hunters and birdwatchers annually.[16]

Photo: Chris Hadfield, NASA

The Great Lakes from the International Space Station on March 15, 2013.

Figure 1. Commercial Harvest of Lake Trout in the Western Great Lakes from 1915 to 2007[18]



Despite the importance of the Great Lakes, misuse and abuse over the centuries has created serious – and, in some cases, lasting – damage.

Photo: Marquette, Michigan Weather Service Forecast Office/CC BY 2.0

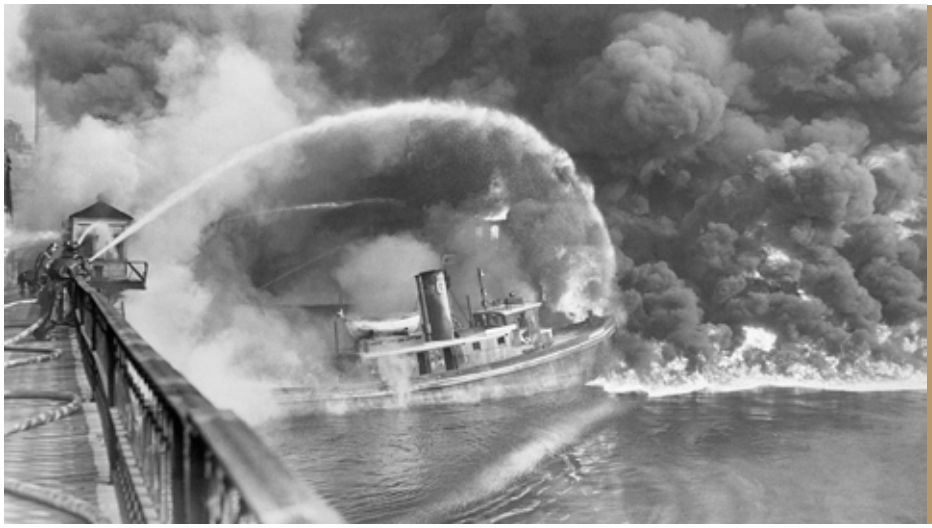
Mosquito Beach at Pictured Rocks National Lakeshore in Lake Superior.

The arrival of non-native species, coupled with overfishing, has threatened native wildlife populations and inflicted widespread changes to the food web.[17] The arrival of the sea lamprey, for example, devastated the lake trout population (see Figure 1) that had helped keep algae levels in check. Harmful algal blooms have persistently threatened water quality and coastal communities in the Great Lakes.

Agricultural, industrial and urban pollution, meanwhile, fouled the Great Lakes. Runoff from farms, and discharges from sewer systems and industry contaminated the lakes with sediment and nutrients. Urbanization caused soil erosion and exacerbated runoff. One result has been the growth of algae that consume oxygen, creating large "dead zones" where fish cannot survive, particularly in Lake Erie.

The dumping of chemicals from industrial facilities also posed hazards to people fishing, swimming or drinking water from the Great Lakes and its

Photo: EPA



A fire-fighting tug catches fire on the Cuyahoga River near downtown Cleveland on June 25, 1952.

tributaries. The Cuyahoga River, which feeds into Lake Erie, famously caught fire at least 13 times between 1868 and 1969, and became a symbol of out-of-control pollution that helped spark the formation of the EPA and adoption of the Clean Water Act in 1972.[19]

The creation of the EPA marked a turning point for the Great Lakes. The U.S. and Canada developed a joint clean-up agreement for the Great Lakes in 1972, the same year the Clean Water Act was passed, and have collaborated to protect and clean up the Great Lakes ever since.[20] In 2008, Congress launched the EPA-led Great Lakes Restoration Initiative with the goal of "leav[ing] the Great Lakes better for the next generation than the condition in which we inherited them."[21] Between 2010 and 2016, the EPA granted $721 million to projects addressing toxic substances, invasive species, agricultural and stormwater runoff, habitat restoration and other challenges in the Great Lakes region.[22]

As the examples provided later in this report show, the presence of a capable, strong and well-funded EPA has made a world of difference for the Great Lakes. But, as residents of the Great Lakes region know, the job of cleaning up the lakes is far from complete.

To continue to restore the Great Lakes – and to ensure that the improvements of the last four decades are not reversed – America needs a strong EPA. Unfortunately, the Trump administration's proposed budget for the agency eliminates or slashes funding for EPA efforts critical for clean water, putting the Great Lakes at risk.

Photo: NOAA Central Library Historical Fisheries Collection

Cleaning dead alewife off Chicago shoreline following great die-off of June 1967.

Trump Administration Budget Cuts Would Hobble the EPA's Work to Protect Our Waterways

The Trump administration's proposed fiscal year 2018 budget, released in May 2017, cuts funding for the Environmental Protection Agency by 31 percent, from $8.2 billion in fiscal year 2017 to $5.7 billion in fiscal year 2018.[23] That would return the agency's budget to 1970s levels, adjusted for inflation, despite the EPA's vastly expanded congressionally mandated responsibilities and the continued severe threats facing our waterways.[24] Congress will likely modify the administration's budget, but even if proposed cuts are scaled back they would still have disastrous impacts on the EPA's ability to protect our waterways.

The Environmental Protection Agency plays a vital role in ensuring that the nation has clean water for drinking and recreation, and for sustaining fish, plants and wildlife. The EPA works directly to ensure the requirements of the Clean Water Act, the Safe Drinking Water Act and other laws protecting water quality are met, and also supports the work of states in implementing and enforcing those laws. The budget cuts proposed by the Trump administration would weaken the EPA's efforts on both fronts.

Cuts Would Affect Human Health and Hamper Scientific Research

Dramatic budget cuts mean that the EPA would be less able to protect clean water and hold polluters accountable across the country. The Trump administration's proposed budget indicates that the EPA would need to reduce its staff by nearly one quarter.[25]

Environmental programs run by the EPA and related to water are slated for a 34 percent reduction.[26] This would make it harder for the EPA to reduce runoff pollution, monitor waterways for contamination, and protect watershed lands and wetlands that are critical to keeping our waterways clean and healthy. The EPA's resources for pursuing polluters and enforcing water quality protections would also be slashed, with a proposed 24 percent budget cut.[27]

Funding for research and development by the EPA is slated for a 47 percent reduction, a larger research and development cut than for any other agency.[28] Budget cuts proposed for the Office of Science and Technology that would harm water quality include:

- A 33 percent budget cut for the Safe and Sustainable Water Resources program, which provides the science and technological research to protect water for drinking and wildlife.[29]
- A 40 percent cut in funding for the Human Health Risk Assessment program, which seeks to understand how environmental contaminants affect human health.
- A 31 percent cut for the Chemical Safety for Sustainability program, which studies the potential health and environmental impacts of manufactured chemicals throughout their lifecycle and seeks to develop faster analytical tools to more quickly identify risks.
- A 61 percent cut to the Sustainable Healthy Communities program's research in support of better cleanup technologies for Superfund sites.
- A 38 percent cut to the Homeland Security Research Program that includes understanding how to decontaminate water supplies in the event of a chemical, biological or radiological attack.[30]
- A 23 percent cut to the Forensics Support program, which documents sources and types of pollution to help EPA's enforcement actions against polluters.

Cuts Would Slow Efforts to Prevent Pollution and Clean up Contamination

The budget cuts would also limit the EPA's support for the work that state and tribal governments do to protect water quality. Many state and tribal assistance grants for clean water are slated to be reduced by 30 percent or more.[31]

Table 1. Estimated EPA Grant Funding Losses to Great Lakes States if Trump Administration's Proposed Budget Is Enacted (table shows selected programs)[35]

State	Estimated Lost Funding for Water Pollution Control Grants	Estimated Lost Funding for Nonpoint Pollution Control Grants	Estimated Lost Funding for Drinking Water Protection and Enforcement Grants
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Ohio	$1,541,400	$4,388,897	$793,800
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Wisconsin	$1,929,600	$4,023,001	$1,041,600
TOTAL	$13,983,300	$34,198,237	$7,857,600

Note: Estimates are calculated assuming EPA budget cuts affect all states by the same percentage. Reductions are based on grants from most recent fiscal year. "Water pollution control grants" are Section 106 grants, slated for a 30 percent cut. "Nonpoint pollution control grants" are Section 319 grants, cut entirely in the administration's proposed budget. "Drinking water protection and enforcement grants" are Public Water System Supervision grants, cut by 30 percent.

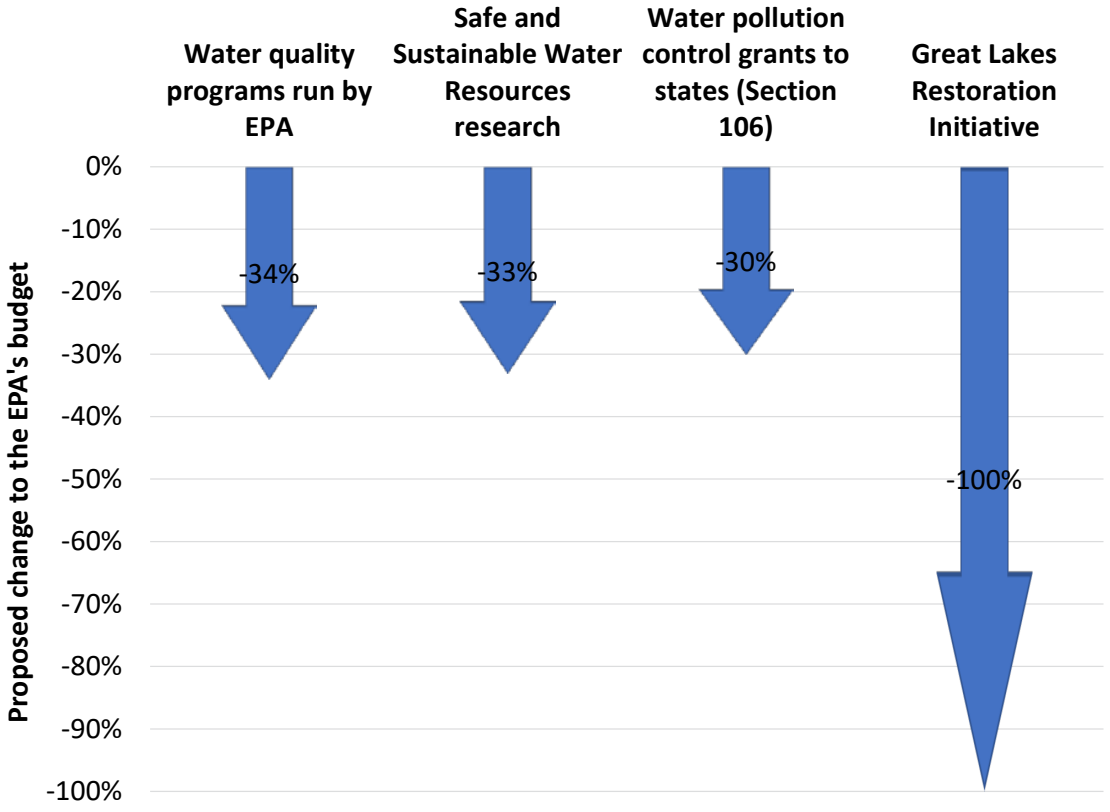
The proposed budget eliminates entire programs that have helped states to protect water quality. The budget would:

- End grants to state governments and tribal agencies to address pollution from farms, storm-water runoff and other dispersed sources.[32]
- End grants that help local governments identify and clean up underground storage tanks that may be leaking oil or other hazardous pollutants into groundwater.[33]
- End regional programs that engage multiple states to address pollution problems in the Great Lakes, the Gulf of Mexico, Chesapeake Bay and other large water bodies.[34]

Other aspects of EPA's budget that affect water quality are also slated for cuts. For example, funding for efforts to clean up hazardous waste sites, which have the potential to pollute water, is in jeopardy. Table 1 shows state-level funding losses for selected programs.

These budget cuts to EPA's national work and its support of state and local action would harm water quality in the Great Lakes.

Figure 2. The Trump Administration's Proposed Budget Slashes Clean Water Funding (selected programs)



Great Lakes Water Quality Is Threatened by the Trump Administration's EPA Budget Cuts

The EPA plays a critical role in protecting clean water in the Great Lakes in partnership with state agencies, local organizations, and Canada. The EPA establishes and enforces limits on pollution, helps support pollution cleanup and restoration of damaged streams and rivers, and pursues research to better understand threats to clean water. The budget cuts proposed by the Trump administration will greatly weaken the EPA's ability to ensure water in the Great Lakes is clean enough for drinking, swimming and fishing.

More Pollution in the Great Lakes

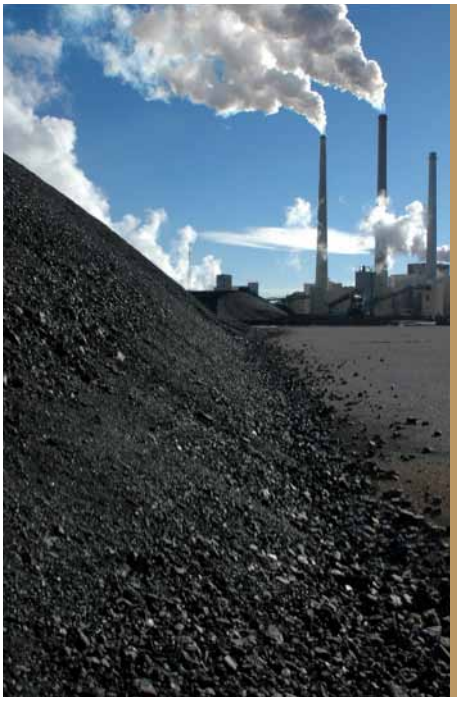
The most important task to protect and restore the Great Lakes is preventing pollution from reaching and contaminating the waterways. Sometimes that means setting limits on what polluters can release to waterways. Other times, it means taking decisive action to eliminate longstanding threats. The EPA plays a critical role in protecting water quality in the Great Lakes. Proposed budget cuts will limit the EPA's ability to protect clean water in the region.

The EPA Is Working to Eliminate Mercury Pollution

In the early 1970s, Canadian researchers discovered mercury in fish from Lake St. Clair at double the concentrations considered safe at the time and four times higher than today's health standards.[36] The discovery led Michigan and Ohio to ban sport and commercial fishing near Detroit and in Lake Erie in order to protect public health.[37]

Mercury emitted from medical waste incinerators, industrial facilities and coal-fired power plants was accumulating up the food chain, posing serious health risks, especially to children and fetuses. Mercury in contaminated fish, such as walleye or salmon, can cause kidney damage, inhibit brain development in small children and fetuses, and harm immune systems and adult heart function.[38]

Photo: Joanna Woerner IAN UMCES



The EPA set standards to regulate toxic air emissions from coal plants.

The EPA led efforts to reduce mercury contamination in the Great Lakes and other waterways. The agency convinced industries using mercury to find substitutes.[39] In 1995, it set mandatory air emissions standards for toxic air pollution that reduced emissions from medical waste incinerators and municipal waste combustors by more than 95 percent. And in 2011, the EPA finalized the first-ever national limits on power plant emissions of mercury and other toxics.[40] This decision limited mercury pollution from more than 140 coal-fired power plants in the Great Lakes states that emitted more than 13,000 pounds of mercury into the atmosphere each year.[41] Finally, a new EPA rule to reduce mercury discharge from dental offices, which commonly use mercury and other metals to fill cavities, went into effect in July 2017.[42]

These efforts have helped to reduce mercury levels in fish, which have dropped substantially since the 1970s. But there is still work to be done.

Fish consumption advisories remain in place for all five lakes, and a recent study has shown a 2 percent per year increase since 2000 in mercury levels in walleye and lake trout in Lake Huron, Lake Erie and Lake Michigan.[43] The rising levels of fish contamination may be caused by invasive species that disturb mercury currently locked in contaminated sediment.[44] Airborne mercury pollution continues to land in the Great Lakes, and much of that pollution comes from remote sources. For example, in Michigan less than 10 percent of airborne mercury pollution now comes from in-state sources.[45] The rest comes from other states and countries.

The EPA's involvement is essential to protecting the public from exposure to mercury. Its work to control invasive species may help limit how much they disturb mercury in sediment, while the EPA's efforts to reduce cross-state and international mercury emissions are critical to limiting additional mercury pollution in the Great Lakes. Through research and international agreements, the EPA is involved in multiple efforts to reduce airborne mercury pollution from other countries that pollutes the Great Lakes.[46] This work cannot easily be assumed by individual states if the EPA's funding and staff are cut.

The EPA Is Working to Keep Asian Carp out of the Great Lakes

Asian carp, an invasive species with no local predators, can eat up to 40 percent of its body weight daily, decimating food sources that native fish depend upon. The carp not only out-compete native species for food but also prey upon endangered native snails and mussels.[47] Since Asian carp escaped from Southern aquaculture ponds in the early 1980s, they have invaded the Mississippi River system and now are threatening to enter the Great Lakes.[48] If Asian carp become established in the Great Lakes, they could decimate underwater grasses, reduce plankton that provide food for native fish, and overwhelm native fish populations.[49]

A recent study found that in Lake Michigan they are likely to congregate in bays and other sheltered areas within a mile of shore, drawn by warmer waters and

Photo: USFWS

Carp leap out of the water in the Illinois Waterway behind a boat.

abundant plankton.[50] The fish could appear first in the lake near Chicago, and then spread out following the edge of the lake. This nearshore area is also where recreational boating is most common. Because some species of carp leap out of the water at the sound of a boat engine, they present a nuisance and potential hazard to boaters.

To keep Asian carp out of Lake Michigan, the EPA and other federal agencies have installed electric barriers, which create an electric field in the water that discourages fish from crossing, in a canal that connects the Mississippi River and its tributaries to the Great Lakes. The barriers were installed beginning in the 2000s in the Chicago Sanitary and Ship Canal near Romeoville, Illinois.[51] But these barriers aren't perfect – since 2010, two carp have been discovered past the barriers – and so the EPA monitors waterways between the barriers and Lake Michigan, and also elsewhere in the Great Lakes region, for the presence of carp. The most recent discovery of a carp upstream from the barriers occurred in June 2017, when a commercial fisherman working for agencies trying to prevent the spread of Asian carp caught an adult Asian carp in one of the regular carp monitoring spots on the Little Calumet River, only 9 miles from Lake Michigan.[52] In response, the EPA increased monitoring efforts in the river to search for any additional carp.

Since 2010, the Great Lakes Restoration Initiative, funded through the EPA, has spent $56.6 million to control, monitor and research Asian carp and their potential impacts on the Great Lakes.[53] But the Trump administration's proposed budget would zero out funding for the Great Lakes Restoration Initiative, axing funding for these efforts to keep Asian carp out of the Great Lakes.[54]

Impacts of Budget Cuts

The Trump administration proposes to cut EPA programs that protect water quality in the Great Lakes, as well as grants for essential state-level protections. The administration proposes to cut by 23 percent state and tribal assistance grants for clean water, which help address mercury pollution. Eliminating mercury pollution also requires reducing mercury in air pollution, but the EPA's work on air quality management would be cut by 30 percent.[55]

The proposed budget would eliminate the Great Lakes Restoration Initiative, which engages in a broad range of restoration and water quality protection activities.[56] For example, if the Great Lakes Restoration Initiative is eliminated, the EPA will have far fewer resources to protect ecosystems across the Great Lakes from Asian carp and other invasive species. In addition to monitoring the progress of Asian carp up the Mississippi and its tributaries, the EPA regulates the discharge of ballast water from ships, which often contains non-native species. Thanks to lake-wide surveillance programs and rapid response to new detections, like grass carp in Michigan and red swamp crayfish in Wisconsin, there have been no new introductions because of ballast water since 2006.[57] The proposed budget cuts could impair the EPA's efforts to prevent the arrival of new invasive species in ballast water.

Photo: D. Jude for NOAA/CC BY-SA 2.0

The EPA regulates ballast water to prevent invasions of non-native species like zebra mussels.

Less Accountability for Polluters

Protecting clean water requires holding polluters accountable when they violate the law. Strong enforcement serves as a deterrent by convincing would-be polluters to engage in safer practices from the start. The EPA and state agencies work together to enforce clean water laws and keep communities and the environment safe from harm. Reducing the number of environmental "cops on the beat" will encourage polluters to test the limits of the law, potentially putting the health of the Great Lakes and the people who use them at risk.

The EPA Held Enbridge Responsible for the Kalamazoo Oil Spill

On July 26, 2010, a pipeline owned by Enbridge Energy Partners LLP ruptured near Marshall, Michigan, spilling more than a million gallons of heavy tar sands oil into the Kalamazoo River. The heavy oil sank to the bottom of the river, and the rain-swollen river carried the oil 35 miles towards Lake Michigan.[58] Around 150 families self-evacuated to avoid benzene exposure, which can lead to headaches, heart palpitations, anemia, and weakened immune systems; 320 people reported symptoms typically associated with crude oil exposure.[59] As well as poisoning residents, the spill oiled hundreds of animals, including geese, ducks, beavers, deer, muskrats, snakes and turtles, which were treated at a makeshift wildlife rehabilitation center.[60] The Kalamazoo River cleanup cost billions of dollars, kept the river closed for swimming, boating, wading or fishing for nearly two years, and is still ongoing, seven years later.[61]

After immediately responding to protect the environment and public health, the EPA turned its attention to holding Enbridge accountable. The EPA oversaw Enbridge's work to clean thin layers of sediment on site, dredge deeper sediment for off-site decontamination, and remove oiled debris and soil to restore the polluted riverbanks.[62] Following a July 2016 settlement with the Department of Justice and the EPA, Enbridge paid $62 million in civil penalties for Clean Water Act violations and $5.4 million to reimburse the U.S. government for its role in the cleanup. Enbridge also agreed to spend at least $110 million on spill prevention measures and operational improvements across 2,000 miles of pipeline in the Great Lakes region.[63] The Enbridge spill remains one of the largest and most expensive inland oil spills in American history.

Photo: Justin Billau/CC BY-SA 2.0

A 52-year old pipeline carries crude oil under the Straits of Mackinac, seen here from above the Mackinac Bridge.

Despite the EPA's enforcement response to Enbridge's Kalamazoo spill, oil and gas pipelines continue to threaten clean water in the Great Lakes. For example, were a different Enbridge pipeline, known as Line 5, to spill, it could pollute a large area.[64] Built in 1953, two pipelines with 1-inch walls carry 540,000 barrels of crude oil and natural gas liquids each day across the Straits of Mackinac, where Lake Huron and Lake Michigan meet.[65] In the past 50 years, almost 30 spills along Line 5 have discharged at least 1.1 million gallons.[66] An expert from the University of Michigan concluded in 2016 that the Straits were "the worst possible place" in the Great Lakes for a major crude oil spill, even of conventional oil.[67]

Because the Clean Water Act specifies that the EPA should lead and coordinate the cleanup of inland oil spills and hold polluters responsible, maintaining EPA funding is essential to ensure the agency can respond rapidly to contain spills and vigorously pursue companies that pollute our waterways. However, the Trump administration proposes to cut 6 percent of the EPA's compliance monitoring and civil enforcement budget dedicated to inland oil spills, as well as 16 percent of the EPA's oil spill prevention, preparedness and response budget.[68]

EPA Enforcement Is Stemming the Flow of Raw Sewage into the Great Lakes

In 2010, people wanting to swim at Noble Beach in Euclid, Ohio, were frequently disappointed. The beach had contamination advisories for almost half of the season due to *E. coli* in the water, which can cause nausea, vomiting and diarrhea.[69] *E. coli* can come from multiple sources, including raw sewage, which can enter the Great Lakes through overflows from antiquated combined sewer systems.

The Northeast Ohio Regional Sewer District (NEORSD), which serves Cleveland and 59 adjoining communities, including Euclid, dumped nearly five billion gallons of raw sewage into Cleveland-area waterways and Lake Erie each year in the 2000s – 10 times more than what is allowed under the Clean Water Act.[70]

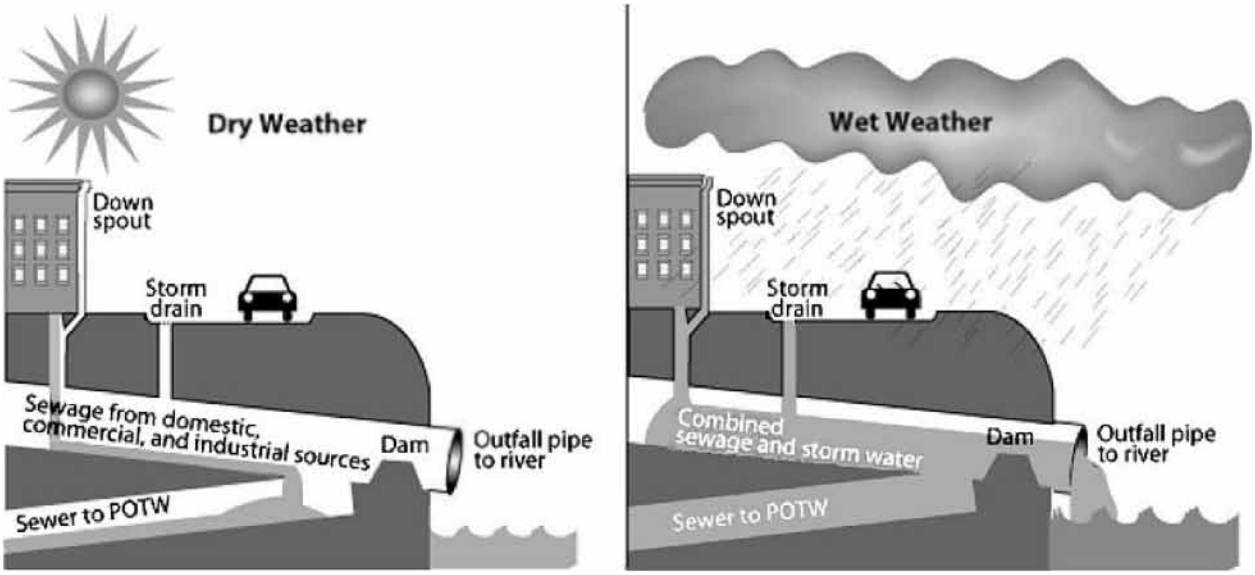
Photo: USFWS

Workers survey the Kalamazoo River following the Enbridge spill.

The EPA and the state of Ohio sued NEORSD for violating the Clean Water Act, reaching a settlement in 2010. In the settlement, NEORSD agreed to pay a $1.2 million civil penalty and to reduce sewer overflow discharges to half a million gallons per year by 2036, investing $3 billion over the next 25 years to expand and improve its water treatment systems and install "green infrastructure" such as pervious pavement and rain gardens that limit the flow of stormwater into the sewer system.[71,72]

Ohio is not the only state where overflows from combined sewer systems pose a threat to the health of beachgoers and the public at large. Between January 2009 and January 2010, five U.S. cities – Detroit, Cleveland, Buffalo, Milwaukee and Gary, Indiana – discharged 41 billion gallons of raw sewage and stormwater into the Great Lakes.[73] These and other cities in the Great Lakes region are working to modernize their outdated sewer systems that overflow during heavy rains and expose humans to raw sewage, as well as flood the lakes with excess nutrients that cause harmful algal blooms.

Figure 3. Combined Sewer Systems that Collect Sewage and Stormwater Can Overflow in Heavy Rain Conditions and Expose Local Communities to Contamination[75]



Credit: EPA

Between January 2009 and January 2010, five U.S. cities discharged 41 billion gallons of raw sewage and stormwater into the Great Lakes.[74]

The EPA has reduced the amount of raw sewage being dumped by sewer systems in many cities in the region, particularly around Lake Erie and Lake Michigan. This effort is part of an EPA "National Enforcement Initiative" focused on tackling Clean Water Act violations by sewer systems across the nation; other major Great Lakes cases were settled in the past decade in Akron (OH), Elkhart (IN), South Bend (IN) and Toledo (OH).[76] A full list of sewage pollution settlements the EPA has reached in the Great Lakes region in recent years is shown in Table 2. Each settlement requires the utility operator to undertake extensive improvement programs over the course of years. Continued funding for EPA's enforcement work is critical for ensuring that upgrade work happens as outlined in the settlements and reduces or eliminates sewer overflows polluting the Great Lakes and their tributaries.

Table 2. Selected Cities Where the EPA Has Acted to Reduce Sewage Pollution[77]

City	How the EPA's action protected clean water	Year of Settlement
Hammond, Indiana	The EPA required Hammond to reduce discharge of untreated sewage into the Grand and Little Calumet Rivers.	2017
Lima, Ohio	The EPA required Lima to quit releasing raw sewage into the Ottawa River during wet weather.	2014
Mishawaka, Indiana	The EPA required Mishawaka to spend an estimated $132 million on upgrades to its sewer system that should end overflows of raw sewage into the St. Joseph River (a tributary of Lake Michigan) in normal rainfall years.	2014
Elkhart, Indiana	The EPA required Elkhart to spend an estimated $156 million to repair its sewer system by 2029 and protect the St. Joseph River, Elkhart River and Christiana Creek. To fully comply with a consent decree, Elkhart also will pay $87,000 in penalties.	2011
Euclid, Ohio	The EPA required Euclid to upgrade its sewer system by 2026 to reduce pollution of creeks and streams flowing into Lake Erie.	2011
South Bend, Indiana	The EPA required South Bend to spend an estimated $510 million on sewer system upgrades to "significantly reduce" spills of untreated sewage to the St. Joseph River, a tributary of Lake Michigan.	2011
Northeast Ohio Regional Sewer District Clean Water Act Settlement	The EPA required the Northeast Ohio Regional Sewer District to make infrastructure investments to capture and treat "more than 98 percent of wet weather flows" entering its sewer system and protect Lake Erie.	2010
Toledo, Ohio	The EPA required Toledo to upgrade its sewer system to "significantly reduce" releases of raw sewage into Swan Creek, Maumee River, and Ottawa River.	2010
Akron, Ohio	The EPA required Akron to upgrade its sewer system to "reduce or eliminate sewage overflows" into the Cuyahoga River.	2009

Impacts of Budget Cuts

The Trump administration proposes to shrink the EPA's budget for enforcement by 19 percent and for compliance monitoring by 15 percent.[78] Compliance monitoring and civil enforcement of inland oil spills would be cut by 6 percent.[79] In addition, the proposed budget would slash grants that help states monitor and enforce protections against pesticides by 37 percent.[80]

The Trump administration's proposed budget cuts mean the EPA would have less ability to monitor polluters' compliance with water quality standards. The EPA would also have fewer resources to then go after polluters that do violate the terms of their pollution permits or that fail to make the necessary upgrades to their infrastructure to comply with clean water standards, such as wastewater utilities around Lake Erie. Finally, cutting funding for inland oil spill programs, so vital in enabling the EPA to respond quickly to the Kalamazoo spill and hold Enbridge accountable for its impacts, would place the Great Lakes at risk when another accident occurs.

Stalled Restoration of the Great Lakes

It will take massive investment in restoration activities to bring the Great Lakes back to health from decades of pollution and degradation. With this task in mind, the Great Lakes Restoration Initiative (GLRI) was established in 2010 with overwhelming bipartisan support. To date, the GLRI has made significant progress, but major work remains to be done – from cleaning up remaining toxic hot spots to protecting wetlands and wildlife habitat. Unfortunately, the Trump administration's proposed budget would wipe out GLRI funding, bringing successful Great Lakes restoration to a grinding halt.

EPA-Led Initiative Cleans Up Toxic Pollution Hotspots

In the 1980s, the EPA closed the beaches and recommended that fishermen avoid eating any fish caught in Waukegan Harbor, just north of Chicago, to avoid exposure to PCBs, synthetic compounds that are capable of causing cancer in humans. The PCB contamination of Waukegan Harbor came from hydraulic fluid used by the now-bankrupt Outboard Marine Corporation, creating what the EPA identified in 1981 as the "highest known concentrations of uncontrolled PCBs in the country."[81]

In 1993, the EPA began dredging Waukegan Harbor to remove sediment contaminated with PCBs, cleaning the groundwater and soil, and disposing of industrial contaminants. In 2011, pollution had dropped enough that the EPA lifted the beach closings, and in 2013 the agency concluded that dredging had successfully reduced PCB levels in harbor sediment to levels that mean most fish are safe to eat. In 2014, after a 30-year, $150 million cleanup effort, the EPA concluded that Waukegan Harbor could be considered for removal from the Great Lakes' most contaminated sites, known as Areas of Concern, a move hailed as pivotal to local efforts to revitalize the Waukegan waterfront.[82] Today in Waukegan Harbor, fishermen are allowed to consume the sunfish, mullets, rock bass and black bullhead they catch – though they are still recommended to limit their consumption to avoid any risk to health.[83]

Waukegan Harbor was one of many areas in Lake Michigan and the Great Lakes to be polluted by decades of industrial activity. Since 2000, the EPA has removed more than 1,000 Olympic swimming pools' worth of contaminated sediment from 31 especially polluted areas within the Great Lakes. This cleanup work is supported by $338 million in federal funding and an additional $227 million from nonfederal sponsors.[84] The Great Lakes Restoration Initiative has accelerated these cleanup efforts, granting the EPA an additional $246 million between 2010 and 2016 to support 88 projects focused on cleaning up particularly polluted areas.[85]

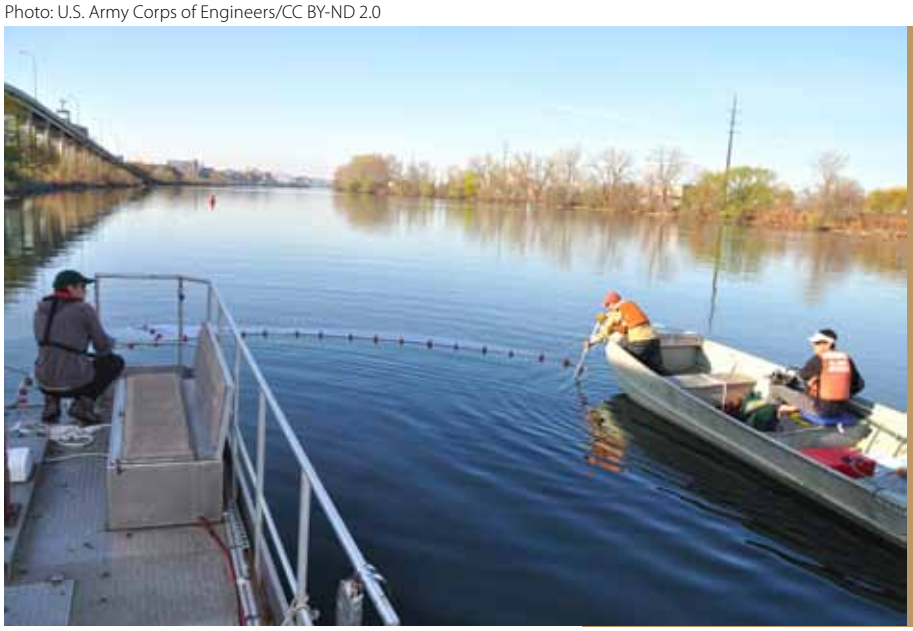
Successful hotspot cleanups have led to a healthier environment. Fish in Waukegan Harbor are once again safe to eat. After 30 years without young, the bald eagle nest on Deer Lake in Michigan began regularly fledging eaglets without deformities after that pollution hotspot was cleaned up. Mayfly and amphipod populations bounced back in Michigan's White Lake after toxic sediments were dredged.[86] White Lake, Michigan; Deer Lake, Michigan; and Presque Isle Bay, Pennsylvania, have all been cleaned up enough

that they have been removed from the list of most contaminated sites in the Great Lakes.[87] Cleanup work has been completed at the Ashtabula River, Ohio, and Sheboygan River, Wisconsin, hotspots, though they have not yet technically been removed from the list of most contaminated sites.[88]

Even though 27 pollution hotspots still remain to be cleaned up, the administration's proposed budget would eliminate funding for the Great Lakes Restoration Initiative and its cleanup efforts.[89] Cleanup efforts at pollution hotspots in many states would be affected.

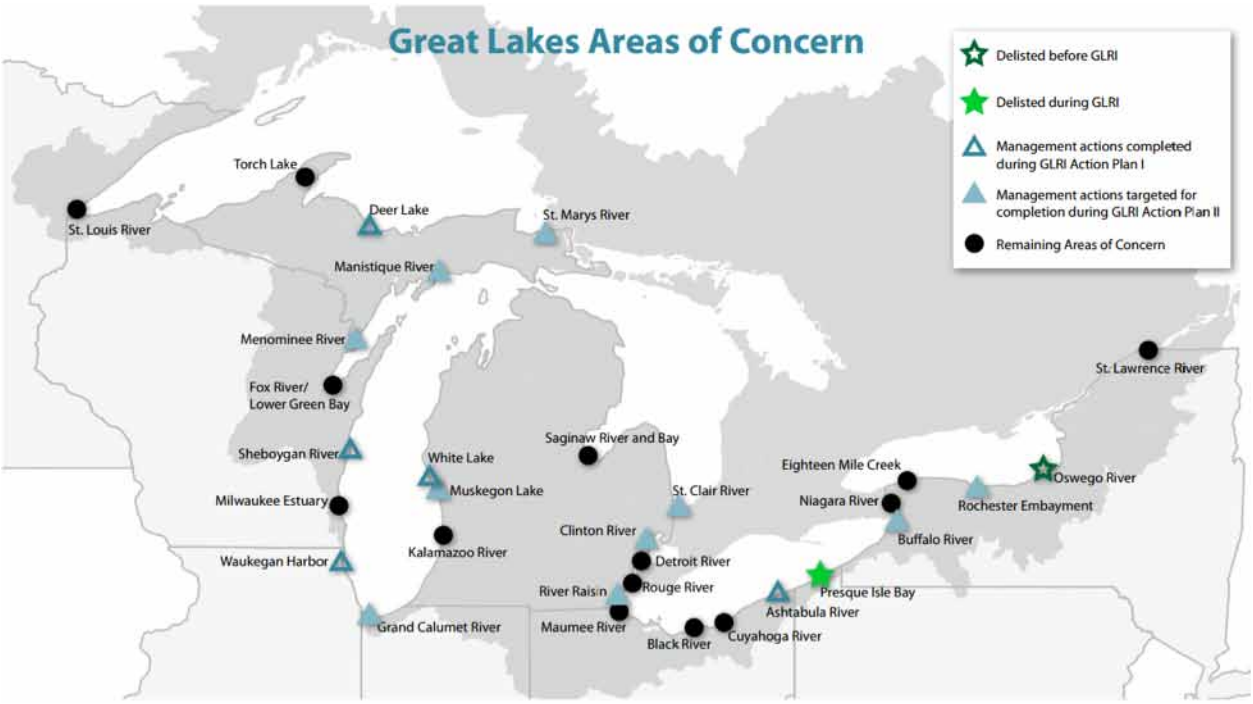
- The Niagara River Area of Concern, in New York, extends from Lake Erie to Lake Ontario. PCBs, dioxins and other toxic pollution in sediment, groundwater and the Niagara River make many fish unsafe for human consumption.[90] Maintaining ship access, in Buffalo Harbor and elsewhere, is difficult because pollution in sediment is released by dredging. In addition, fish and wildlife habitat was destroyed along the Niagara River when wetlands and shallow-water areas were filled in. Cleanup efforts have begun to reduce pollution levels – for example, fish no longer develop tumors or deformities caused by pollution – but many problems remain that require ongoing funding to address.[91]
- In Minnesota and Wisconsin, sediment in the St. Louis River is polluted from decades of industrial activity and as a result, fish contain too much mercury and PCBs to be safe for human consumption.[92] In addition, thousands of acres of habitat have been lost to dredging of shallow areas and filling of wetlands, diminishing fish and wildlife populations.[93] Cleanup activities have removed polluted sediment from some areas, including the St. Louis River Interlake Duluth Tar superfund site where cleanup was completed in 2011. Habitat for the piping plover has been restored, and sturgeon once again spawn where the Red River enters the St. Louis estuary. More work remains to be done, with full restoration scheduled to be completed by 2025.[94] Though Minnesota recently increased funding for the project, federal funds are essential to completing the cleanup.[95]
- Michigan's Saginaw Bay/River pollution hotspot suffers from PCBs, dioxin and other toxic contaminants that taint sediment, make fish unsafe to eat, and cause deformities in fish and wildlife.[96] Nutrient and bacterial pollution from sewage systems and

Photo: U.S. Army Corps of Engineers/CC BY-ND 2.0



Researchers survey fish as part of the effort to restore habitat and fish populations within the Niagara River Area of Concern.

Figure 4. Great Lakes Hotspots that Remain to Be Cleaned Up as of FY15 Indicated by Black Circles Below[102]



stormwater runoff cause algal blooms and force beach closings.[97] Cleanup work in recent years has begun to address these problems, such as a bad odor in drinking water, but extensive remediation and restoration work is still required.[98,99]

- In Wisconsin, extensive restoration and cleanup efforts are underway at the Fox River/Lower Green Bay pollution hotspot that contains extensive sediment pollution. Contaminated sediments cause tumors in fish and deformities in wildlife, and make fish and wildlife unsafe to eat. This pollution is being removed, with the Wisconsin Department of Natural Resources expecting to begin to evaluate in 2019 whether this pollution remediation has been successful.[100] Remediation efforts are also underway to address degraded habitat, high levels of algae and other issues in the Fox River/Lower Green Bay Area of Concern.[101]

EPA-Backed Project Removes Dam to Restore the Middle Cuyahoga River

In 2000, the Middle Cuyahoga River was not able to support healthy fish populations, like mullets and other fish that spawn in gravel.[103] The Ohio Environmental Protection Agency determined that the Kent Dam in Kent, Ohio, constructed in 1836, was obstructing the river's free flow and causing low levels of dissolved oxygen, excess nutrients, and poor river habitat.[104]

The city of Kent, Ohio, received EPA funds, as well as state loans and grants, through the Clean Water Act to modify the dam and restore the river's channel and banks upstream.[105,106] Within six weeks of the project's completion in 2004, fish habitat had improved and different kinds of fish were returning to the Middle Cuyahoga River; within six months, the river was fully complying with water quality stan-

dards.[107] The project improved water quality in the Middle Cuyahoga River, a Lake Erie tributary, and saved the city of Kent millions of dollars in additional improvements to their wastewater treatment systems that would have been required to allow fish and wildlife to flourish in the river.[108]

Across the Great Lakes, the EPA has funded removal of more than 500 dams and other obstacles.[109] This has enabled fish to access more than 3,800 additional miles of rivers and streams.

As well as funding restoration projects through its national clean water efforts, such as the Kent Dam modification project, the EPA has also granted $112 million since 2008 through the Great Lakes Restoration Initiative to fund 228 projects restoring nearshore health and reducing nonpoint source pollution (i.e., agricultural and urban runoff), including nutrient runoff and pollution that can cause harmful algal blooms. For example, Ohio received nearly $700,000 through the Great Lakes Restoration Initiative to reduce sediment and nutrient pollution from farms in the Sandusky River watershed.[110,111] When the three-year project is complete, it will curtail thousands of tons of pollution each year.

There are many more dams like the Kent Dam throughout the Great Lakes region that are slated for removal to restore river ecosystems to health. Many of these dam removal projects are contingent upon funding from the EPA. For example, a plan in northern Michigan to remove the aging Maple River Dam, which could smother downstream habitat in sediment if it collapses, is dependent on funding from the Great Lakes Restoration Initiative.[112] Other dam removal plans that are dependent on funding through the EPA include the Gorge Dam on the Cuyahoga River.[113]

Impacts of Budget Cuts

The Trump administration's proposed budget cuts would prevent the EPA from carrying on with the Great Lakes Restoration Initiative and set back restoration efforts in the Great Lakes.

The Trump administration would eliminate the Great Lakes Restoration Initiative, which addresses hotspots of sediment pollution, funds restoration projects, and supports restoration research.[114] Cleanup of the 27 most contaminated areas in the Great Lakes would be slowed, continuing to put our health and environ-

Photo: Ohio EPA

EPA funding helped modify Kent Dam and restore the Middle Cuyahoga River.

ment at risk. Dam removal, so successful on the Kent River, would be less likely to happen elsewhere.

States, local entities and nonprofit organizations would also lose over $160 million in grants from the EPA to address agricultural, urban and industrial runoff pollution.[115] Finally, the Superfund and Brownfields program budgets, which clean up the most contaminated sites in the Great Lakes region and invest in communities cleaning up legacy pollution, would shrink by 30 percent and 37 percent respectively. [116,117]

The administration's proposed budget would bring Great Lakes restoration to a standstill. The Trump budget would jeopardize the restoration of Lake Erie in particular, which struggles the most with runoff pollution, by taking funding away from grant programs that limit nonpoint source pollution, like agricultural runoff and septic discharges.[118] Eliminating the Initiative's budget would limit the EPA's ability to help states protect the Great Lakes, and would abandon a bipartisan promise to rehabilitate the Great Lakes and leave them better for the next generation.[119]

Less Research and Education on Threats to Water Quality

Emerging threats pose new challenges to protecting and restoring the Great Lakes. Research generates knowledge and tools that help toxicologists, water agency managers and officials understand the impacts of various threats to water; set drinking water and wastewater treatment standards that protect public health; and establish new land use, discharge and wastewater management regulations that effectively safeguard our most precious natural resource.

Public education then helps spread information about threats and solutions to empower local communities to act and protect their water resources. Great Lakes research teams broke new ground in the field of environmental toxicology in the 1970s, showing how fish consumption can expose people to persistent organic pollutants.[120] Those discoveries have influenced water protections across the U.S. and around the world.[121] Proposed budget cuts would eliminate important research programs and limit funding to support the pioneering work of Great Lakes research teams.

EPA-Funded Research Improves Pathogen Detection in Drinking Water

Beaches along the shores of the Great Lakes often have high levels of bacteria that can make swimming unsafe. The bacteria in question may include *E. coli* and *Cryptosporodium,* which can cause cramping, nausea, diarrhea and fever. High bacteria counts were common in the summer of 2017:

- In Illinois, from May through July 2017, public beaches on Lake Michigan had high bacterial levels in test results on 197 occasions.[122] Pollution has been detected at beaches along the length of the state's Lake Michigan shoreline.
- Michigan beaches on various Great Lakes had elevated bacteria levels 42 times in June and July 2017.[123]
- Public beaches on Lake Erie in Ohio had high bacteria levels 206 times from May through July 2017. Affected beaches include those at popular destinations like East Harbor State Park beach and Kelleys Island State Park.[124]

With traditional water quality testing methods, results aren't available for 24 hours.[125] That means that polluted beaches might be open for swimming while authorities wait for test results, or clean beaches might be closed because the results of subsequent testing haven't yet been reported.[126] The EPA has funded research to develop faster testing technologies that are now starting to be used by the Great Lakes states.

In 2006, the EPA granted a Michigan State University research team $600,000 to develop a cheaper meth-

Photo: AlanScottWalker/Wikimedia CC-BY-3.0

Beachgoers crowd Chicago's Foster Beach, one of many that periodically show high levels of bacteria pollution.

od for rapid detection of 20 waterborne pathogens, including bacteria associated with food poisoning, diarrhea, cholera, salmonella, and legionellosis, using genetic markers.[127] Over the course of the project, the researchers reduced the cost of each test from $2.50 to just 8 cents, and developed a method for obtaining results within four hours. They also developed a fast, efficient and reproducible way to gather bacteria for testing from treated sewage, by recovering them from a removable coating placed on membranes that filter treated wastewater at the treatment plant's outfall.[128] Research like this led the EPA to approve new protocols for faster testing of bacteria pollution at beaches and of treated water at wastewater treatment plants.[129]

State health departments have begun to adopt these faster testing methods. For the 2017 swim season, officials at the Chicago Park District have started using rapid testing methods to identify bacterial DNA in the water. The tests produce results within four hours, enabling health officials to provide more timely warnings of when beaches are not clean enough for swimming.[130] Health officials in Michigan began using rapid DNA-based testing on a trial basis in 2014 and have expanded its use since then with funding from the EPA.[131]

This story is just one example of the research that the EPA supports in the Great Lakes, which include:

- Evaluate toxicity and contamination pathways related to sewers and drinking water infrastructure,[132]
- Better understand the impacts of environmental exposure to pollution on child development,[133]
- Develop new membranes for better oil spill clean-ups,[134]
- Develop a model for phosphorus transport from agriculture, which contributes to algal blooms,[135] and
- Forecast the vulnerability of the Great Lakes to global warming.[136]

Funding Great Lakes research institutions complements the EPA's own research and scientific activities to address the wide range of issues that affect Great Lakes communities and ecosystems.

EPA-Funded Research Tests Sustainable Agriculture Practices to Decrease Runoff

In 2011, Lake Erie experienced a severe algal bloom, as mycrocistin, an alga that is toxic to mammals, covered swathes of the lake's western basin, reaching levels 50 times greater than recommended for safe recreation; two people reported symptoms associated with algae exposure.[137] In 2013, the 2,000 residents of Carroll Township were told they could not use their tap water due to an algal toxin as dangerous as cyanide bearing down on their water intake pipe.[138] Another toxic bloom in 2014 left nearly half a million people in the Toledo area without drinking water for nearly three days.[139] In 2015, the algal bloom covered the largest area ever recorded in Lake Erie.[140] Overall, harmful blooms have increased in frequency since the mid-1990s.[141]

Agricultural runoff, particularly from the Maumee River, which drains into western Lake Erie, is one of the main culprits behind the lake's yearly algal blooms.[142] Farmers seeking higher crop yields use intensive agricultural practices that include overapplying fertilizer and using drainage tiles that increase runoff carrying nitrogen, phosphorus, pesticides and sediment into waterways.

An EPA-funded initiative worked with farmers to demonstrate the effectiveness of using cover crops and leaving crop residue (e.g., corn stalks or wheat stubble) on fields between plantings. When participating farmers adopted these practices on nearly 37,000 acres in the Lake Michigan, Lake Erie and Lake Huron watersheds, they reduced pollution loads in the Great Lakes by more than 72,951 pounds of nitrogen, 24,126 pounds of phosphorus and 2,888,000 pounds of sediment. [143,144] The EPA funded the initiative from 2010 to

Photo: NOAA Coastwatch

Satellite image of 2011's intense algal bloom, concentrated in Lake Erie's western basin.

2013 to educate farmers on the benefits of conservation practices in the agricultural sector that can limit nutrient runoff that causes harmful algal blooms.[145] The initiative showed that these practices decrease agricultural runoff, sequester carbon in the soil (helping to reduce global warming), and generate economic benefits for agricultural producers, while increasing yields and helping with weeds.[146]

This kind of initiative, which provided proof of concept for innovative agricultural practices and encourages their adoption by farmers, would not be funded under the administration's current budget proposal.

Impacts of Budget Cuts

The administration's proposed budget cuts the EPA's overall research and development budget by nearly half. The Safe and Sustainable Water Resources research program would lose a third of its funding.[147] Under the proposed budget, the key grant program through which the EPA supports university research programs for better environmental science and management, called Extramural Science to Achieve Results, and which has disbursed an average $100 million a year since its inception, would not receive any funding.[148]

Numerous other programs and sub-programs would also be cancelled, including those focusing on water quality, endocrine disruptors (compounds that disrupt hormone balances), pesticide licensing, and regional research support for fieldwork.[149] The Trump administration's proposed budget would also cut funding for chemical safety research and human health risk assessment by a third.[150]

If the Trump administration's budget proposal becomes law, the EPA will have lost half its budget to assess pollution sources, investigate human health impacts, set standards for new contaminants and develop new tools to clean up pollution and protect ourselves from the kind of pollution which builds up in the Great Lakes.[151] Proposed budget cuts would also sever funding for valuable Great Lakes research programs, which have significantly contributed to our knowledge of human health risks from environmental exposure to pollution.[152] Slashing EPA funding would hinder the agency from supporting Great Lakes research teams, whose breakthroughs and tools help the EPA fulfill its responsibility to protect the Great Lakes, for all Americans.

The Health of the Great Lakes Depends on a Strong EPA

Water quality in the Great Lakes has greatly improved since the middle of the 20th century. The EPA – along with state and local government, citizens, academics, and philanthropic and business partners – has been critical to this effort. The EPA has established and enforced limits on pollution, helped to restore waterways, and supported research and education about the threats to the Great Lakes and solutions that can return them to health.

The job is not done, however. Existing sources of pollution – from industrial facilities to sewage pipes to urban and farm runoff – continue to imperil water quality and human health, requiring continued vigilance and action. New threats and sources of pollution, meanwhile, may add to the region's water quality problems.

Now is not the time to hobble the essential work of protecting and restoring the Great Lakes. To build on the progress of recent decades and ensure that the lakes and their tributaries are safe for swimming, fishing and other uses, funding for the EPA and the state and local efforts it supports should be *increased*, not cut. For example, aging drinking water and sewage infrastructure are in need of replacement.[153] In the Great Lakes states, drinking water infrastructure needs $100 billion worth of upgrades, and sewage and wastewater infrastructure is in need of $80 billion of investment.[154]

Continued progress at cleaning up existing sources of pollution and addressing new sources of contamination requires increased funding for the EPA's clean water efforts. The agency needs resources to establish pollution limits that protect human health and to make sure that polluters abide by those pollution standards. The agency needs money to continue its critical role in supporting cleanup of past pollution and restoring damaged rivers and streams so that they can provide clean water. The EPA also needs funding to help it identify and respond to future threats to clean water. Ensuring that people who live in the Great Lakes region have continued access to clean water requires full funding for the EPA.

Notes

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7. U.S. Environmental Protection Agency, *FY 2018 Budget in Brief*, May 2017, 43.

8. U.S. Environmental Protection Agency, *FY 2018 Budget in Brief*, May 2017.

9. Office of Management and Budget, *Appendix: Budget of the U.S. Government, Fiscal Year 2018*, 2017.

10. Office of Management and Budget, *Budget of the U.S. Government: A New Foundation for American Greatness, Fiscal Year 2018*, 2017.

11. Estimated losses to individual states are based on the assumption that EPA budget cuts will affect all states by the same percentage. That percentage cut was applied to grant funding for each state in the most recent fiscal year for which data were available. "Water pollution control grants" are Section 106 grants, slated for a 30 percent cut. "Nonpoint pollution control grants" are Section 319 grants, cut entirely in the administration's proposed budget. "Drinking water protection and enforcement grants" are Public Water System Supervision grants, cut by 30 percent. Information on proposed cuts comes from U.S. Environmental Protection Agency, FY 2018 Budget in Brief, May 2017, 39 and 43. Lost funding by state is based on most recent funding levels for each program: FY 2016 for Section 106, per U.S. EPA, *FINAL Section 106 FY2016 Funding Targets with Rescission*, 29 December 2015, archived at https://web.archive.org/web/20170727210615/https://www.epa.gov/sites/production/files/2017-04/documents/final_fy_16_section_106_with_rescission_standard.pdf. FY 2016 for Section 319, per U.S. EPA, *Grants Reporting and*

Tracking System, accessed 9 August 2017, at https://ofm-pub.epa.gov/apex/grts/f?p=109:9118:::NO:::. FY 2017 for PWSS grants, per Memorandum from Anita M. Thompson, Director, Drinking Water Protection Division, U.S. Environmental Protection Agency, to Regional Drinking Water Programs Managers, *Final Allotments for the FY2017 Public Water System Supervision (PWSS) State and Tribal Support Grants,* 30 May 2017, archived at https://web.archive.org/web/20170727210933/https://www.epa.gov/sites/production/files/2017-06/documents/wsg_202_pwss_fy17_allotments.pdf.

12. See note 1.

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23. See note 10.

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25. Office of Management and Budget, *Analytical Perspectives: Budget of the U.S. Government, Fiscal Year 2018*, 2017, Table 7-1.

26. See note 9.

27. Office of Management and Budget, *Major Savings and Reforms: Budget of the U.S. Government, Fiscal Year 2018*, 2017.

28. See note 25, Table 18-1.

29. Information in this and the following bullet points on proposed budget cuts to programs within the Office of Science and Technology comes from note 8.

30. 38 percent represents the budget cut for all homeland security activities in the Office of Science and Technology; per note 8.

31. See note 7.

32. Section 319 grants. See note 7.

33. Underground Storage Tank funding. See note 7.

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