Turning the Tide:

Investing in Wastewater Infrastructure to Create Jobs and Solve the Sewage Crisis in the Great Lakes

A Report by the Healing Our Waters® - Great Lakes Coalition

August 2010

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Cover Photo: Children play in Lake Michigan at Chicago's North Avenue Beach—Associated Press/Brian Kersey.

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Executive Summary

The Great Lakes are under siege from sewage pollution, four decades after Congress passed one of America's landmark environmental laws — the federal Clean Water Act. Communities that rely on the Great Lakes for drinking water and recreation continue to dump billions of gallons of untreated sewage every year into these freshwater seas.

From January 2009 through January 2010, just five cities on the U.S. side of the Great Lakes — Detroit, Cleveland, Buffalo, Milwaukee and Gary, Ind. — discharged 41 billion gallons of untreated sewage and filthy storm water into the lakes. That volume equals the amount of water that flows over Niagara Falls during a 15-hour period.

Discharges of untreated and diluted sewage occur when rain overwhelms combined sewer systems that collect and treat storm water and sanitary sewage. When that happens, cities are forced to open emergency floodgates to prevent sewage from flooding homes and businesses.

Nearly 200 communities in the U.S. portion of the Great Lakes basin have combined sewer systems, many of which routinely discharge untreated sewage into the lakes.

Combined sewer overflows, or CSOs, are one of the most serious pollution problems facing the Great Lakes. These discharges force beach closures, prompt health advisories urging people to stay out of polluted rivers, harm wildlife and hurt tourism.

Global warming could exacerbate sewage overflows into the Great Lakes. Climate in the region is already changing, with shorter winters, warmer annual average temperatures, heavy rain and snow, and extreme heat events occurring more frequently. Stronger storms fueled by global warming could cause the frequency of CSO events in the Great Lakes to more than double. That would increase the risk of waterborne diseases among swimmers at beaches located near CSO outlets.

Solving the CSO problem requires a two-pronged attack: Cities need to separate miles of combined sewer pipes and install green infrastructure — rain gardens, vegetated roofs and pervious pavement — to capture and cleanse storm water and reduce the volume of storm water flowing off the landscape and into sanitary sewers and surface waters.

For decades, cities tackled the CSO problem by focusing exclusively on traditional, so-called gray, infrastructure — separating combined sewer pipes, upgrading treatment facilities and building sewage retention basins. Increasingly, communities are investing in green infrastructure to dramatically reduce storm water runoff. This report highlights several successful green infrastructure initiatives.

Solving the sewage contamination crisis will cost billions of dollars. The U.S. EPA estimates that the nation faces a

$298 billion backlog in wastewater infrastructure improvements—with communities in the Great Lakes basin facing a $23.3 billion tab. Reducing the incidence of CSOs to a level the EPA considers acceptable would collectively cost the cities of Detroit, Cleveland, Buffalo, Milwaukee and Gary, Ind., about $3.7 billion.

For cash-strapped cities facing rising unemployment and increasing poverty rates, there is far more work that needs to be done to eliminate CSOs than money to pay for it. This report highlights five cities—Buffalo, Cleveland, Detroit, Gary, Ind., and Milwaukee—facing these challenges.

For its part, the federal government's investment in America's wastewater infrastructure has not kept pace with the severity of the problem. For the better part of the last decade, Congress has cut funding for sewer improvements.

Federal funding for the Clean Water State Revolving Fund — which provides low-interest loans to communities for sewer upgrades — has declined from $1.35 billion in 1998 to $689 million in 2008. The program distributes funding to states based on a set formula. The Great Lakes states of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin collectively receive about 36 percent of the program funding.

While Congress increased funding to the Clean Water State Revolving Fund last year – appropriating $2 billion in the 2010 fiscal budget and $4 billion in the American Recovery and Reinvestment Act of 2009 – there is a long way to go to meet the region's wastewater infrastructure needs.

The Healing Our Waters-Great Lakes Coalition wants Congress to provide at least $2.7 billion this year for sewer upgrades nationally ($972 million for Great Lakes states), with 20 percent of that money going to green infrastructure projects.

Reducing CSOs isn't just good for the Great Lakes environment and public health: It's also good for the economy. Investing in green infrastructure and gray infrastructure could create tens of thousands of jobs. The federal Clean Water State Revolving Fund created 716,000 jobs nationally from 1987 to 2005. Every $1 billion invested in wastewater infrastructure creates between 20,003 and 26,669 jobs, according to the Water Infrastructure Network.

Halting sewage contamination is part of a Great Lakes restoration strategy that, if implemented, would provide $2 in economic benefit to the region for every $1 investment, according to the Brookings Institution.

Eliminating combined sewage overflows needs to be an essential part of the effort to restore the Great Lakes and revive the economy.

Last year, Congress approved $475 million for President Obama's Great Lakes Restoration Initiative, a federal program to jump-start restoration by cleaning up toxic pollution, reducing urban and farm run-off, restoring habitat and wetlands, and preventing and controlling aquatic invasive species.

Allowing the CSO problem to fester will only slow efforts to restore these incomparable lakes, which contain 20 percent of all surface fresh water on the planet and are the source of drinking water for 25 million people.

There is no time to waste. Cities around the Great Lakes know how to fix the CSO problem — they need financial assistance from Congress to get started.

Cash-Strapped Cities Struggle to Halt Massive Sewage Discharges Into Great Lakes

Robert Burns, Detroit Riverkeeper

Four decades after Congress passed the Clean Water Act, communities that rely on the Great Lakes for drinking water and recreation still dump billions of gallons of untreated sewage every year into these freshwater seas.

From January 2009 through January 2010, five cities on the U.S. side of the Great Lakes — Detroit, Mich., Cleveland, Ohio, Buffalo, N.Y., Milwaukee, Wis., and Gary, Ind. — discharged 41 billion gallons of untreated sewage and filthy storm water into the lakes from combined sewer systems.[1] That volume is equal to the amount of water that flows over Niagara Falls during a 15-hour period.

Canadian cities with combined sewer systems also dump billions of gallons of untreated sewage into the Great Lakes each year.[2]

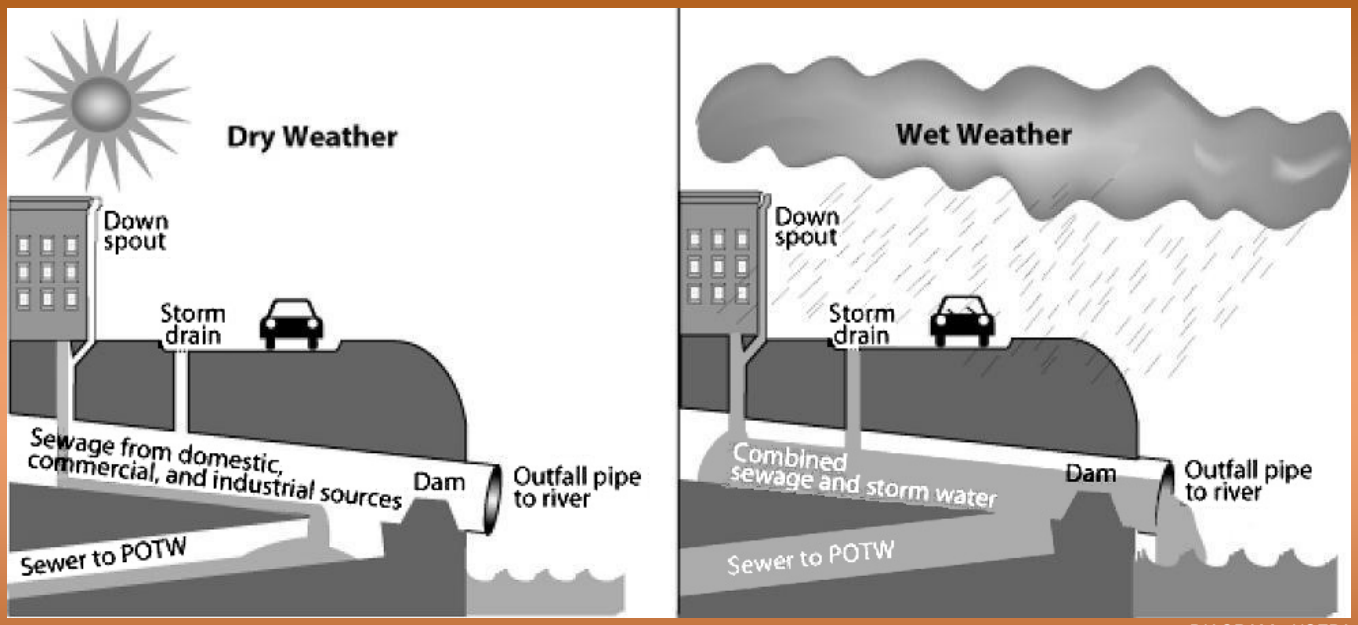

DIAGRAM: USEPA

Combined Sewage Overflow system.

Problems arise when rain overwhelms sewer systems that collect storm water and sanitary sewage in combined pipes. When that happens, cities are forced to open emergency floodgates to prevent sewage from flooding homes and businesses.

Combined sewer overflows, or CSOs, are one of the most serious pollution problems facing the Great Lakes. Discharges of untreated sewage force beach closures, prompt health advisories urging people to stay out of polluted rivers, harm wildlife and hurt tourism.

Solving the problem will cost billions of dollars, which most cities can't afford, particularly in this struggling economy.

In just five cities — Detroit, Mich., Cleveland, Ohio, Buffalo, N.Y., Milwaukee, Wis., and Gary, Ind. — reducing the incidence of CSOs to a level the U.S. Environmental Protection Agency considers acceptable would cost about $3.7 billion.[3]

To tackle the problem of sewage contamination in the Great Lakes region, a comprehensive strategy endorsed by the region's mayors, governors, environmentalists and business and industry leaders recommends an investment of $14 billion to upgrade city wastewater infrastructure in the states of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin.[4]

Controlling CSOs nationwide will cost $50 billion over the next two decades, according to EPA estimates.[5]

The CSO problem is not unique to the Great Lakes but it is more serious here than elsewhere in the United States.

Nationally, 746 communities with combined sewer systems dump 850 billion gallons of untreated sewage into surface waters each year. Nearly one-fourth of all CSO communities in the U.S. — 182 in all — are located within the Great Lakes basin.[6]

Combined sewer systems are a throwback to the early 20th century when cities decided it made sense to collect and treat all storm water and sanitary sewage in combined pipes. Streets back then had tremendous amounts of pollution, including horse droppings, as horses were a significant transportation source when these sewers were being constructed. Building combined sewers was a good theory that proved impractical over time: Growing cities eventually outgrew their wastewater systems. Today, heavy rains often overwhelm combined sewer pipes, forcing cities to discharge untreated sewage and storm water into the nearest lake or river.

The annual volume of CSOs is directly related to the amount of precipitation: The more it rains, the greater the likelihood that storm water will inundate combined sewer systems and cause a discharge of untreated sewage.

The seriousness of the problem was highlighted on Sept. 13, 2008, when a record-breaking storm dumped 6.6 inches of rain on Chicago. The deluge overwhelmed the city's massive sewer system with storm water, forcing the Metropolitan Water Reclamation District to open emergency floodgates to prevent urban flooding.

Over the course of two days, Chicago discharged 99 billion gallons of diluted sewage and storm water into Lake Michigan. It was the city's largest discharge of untreated sewage into the lake since 1985, when Chicago opened the first section of a huge deep tunnel storage system that was supposed to prevent discharges of untreated sewage into Lake Michigan.[7]

With climate change expected to increase precipitation and the incidence of severe storms in the Great Lakes region, the CSO problem will only get worse unless dramatic action is taken now.

Heavy rains often overwhelm combined sewer pipes, forcing cities to discharge untreated sewage and storm water into the nearest lake or river.

Solutions Require Funding, Creative Approaches

Chicago's 2008 sewer overflow was a cautionary tale for the other 181 Great Lakes communities that have combined sewer systems. It demonstrated that cities simply could not afford to lay enough sewer pipes or dig enough storage tunnels and retention basins to prevent combined sewer systems from overflowing during storms.

Solving the CSO problem requires a two-pronged attack: cities need to separate miles of combined sewer pipes and install green infrastructure — rain gardens, vegetated roofs and pervious pavement — to capture and cleanse storm water and reduce the volume of storm water flowing off the landscape and into sanitary sewers and surface waters.

Ignoring the problem carries serious consequences for public health, the economy and the region's way of life.

CSOs contaminate the Great Lakes with toxic chemicals, dangerous pathogens and debris that pollute beaches, threaten human health and wildlife, and harm the region's multi-billion dollar tourism economy. CSOs have plagued the Great Lakes for decades, despite costly efforts by some cities to curb the practice of using the lakes as toilets every time it rains hard.

Part of the problem is that Congress has cut funding over the past decade for sewer improvements. Congress has reduced funding for the Clean Water State Revolving Fund — which provides low-interest loans for sewer upgrades — from $1.35 billion in 1998 to $689 million in 2008.[8]

In the 2010 fiscal year, Congress allocated $2 billion for sewer upgrades through the Clean Water State Revolving Fund, which distributes funding to states based on a set formula. The Great Lakes states of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin collectively receive about 36 percent of program funding. The American Recovery


Natural Area Preservation


Milwaukee Metropolitan Sewage District


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Rain gardens, vegetated roofs and water pervious pavement help capture and cleanse storm water and reduce the volume of storm water flowing off the landscape and into sanitary sewers and surface waters.

and Reinvestment Act of 2009 included an additional $4 billion for the Clean Water State Revolving Fund, with 20 percent of the grants designated for green projects, including green infrastructure, energy or water efficiency, and environmentally innovative activities.

The Healing Our Waters-Great Lakes Coalition is urging Congress to provide at least $2.7 billion this year for sewer upgrades nationally ($972 million for Great Lakes states), with 20 percent of that money going to green projects.[9]

More Cities Going Green

In the past, cities have focused sewer expenditures almost exclusively on gray infrastructure — pipes, retention basins and storage tunnels — to curb CSOs. That single-minded focus is beginning to change. A growing number of cities are utilizing green infrastructure — parks, trees, rain gardens, wetlands and green roofs — to capture and cleanse storm water. Green infrastructure reduces the volume and frequency of CSO events, reduces water pollution and flooding, improves air quality, creates wildlife habitat and beautifies communities.

Green infrastructure alone will not eliminate all CSOs in the Great Lakes region. Many cities still need to invest heavily in gray infrastructure — separating combined sewer pipes, upgrading treatment facilities and building retention basins — to reduce CSOs. However, there is a growing body of evidence that suggests green infrastructure can dramatically reduce storm water runoff — thereby decreasing the pressure on sanitary sewer systems and reducing the risk of combined sewer overflows.

Green infrastructure can save cities money by helping them avoid or reduce expenditures on storm water ponds, pipes, treatment devices and other hard infrastructure. By using wetlands, trees, and downspout disconnection to limit storm water flows into its combined sewer system, the City of Indianapolis is saving over $300 million.[10]

Investing in green infrastructure also creates local jobs—employing engineers, scientists, landscapers, plumbers and construction workers. Reducing CSOs isn't just good for the Great Lakes: It's also good for the economy.

What is Gray Infrastructure?

Engineered systems which are impervious that contain, transport and/or treat storm water runoff. Examples of gray infrastructure include:

- Sewer pipes
- Treatment facilities
- Retention basins
- Deep tunnel reservoirs that transport, store and treat sanitary sewage and storm water.

What is Green Infrastructure?

Natural and engineered systems that mimic natural landscapes to capture, cleanse and reduce storm water runoff. Examples of green infrastructure include:

- Parks and natural areas
- Rain gardens
- Vegetated roofs
- Rain barrels
- Wetlands
- Bio-swales
- Pervious pavement

Benefits of Green Infrastructure

- Fewer sewer overflows
- Reduced flooding
- Decreased water pollution
- Improved air quality
- Reduced air temperatures and lower energy costs
- Increased wildlife habitat
- Increased property values
- Community beautification

Global Warming to Exacerbate Polluted Runoff, Sewage Contamination

CSOs are a menace to the Great Lakes and global warming will make the problem much worse unless swift action is taken.

Rising temperatures are expected to bring more snow and rain to the Great Lakes region in the winter and spring—with increasing frequency and intensity of storms.[11]

Climate in the Great Lakes region is already changing, according to leading scientists in the United States and Canada. Shorter winters, warmer annual average temperatures, heavy rain and snow, and extreme heat events are occurring more frequently.[12] The increasing severity of storms, caused by global warming, will pose a challenge to cities that have to build and maintain infrastructure to deal with storm water.

By the end of this century, stronger storms fueled by global warming could cause the frequency of CSO events in the Great Lakes to more than double, according to scientists at the University of Wisconsin. That would increase the risk of waterborne diseases among swimmers at beaches located near CSO outlets.[13]

A combined sewage overflow in Milwaukee, Wis.

The researchers concluded that cities could reduce CSOs by building costly retention basins and underground tunnels to store large volumes of sewage and storm water. But they cautioned that larger storms in the future will make it difficult, if not impossible, to capture and treat all of the rain produced by the most extreme storms.[14]

The September 2008 deluge in Chicago offered a glimpse of how global warming could exacerbate the CSO problem unless cities are given the financial resources needed to greatly reduce the volume of storm water that flows into sanitary sewer pipes.

The nation needs to address the climate crisis, while simultaneously investing in the nation's wastewater infrastructure at levels which allow communities to deal with increasing amounts of storm water.

Failure to halt sewage overflows will slow efforts to restore the Great Lakes at a time when the U.S. Congress and President Obama are investing millions of dollars in rehabilitating the freshwater seas.

Last year Congress approved $475 million for President Obama's Great Lakes Restoration Initiative, a federal initiative that funds solutions to clean up toxic pollution, reduce urban and farm run-off, restore habitat and wetlands, and prevent and control aquatic invasive species.

Because the Great Lakes Restoration Initiative does not fund wastewater infrastructure, it is imperative that federal public officials continue to make robust investments to help communities modernize old sewers.

There is no time to waste. Cities around the Great Lakes know how to fix the CSO problem — they just need significant financial assistance from Congress to get started.

Communities which have had combined sewage overflows in the United States.

Graphic: USEPA

CSOs & Polluted Storm Water Runoff:

A Threat to Human Health & Wildlife

Combined sewer overflows are a scourge on the Great Lakes, a recurrent dose of pollution that fouls the water with toxic chemicals and dangerous pathogens that force beach closures and threaten municipal drinking water supplies used by millions of people.

Sewage discharged into the lakes during a CSO event can contain a witch's brew of potentially deadly viruses and parasites, oil and grease, food waste and toxic chemicals.

More than 120 viruses can be found in untreated sewage. Recent studies have found that combined sewer overflows are likely to contain "significant concentrations of *Giardia* and possibly *cryptosporidium*," according to the U.S. Environmental Protection Agency.[15]

Giardia and *cryptosporidium* cause intestinal ailments, which can be fatal to people with compromised immune systems. A 1993 outbreak of *cryptosporidium* in Milwaukee's municipal water system killed more than 100 people and sickened more than 400,000.

That type of bacterial water pollution, some of which comes from CSOs, forces the closure of hundreds of Great Lakes beaches every year. Bacterial pollution exceeded national water quality standards at 12 percent of the Great Lakes beaches tested in 2008 — giving the region the dubious distinction of having the nation's dirtiest beaches that year.[16]

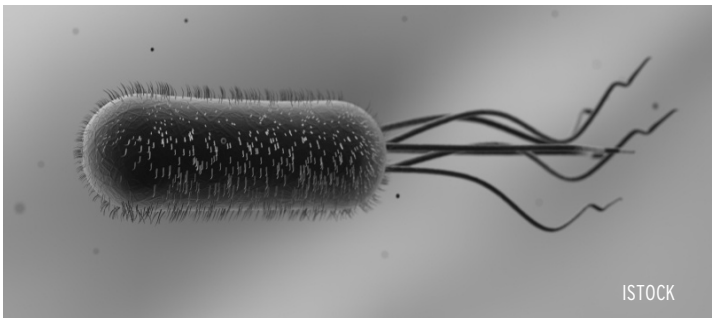
USGS

Summer bummer: Beach closure sign warns beachgoers of health risk posed by sewage-contaminated waters.

Cause & Effect

A recent EPA study underscores the threat that sewage contamination poses to human health. Scientists surveyed swimmers at beaches near Gary, Ind., and Cleveland, Ohio—two cities which have struggled with halting combined sewage overflows.

The city of Gary dumps 11 billion gallons of sewage mixed with storm water into Lake Michigan annually, while CSOs in and around Cleveland dump about 4 billion gallons of diluted, untreated sewage into Lake Erie.[17]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***E. coli* bacteria linked to human waste from combined sewer overflows is a common cause of beach closings.**

The study found that 10 percent to 14 percent of beach-goers in those communities reported getting sick after swimming.

Elevated concentrations of bacterial pollution routinely force beach closures in Detroit — which happens to be one of the largest sources of CSOs in the Great Lakes.[18]

In 2009, elevated concentrations of the *E. coli* bacteria linked to human waste from CSOs forced a record 205 beach closures in suburban Detroit's Macomb County.[19]

Debris that washes off the landscape and into the Great Lakes during CSOs also threatens fish and wildlife.

Tiny particles of dirt and other grime that remain suspended in the water can suffocate fish and cause reproductive problems. Plastics and other trash can harm wildlife that ingest or become entangled in the garbage.[20]

Stormy Waters

CSOs aren't the only cause of bacterial pollution in the Great Lakes and storm sewers aren't problems only during periods of rainfall.

A recent study found that storm water runoff from rural and urban areas accounted for 89 percent of bacterial pollutants entering Milwaukee's major rivers and Lake Michigan.[21]

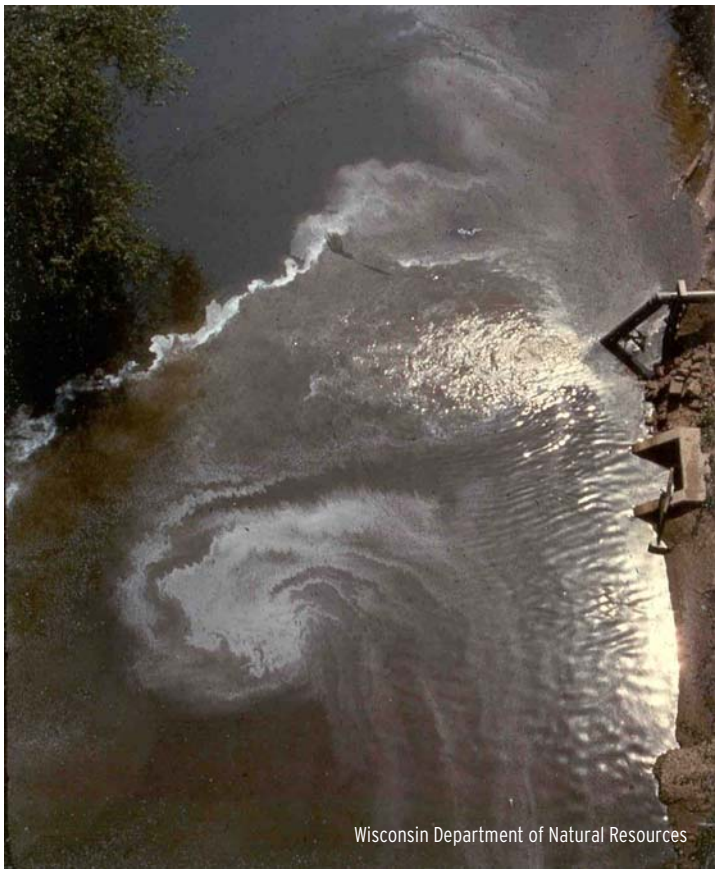
That problem may be due in part to broken sanitary sewer mains that leak into storm sewers, or are illegally connected to storm sewers. This potentially widespread problem was recently discovered in Milwaukee.

Researchers from the University of Wisconsin-Milwaukee found human sewage flowing out of municipal storm sewers and polluting several rivers and beaches throughout the Milwaukee area. The scientists even found human sewage flowing out of storm sewer pipes during dry periods.

The potential scope of the problem is unsettling.

Researchers discovered chronic fecal pollution at 44 of the 62 storm sewer outlets they tested in Milwaukee. One of the worst sites was a storm sewer outlet that discharged near the Big Bay State Park beach on Lake Michigan.[22]

That finding prompted the lead researcher to say: "There is a problem somewhere in their sewer system. People should not be swimming at that beach."[23]



A combined sewage overflow in Milwaukee, Wis.

The Milwaukee study caught the attention of federal officials, who feared polluted storm sewers could be discharging human fecal matter into lakes and rivers across the United States. The Milwaukee studies were the latest evidence that Congress must provide more funds to help Great Lakes. communities upgrade failing sewer systems.

Green Infrastructure: Beauty Trumps Brawn when it comes to Storm Water Runoff

Cities in the U.S. have traditionally attacked the CSO problem by focusing exclusively on gray infrastructure — spending billions of dollars on new sewer mains, massive retention basins and upgraded treatment facilities.

But there is more than one way to prevent a combined sewer overflow.

Increasingly, communities are looking to green infrastructure — rain gardens, bio-swales, green roofs, wetlands, nature preserves, rain barrels and pervious pavement — to reduce the volume of storm water and pollutants flowing into sewer pipes and the nearest surface waters.

Green infrastructure has numerous benefits. It restores natural hydrology, improves air quality, reduces urban air temperatures and provides wildlife habitat — all at far less cost than building gray infrastructure.

Rain gardens, natural areas and bio-swales also beautify communities, turning seas of pavement into attractive oases of vegetation. Milwaukee Mayor Tom Barrett noted the aesthetic value of green infrastructure during a recent Congressional hearing.

Barrett said Milwaukee converted an abandoned railroad that covered 1,200 acres into a park that captures and cleanses storm water before it is released into the Menominee River. People walk and bike on trails in the park, fish in the river, have picnics and use the park's Hank Aaron Trail to reach Miller Stadium, where the Milwaukee Brewers play baseball.

"The problem with traditional pipes is that the public doesn't get any direct enjoyment with this type of hidden infrastructure," Barrett said. "You can't hold a picnic or a tailgate party in a deep tunnel (storm water reservoir)."[24]

Several communities are reporting remarkable success in using green infrastructure to reduce storm water runoff, lower air temperatures, decrease energy use and increase property values. Consider:

- Research conducted in Chicago found that green infrastructure could handle the water produced by about 90 percent of all rainfall events.[25]
- A study in Burnsville, Minn., found that rain gardens reduced storm water runoff from a residential area by 90 percent.[26]
- Officials in Chicago estimate that the city's plan to plant 7 million square feet of green roofs will reduce the need for air conditioning, providing $100 million in energy savings and reducing demand by 720 megawatts annually — the equivalent of three coal-fired power plants. By 2010, green roofs covered more than 2 million square feet of roofs.[27]
- In Seattle, vegetated strips that were installed to replace concrete curbs reduced storm water runoff by 90 percent and at a cost that was 25 percent less than gray infrastructure.[28]
- EPA studies have found that using green infrastructure to deal with storm water can cost 15 percent to 25 percent less than gray infrastructure.[29] Researchers in 2010 were still studying how much green infrastructure could reduce storm water runoff across an urban area.
- Federal officials have said there will always be a need for gray infrastructure to handle large amounts of storm water produced by unusually potent storms.

Still, it's clear that communities can reduce the need for massive, costly storm sewer projects by using green infrastructure to capture and cleanse storm water. That's good for municipal finances, taxpayers and the environment.

Great Lakes Communities in Need:

How the Nation's Wastewater Infrastructure Gap Continues to Grow

Alliance for the Great Lakes

Landmark environmental laws in the 1960s and 1970s sparked a much-needed infusion of federal dollars to improve the nation's inadequate wastewater infrastructure. Those investments are widely credited with improving water quality around the country and reducing threats to public health.

Decades later, however, the nation's wastewater infrastructure is in disrepair.

The U.S. EPA estimates that the nation faces an increasing backlog of work to build and maintain its wastewater infrastructure. The agency's Clean Watersheds Needs Survey 2008 Report to Congress asserts that the nation needs to invest at least $298 billion in its aging sewers: $187.8 billion for wastewater treatment and collection systems, $63.6 billion for combined sewer overflow corrections, and $42.3 billion for storm water management .[30]

Wastewater Infrastructure Needs within Great Lakes Basin

Total documented needs reported by states within the Great Lakes drainage basin (January 2008 dollars in billions)

Illinois	$0.2
Indiana	$1.6
Michigan	$7.0
Minnesota	$0.5
New York	$3.1
Ohio	$5.8
Pennsylvania	$0.3
Wisconsin	$4.8
Total:	**$23.3 billion**

2008 Clean Watersheds Needs Survey, U.S. EPA, p 50

Cities within the Great Lakes basin face a shortfall of more than $23 billion.[31]

All told, the report documents a $43.4 billion (17 percent) increase (in constant 2008 dollars) in investment needs over the 2004 CWNS report.[32] The nation's increasing wastewater infrastructure needs, according to the report, stem from a combination of improved reporting, aging infrastructure, population growth, and more protective water quality standards.

The bottom line is that the nation is facing an increasing infrastructure gap—and the price tag is growing.

For many cities, there is far more work that needs to be done to eliminate CSOs than there is money to pay for it. Consider:

- The Buffalo Sewer Authority faces a $500 million bill to eliminate CSOs, even though the city of Buffalo has a constitutional cap of $125 million for bonded indebtedness.
- Eliminating all CSOs in the greater Cleveland area will cost about $4.3 billion, which would be funded through double-digit rate hikes for residents in the area.
- A rapid decline in tax revenue prompted Detroit in 2009 to cancel a $1.2 billion deep tunnel project that would have reduced sewer overflows into the Rouge River.

Cities along the Great Lakes and St. Lawrence River spend about $15 billion annually on programs and projects that protect and restore water quality. Of that amount, about $2 billion is spent annually to operate and upgrade sewer systems, according to a study by the Great Lakes Commission and the Great Lakes and St. Lawrence Cities Initiative.

That study observed that despite the multi-billion-dollar annual investment being made by cities to maintain infrastructure, the funding gap continued to increase. "While we know that other orders of government have also contributed substantial amounts," the report noted, "those contributions have fallen short."

Federal funding in wastewater infrastructure has not kept pace with the unprecedented need in communities around the country.

Despite agreement that the nation faces an ever-widening wastewater infrastructure deficit, federal funding to successful programs like the Clean Water State Revolving Loan Fund—which provide low-interest loans to communities to fix old sewers—have declined or remained stagnant for years.

That needs to change if the country is to stop sewage overflows into the Great Lakes and other U.S. waters.

Boosting federal funding for projects that reduce or eliminate CSOs will advance efforts to restore the Great Lakes and jumpstart the region's struggling economy.

A Wise Investment:

Funding Projects to Reduce Sewer Overflows would Create Thousands of Jobs in Great Lakes States

As proven over the last two decades, increased federal funding for sewer system upgrades and green infrastructure aimed at eliminating combined sewer overflows can generate tens of thousands of jobs in the Great Lakes region.

The federal Clean Water State Revolving Fund has created 716,000 jobs from 1987 to 2005 by providing low-interest loans for sewer upgrades and other projects designed to improve water quality.[33]

Every $1 billion invested in wastewater infrastructure creates between 20,003 and 26,669 jobs, according to the Water Infrastructure Network, a national coalition of construction, engineering, conservation, labor, municipal and manufacturing organizations whose goal is to maintain our nation's water infrastructure.[34]

Investing in projects that target CSOs in the Great Lakes region could create a variety of jobs and stimulate economic growth in Michigan, Ohio and other states that have been hit hard by the national recession.

Besides construction jobs, spending $1 billion on sewer projects would create ancillary jobs in about 300 different industries — from architectural and engineering services to food service, retail, automotive repair, real estate and trucking.[35]

Economists who examined how investing in sewer improvements could benefit one state found that a $1 billion investment in Minnesota would create up to $2.4 billion in demand for goods and services across the state's economy.[36]

Using green infrastructure to reduce storm water runoff — by installing rain gardens, vegetative roofs, swales, wetlands and permeable pavement — also creates jobs. Designing, installing and maintaining green infrastructure requires the use of architects, designers, engineers, construction workers and landscapers.

A study by the District of Columbia's Planning Office concluded that investing $900 million on installing green roofs in the District would create more than 17,000 full-time, year round jobs.[37]

The Brookings Institution found that implementing a $26 billion Great Lakes restoration plan would yield more than $50 billion in economic benefit for the eight-state region of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin. The plan—which calls for a $14 billion investment in the region's aging wastewater infrastructure—has won the support of chambers of commerce, industry leaders, mayors, governors, tribes and environmentalists, in no small part due to the 2-to-1 return on investment that stems from healthy Great Lakes.

Investing in green infrastructure will create jobs.

Gary, Indiana:

Restoring the Grand Calumet River While Rebuilding the City

National Park Service

Combined sewer overflows are one of numerous problems that have turned the Grand Calumet River into a glorified sewer and earned it the dubious distinction of being America's most troubled river.[38]

The 13-mile long river begins in the east end of Gary, Ind., and flows through the heavily industrialized cities of Gary, Hammond and East Chicago before discharging into Lake Michigan via the Indiana Harbor Ship Canal.

The Grand Cal, as it is known, is the only river in the United States that is damaged in all 14 possible ways, as evaluated by the U.S. EPA—including restrictions on drinking water, eating fish and swimming, as well as impacts on fish and wildlife populations and habitat.[39]

That's not surprising, given the region's history of using the Grand Cal as a dumping ground for all manner of human and industrial wastes.

Sewage discharges, contaminated sediments and toxic runoff from numerous hazardous waste sites along the Grand Cal have made the river unfit for humans or wildlife. Severe chemical and bacterial pollution has caused deformities in fish and wildlife, degraded virtually all life forms and forced the closure of nearby Lake Michigan beaches.[40]

The U.S. Environmental Protection Agency has estimated that 90 percent of the river's flow is comprised of industrial wastewater and municipal wastewater.

Communities along the Grand Cal dump up to 11 billion gallons of untreated sewage mixed with storm water each year into the river and the Indiana Harbor Ship Canal. The city of Gary has 12 of the 15 CSO outlets along the river, most of which are located within eight miles of Lake Michigan.[41]

Ninety percent of Gary's sewer mains are combined, meaning the pipes carry sanitary sewage and storm water. Combined sewer pipes and the loss of most wetlands along the river are a prescription for CSOs.

City officials want to separate the combined sewer pipes and utilize green infrastructure to capture and cleanse storm water. But there simply isn't any money to pay for the work, said Dorreen Carey, environment and storm water management coordinator for the Gary Storm Water Management District.

"We have some small projects in the city where natural infiltration is being used to control storm water," Carey said. "We'd like to use more green infrastructure to address storm water runoff but we don't have any money."

Separating enough combined sewer pipes to bring the city into compliance with federal discharge standards would cost Gary about $250 million, said Dan Vicari, an engineer for CDM, a consulting firm that is coordinating the city's storm water management plan.[42]

Gary officials hope to launch a pilot "green street" project — using porous pavement that would allow storm water to soak into the ground instead of washing into the Grand Cal. If successful, that project could reduce the volume of storm water flowing into the Grand Cal by 4.5 million gallons annually.

To date, most restoration work on the Grand Cal has focused on removing contaminated sediments. That's not surprising: There are between 5 million and 10 million cubic yards of toxic mud on the bottom of the river and the shipping canal.[43]

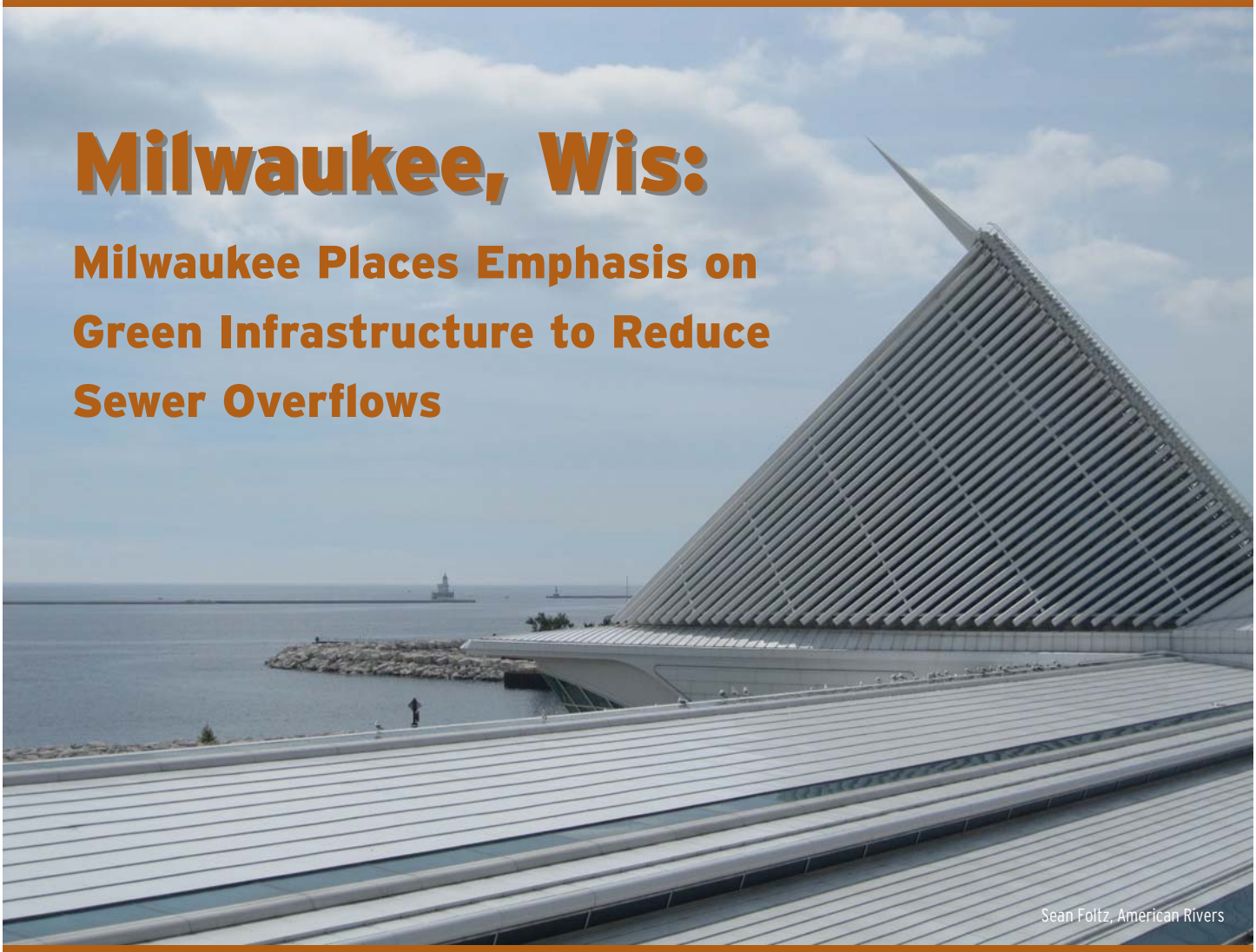
Many communities in the Gary area are working to meet a federal mandate to develop, implement and enforce a storm water management program that will reduce storm water runoff into the Grand Cal and reduce CSOs.

Gary has already amended its storm water management ordinance to restrict the amount of water and sediment that could drain from construction sites and to prohibit illicit connections to sewer pipes.

But like many cities, Gary's aging sewer system is long on problems and short of funds to fix them. Most of its sewer mains are more than 50 years old and many are collapsing.

The Gary Sanitary District has spent more than $60 million to upgrade its sewer system since 1992, and another $10 million of work is underway.[44]

Given the sorry state of the Grand Cal, Gary may be the best example of how increased federal funding could jumpstart efforts to deploy green infrastructure to reduce CSOs and beautify a community trying to overcome a legacy of industrial blight.



Sean Foltz, American Rivers

Milwaukee, Wis:

Milwaukee Places Emphasis on Green Infrastructure to Reduce Sewer Overflows

Milwaukee learned a costly lesson in storm water management in the 1990s, one that prompted the city to shift gears and become a national leader in the green infrastructure movement.

The lesson: Cities can't afford to build sewer systems big enough to handle all of the sewage and storm water that sprawling communities generate.

Milwaukee tried that approach, spending $3 billion since the mid-1990s on massive sewage storage tunnels and other gray infrastructure that was supposed to keep the Milwaukee Metropolitan Sewerage District from discharging untreated sewage into Lake Michigan.

The deep tunnel system, capable of holding 494 million gallons of sewage, reduced the volume of Milwaukee's combined sewer overflows by about 75 percent.[45] But the tunnel system was far from a complete solution, which became painfully evident in 2008 and again in 2009.

A powerful storm that drenched Milwaukee in 2008 forced the city to dump 2.9 billion gallons of untreated sewage and storm water into Lake Michigan. A year later, the city dumped nearly 1 billion gallons of untreated sewage into the lake following a summer downpour.[46]

After the 2009 storm that dumped six inches of rain on the city, Milwaukee Metropolitan Sewage District Executive Director Kevin Shafer said the district could never afford to build a system capable of handling such a deluge of water.[47]

Three months later, Shafer boldly predicted that the Milwaukee sewage district would end all combined sewer overflows and sewage backups into residential basements.

"These are radical goals but they are not impossible," Shafer said. "They can all be accomplished while still minimizing our financial liability on our customers."[48]

Achieving that goal of zero discharge of untreated sewage, Shafer said, would require embracing the practices of integrated watershed management.

Instead of relying solely on gray infrastructure to solve its sewage and storm water problems, the Milwaukee sewage district will place a greater emphasis on green infrastructure — vegetative buffers along rivers and streams, rain gardens, green roofs, tree cover, porous surfaces and fewer downspouts on homes and businesses.

The plan is essentially designed to turn a larger portion of the greater Milwaukee area into a natural sponge that uses vegetation and the soil to absorb more water.

The significance of Milwaukee's shift toward green infrastructure cannot be overstated. The Milwaukee Metropolitan Sewerage District handles sewage and flood management for 1.1 million people who live and work in an area that spans 411 square miles.

Preventing storm water from overwhelming Milwaukee's sewage system and causing sewer overflows into rivers that flow into Lake Michigan is a tall order. Every inch of rain that falls on the Sewerage District's service area equals 7.1 billion gallons of water.[49]

Planting green infrastructure to handle storm water would cost far less than building more deep tunnels to store sewage and storm water during storms.

Deep tunnels store excess storm water at a cost of $2.42 per gallon. Trees can handle storm water for 80-cents per gallon; rain barrels cost $1.94 per gallon; and constructed wetlands can store and process water for less than one penny per gallon.[50]

Gray infrastructure will continue to play a large role in handling Milwaukee's sewage. But Shafer noted that using green infrastructure to increase the natural absorption capacity of land in the Milwaukee region, and reduce the volume of storm water pouring into sewers, would make the gray infrastructure work better.

Combining the forces of gray and green infrastructure could save money and beautify Milwaukee and improve water quality in Lake Michigan.

Detroit, Mich:

Lack of Funding Forces Motor City to Think Green on CSO Control Program

The national economic collapse that began in 2008 exposed an ugly truth about outdated sewer systems that flush billions of gallons of sewage into the Great Lakes each year: many cities simply can't afford to fix the problem.

Nowhere is that more evident than in metropolitan Detroit, an area devastated by the national recession and one of the worst sources of sewage overflows into the Great Lakes.

The Detroit Water and Sewage Department collects and treats wastewater from 77 communities. In 2009, Detroit dumped 34 billion gallons of untreated sewage and storm water into the Detroit and Rouge rivers which flow into Lake Erie.[51]

In 2008-2009, Detroit and the more than three-dozen communities in the surrounding metropolitan area dumped 80 billion gallons of raw sewage and storm water into the region's lakes and rivers.[52]

Those discharges polluted the Great Lakes and its connecting waters with toxic chemicals, heavy metals, oil and grease, and pathogens that contributed to frequent beach closings in the region.

Detroit operates the largest sewage treatment facility on the U.S. side of the Great Lakes, processing between 700 million and 1 billion gallons of municipal and industrial wastewater daily. That facility has long been one of the worst sources of sewage pollution in the Great Lakes.[53]

In 2006 alone, the Detroit sewage treatment facility discharged 32 billion gallons of raw sewage and storm water into the Great Lakes.[54] Combined sewer overflows are particularly significant in Detroit, which handles wastewater from more than 250 industrial facilities.

Detroit has spent $406 million to reduce CSOs into the Rouge River. But much work remains to put an end to CSOs that foul the Detroit and Rouge rivers, as well as western Lake Erie.

Finding money to pay for that work has been daunting.

When the economy tanked, and two of the Big Three automakers went bankrupt, Detroit's unemployment rate soared to 29 percent and the flood of people and money leaving the Motor City accelerated.[55]

The rapid decline in revenue coupled with city residents not being able to afford an increase in water rates, prompted the city in 2009 to pull the plug on a $1.2 billion deep tunnel project that would have further reduced raw sewage discharges into the Rouge River. Though Detroit committed to the deep tunnel project in 1996, city officials said they would have had to raise sewer rates 16 percent to finish the job. They called that an excessive burden on city residents, many of whom were unemployed.

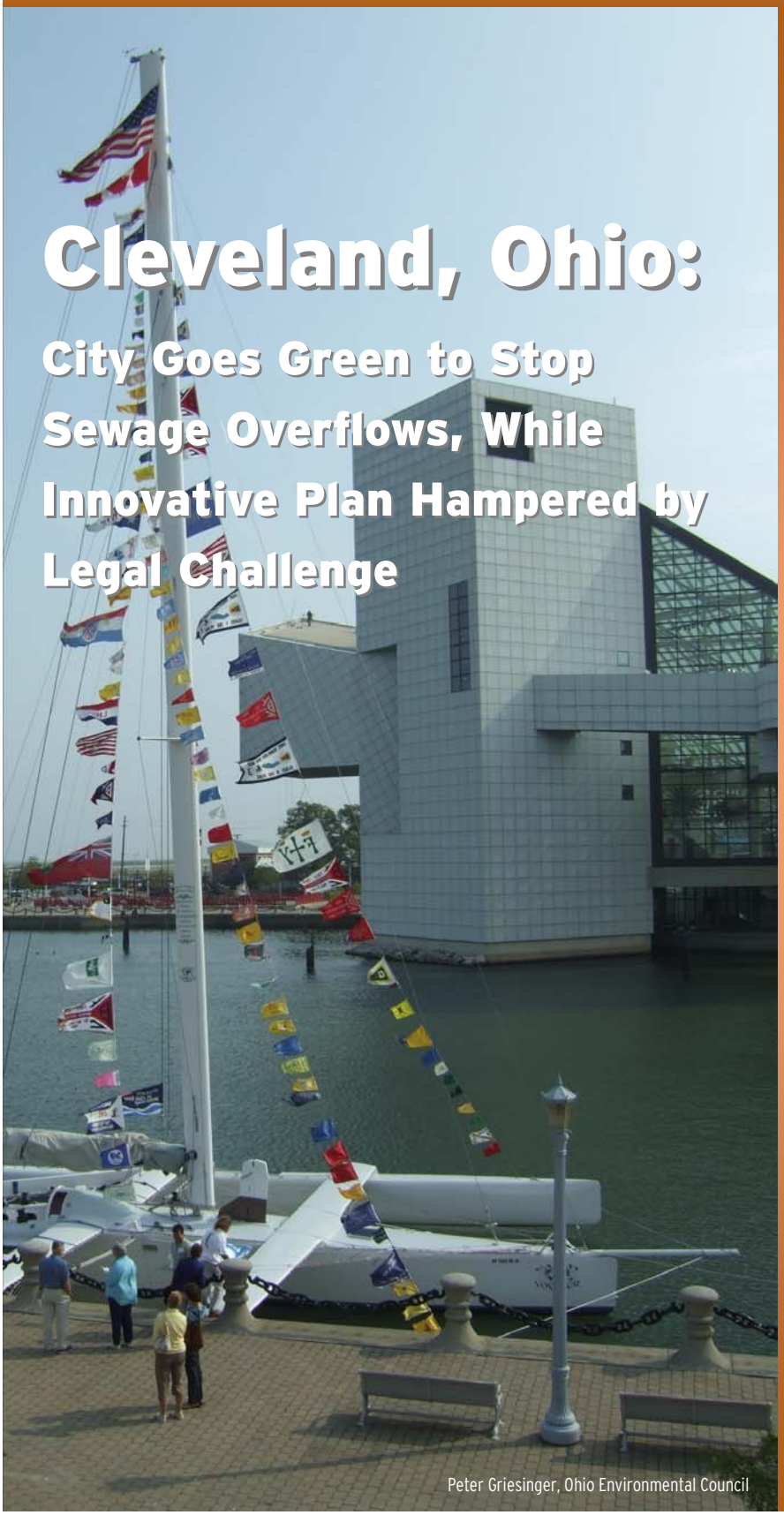
Because the CSO problem still needs to be addressed, the Detroit Water and Sewage District has drawn up a new plan that embraces both traditional and green infrastructure. City leaders estimate that investing in green infrastructure over the next 25 years could have the potential to reduce CSO volumes by 10 percent to 20 percent and achieve those gains at far less cost than the original alternative of digging massive storage tunnels.

The new plan, estimated to cost $33 million annually instead of $190 million, calls for: Building swales and tree trenches along roadways, parking lots and open spaces; disconnecting residential and municipal downspouts; demolishing vacant structures and replacing them with native plantings; and allowing for construction of smaller infrastructure solutions such as first flush capture basins.

The city established a $50 million fund for green infrastructure projects that should be completed by 2029. Sewer bills will generate the revenue to fund the projects.

Green infrastructure won't eliminate all of Detroit's CSO discharges to the Rouge and Detroit rivers. Still, by investing $50 million in green infrastructure and spreading the cost of its CSO control program over 25 years, Detroit could save nearly $4 billion in principal and interest charges.[56]

Detroit's green infrastructure program is a promising step in the right direction and has the potential to significantly reduce CSO discharges, but the city must be held to its promises.



Peter Griesinger, Ohio Environmental Council

Cleveland, Ohio:

City Goes Green to Stop Sewage Overflows, While Innovative Plan Hampered by Legal Challenge

The Northeast Ohio Sewer District, which serves Cleveland and 60 neighboring communities, is the largest sewage treatment system in Ohio. It is also the state's largest source of combined sewer overflows into Lake Erie.[57]

The sewer authority, which treats all sewage generated in a 75-square mile area, discharges about 5 billion gallons of untreated sewage mixed with storm water into Lake Erie each year.[58] There are 126 CSO outlets in the district's sewer system.[59]

The sewer district has spent nearly $1 billion in recent years to upgrade the treatment system, which has reduced the volume of its CSOs by about 4 billion gallons annually.

But much work remains to be done to eliminate the Cleveland area's storm water problem, and the sewer district officials are engaged in high stakes

negotiations and legal battles over how — and how quickly — they will solve the CSO problem.

Three government agencies — the Ohio Environmental Protection Agency, U.S. EPA and the U.S. Department of Justice — want the sewer district to solve its CSO problem over the next 20 years. Sewer district officials want 30 years to complete the work, claiming that forcing the work to be completed sooner would impose excessive rate hikes on cash-strapped citizens.

Eliminating all CSOs in the greater Cleveland area will cost about $4.3 billion.[60]

Like many communities with CSOs, the sewer district is struggling to comply with clean water regulations as federal funding for sewer projects that would help meet those standards dries up.

Local officials are trying a variety of approaches, including the use of more green infrastructure, to prevent storm water from overwhelming sanitary sewers and causing combined sewer overflows into Lake Erie. Though Cleveland's green infrastructure program is in its infancy, the region is taking steps in the right direction.

In 2008, for instance, the city of Cleveland changed its building code to permit alternative storm water management programs. Property owners can now install rain gardens, bio-swales and permeable pavement without having to obtain a zoning variance. The change has prompted some businesses to install rain gardens in parking lots.[61]

And in 2009, Cleveland Mayor Frank Jackson approved $227,000 in grants for projects that involved the installation of rain gardens, bio-swales and other activities that make the city greener.[62]

The Northeast Ohio Sewer District took a bold step in 2010 to address the storm water problem. The district approved a new storm water program — and levied fees to pay for it — to address critical flooding, erosion, water quality and CSO problems across Northeast Ohio.[63]

The sewer district planned to charge businesses, parking lot owners, homeowners, schools and churches a fee based on the amount of hard or "impervious" surface area they have, such as buildings, patios and driveways.

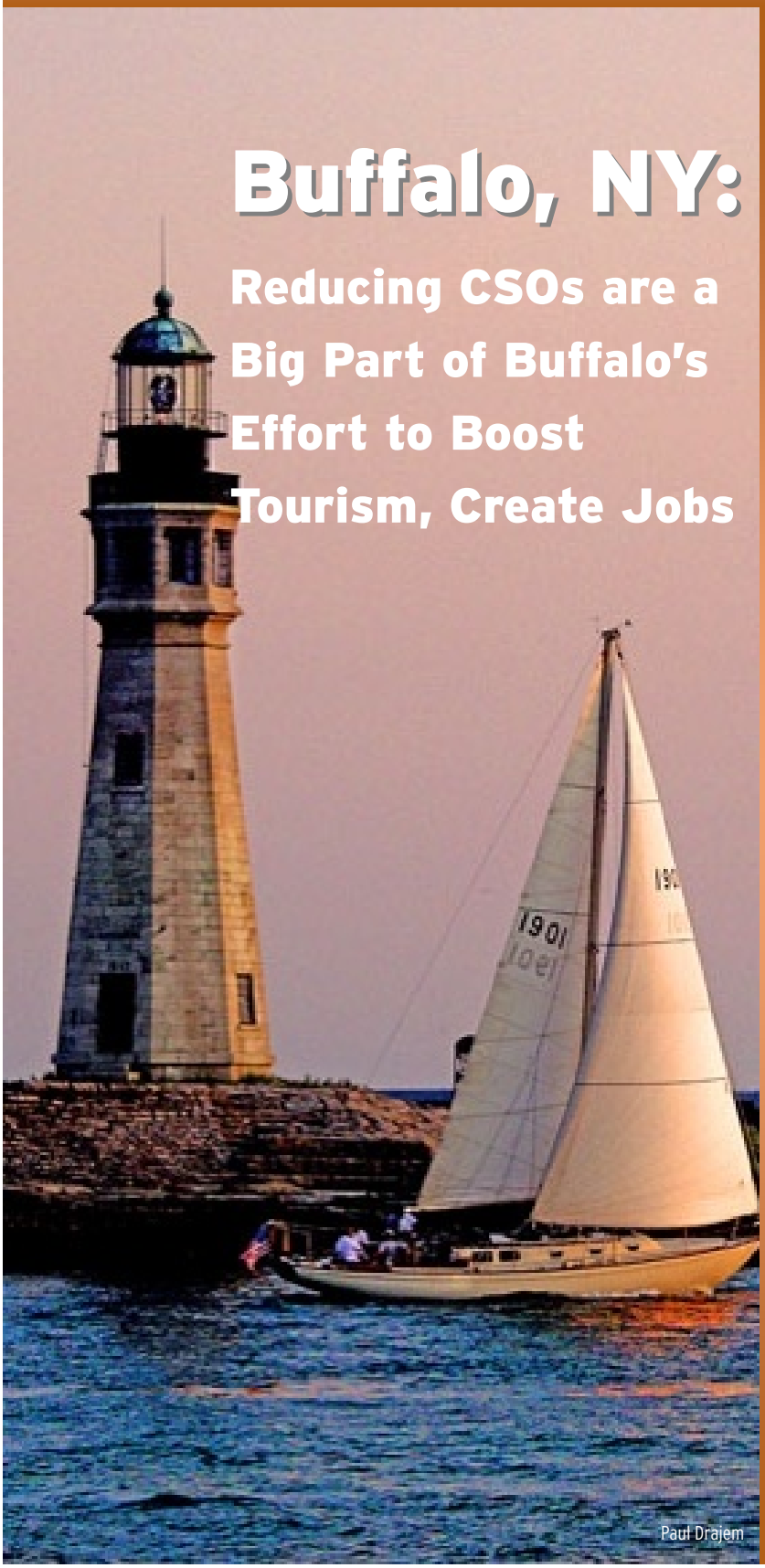
Those fees would have cost the owner of a 2,000- to 4,000-square-foot home, $4.75 per month — $57 per year. A business with a 250-vehicle parking lot, with 120,000 square feet of impervious surface, would be charged $190 per month, or $2,280 annually.

The program also offered incentives for homeowners and business owners to install green infrastructure. Homeowners could earn a 25 percent reduction on fees and businesses could reduce their fees 75 percent by installing retention ponds, swales, rain gardens and porous pavement that would reduce storm water runoff.[64]

But the program faced a legal challenge before it began.

Twenty-one business and property groups filed a lawsuit to block the storm water management fees. The groups represented builders, auto dealers and property managers — whose facilities were some of the largest sources of storm water runoff in the Cleveland area.[65]

The lawsuit could play a critical role in whether the Cleveland area moves quickly and effectively to stem the tide of storm water that is polluting the area's greatest natural resource — Lake Erie.



Paul Drajem

Buffalo, NY:

Reducing CSOs are a Big Part of Buffalo's Effort to Boost Tourism, Create Jobs

Reducing combined sewer overflows will play a major role in Buffalo's ongoing effort to reclaim its waterfront and restore the luster of a community known as the "Queen City of the Great Lakes."

Grant money will be used to improve the Hamburg Drain System, an underground network of canals that carries storm water to the Buffalo River. When rainfall overwhelms Buffalo's combined sewer system, raw sewage and storm water is discharged into the Hamburg Drain to prevent the filthy water from backing up in residential basements.

The city's combined sewers discharge raw sewage and storm water into the Hamburg Drain about 50 times per year.[66]

The problem came into focus recently when Buffalo officials reopened the Hamburg Drain and used it to re-water a part of the historic Erie Canal area known as the Commercial Slip. The Commercial Slip project was part of

a larger effort to make Buffalo's formerly industrialized waterfront a tourist attraction.

The irony was that the city's waterfront redevelopment project uncovered a historic water quality problem that polluted the Buffalo River and the lower Great Lakes.

"Visitors were shocked by the debris, trash, tree branches and human waste that entered the waterway after heavy rains," according to an article in the Buffalo News[67]

The Buffalo Sewer Authority is now working to clean up the Hamburg Drain and address the larger CSO problem in the community. The authority will install a vertical trash rack in the Hamburg Drain to keep debris and "floatables" from reaching the Commercial Slip.

The project is expected to improve water quality in the Buffalo River, bolstering efforts to make Buffalo's waterfront a magnet for tourists and create jobs.

"The Hamburg Drain is a key component to relieving Buffalo's combined sewer system during wet weather events," said Franklin DiMascio, a Buffalo Sewer Authority engineer, in a 2007 article. "The challenges of restoring the historic (Commercial Slip) terminus, contributing to industrial tourism and coordinating these efforts with the Buffalo Sewer Authority's long term (CSO) control plan are both daunting and exciting."

Despite the significance of the Hamburg Drain project, it is by no means the only work that needs to be done to halt combined sewage overflows in Buffalo. The Buffalo Sewer Authority may have to spend as much as $500 million to eliminate all CSOs in the city.[68]

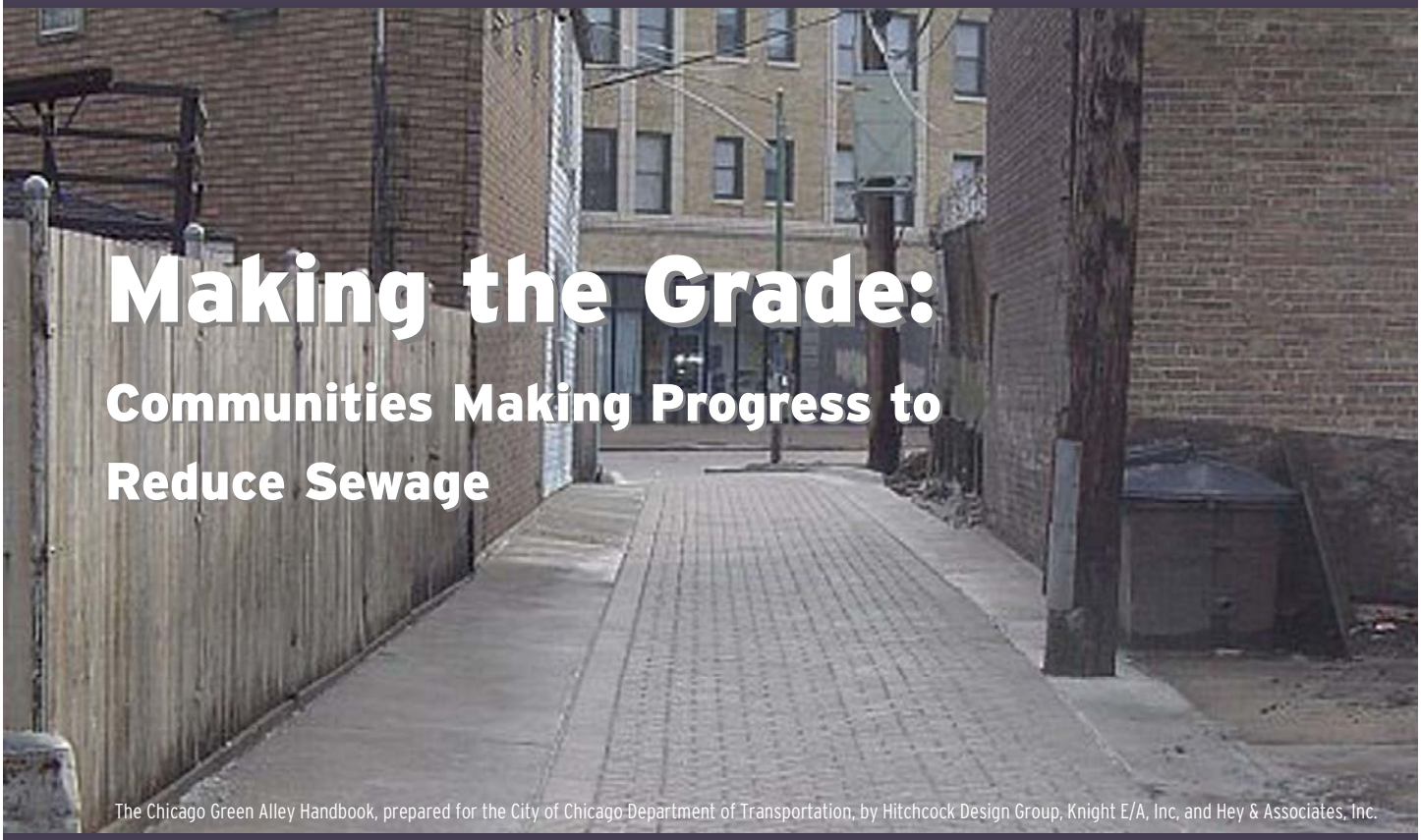
The Buffalo Sewer Authority in 2010 was negotiating a consent decree with the federal government for violations of the Clean Water Act, some of which were caused by CSOs.

Local conservation leaders, including officials at the Buffalo-Niagara Riverkeeper, want the sewer authority's plan for controlling CSOs to make a significant investment in green infrastructure.

"There has been a really strong push to get this done," said Jill Spisiak Jedlicka, Director of Ecological Programs and Buffalo River Remedial Action Plan Coordinator for the Buffalo Niagara Riverkeeper organization. "I think the sewer authority is very interested in pursuing green infrastructure projects because they could be more cost effective than gray infrastructure — they are beginning to understand that."[69]

The lack of funding is the biggest obstacle to Buffalo forging ahead with a comprehensive green infrastructure plan that would reduce water pollution, enhance community beautification and create jobs, Jedlicka said.

"If we can get storm water out of the sewer system that will be a big part of the solution," Jedlicka said.



Making the Grade:

Communities Making Progress to Reduce Sewage

The Chicago Green Alley Handbook, prepared for the City of Chicago Department of Transportation, by Hitchcock Design Group, Knight E/A, Inc, and Hey & Associates, Inc.

Around the region, cities are putting forward innovative approaches to curb CSO's. The following case studies highlight ways in which communities big and small are dealing with storm water, safeguarding public health, and upholding their way of life.

Chicago Thinking Different - THE GREEN ALLEY PROGRAM

The city of Chicago has more alleys—13,000—than any other city in the world, which has led to a difficult problem. The 1,900 miles of alleys throughout the city constitute 3,500 acres of impervious pavement that are not connected to sewer pipes. During heavy rainfall, the lack of drainage in alleys causes flooding in people's homes and exacerbates polluted runoff into Lake Michigan.

To solve the problem, Chicago opted to avoid building costly sewer pipes under the alleys. The city of 2.8 million people has long grappled with sewage overflows resulting from one of the nation's older sewer systems. In 2009, three rain events caused combined sewer overflows that sent about 413 million gallons of untreated sewage and storm water into Lake Michigan.[70] Because of such overflows, the City of Chicago is moving aggressively to reduce storm water runoff and, ultimately, prevent combined sewer overflows.

The Green Alley program is the latest in a series of efforts put forth by Mayor Richard Daley to tackle the CSO problem. Launched in 2006, the program resurfaces city alleys with permeable surfaces, such as pavers and recycled industrial materials.

Using porous pavement allows up to 80 percent of rainwater to soak into the ground, helping to reduce the risk of flooding and combined sewer overflows, according to Chicago's Department of Transportation. Porous pavement provides additional benefits as well—by allowing water to soak into the ground the majority of pollutants are filtered out of storm water before reaching the underlying aquifer.

To date, the city has converted over 100 Chicago alleys from water logged and damaged areas to dry, clean and pedestrian-friendly walkways.

These permeable surface areas are also considered high-albedo, or light in color, and are able to reflect sunlight instead of absorbing it. This helps reduce the urban heat island effect, which is responsible for increasing summertime peak energy demand, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality in many communities.

Syracuse Saving the Rain - THE GREEN IMPROVEMENT FUND

Once labeled one of the most polluted lakes in America, Lake Onondaga near Syracuse, N.Y., is continuing its recovery—in part due to a new program that encourages the communities surrounding the lake to use green infrastructure to cut down on storm water run-off.

Since signing a consent judgment in 1998, in which the county agreed to improve its wastewater infrastructure and reduce sewage discharges into the Lake, Onondaga the county has completed over 30 infrastructure projects at a cost of more than $300 million. Because of these improvements, the communities surrounding Onondaga Lake have seen significant improvements in the Lake's water quality. However, Onondaga County continues to face water infrastructure needs, which is why public officials created the Green Improvement Fund for Syracuse, N.Y.

The Green Improvement Fund offers financial assistance to citizens, businesses and companies to install green infrastructure. The grant program is part of the county's overall effort to reduce storm water runoff and improve water quality in Onondaga Lake and its tributaries, all of which fall within the Great Lakes basin.

The fund invests in projects including green roofs; bioswales; porous pavement; rain barrels and cisterns; tree trenches/tree planter boxes; and storm water planters.

In December 2009, county officials announced that more trees, plants and environmentally friendly solutions will be a large part of the new green landscape designed to manage storm water runoff naturally. Officials also announced plans to construct several large holding tanks to temporarily store runoff from overflowing sewers.

The New York State Department of Environmental Conservation Commissioner Peter Grannis announced, "This can make the Syracuse area one of the national leaders in the emerging green infrastructure movement."

Milwaukee Metropolitan Sewage District

Toledo Reconnecting by Disconnecting - DOWNSPOUT AND DRAIN REMOVAL PROGRAM

For far too long, sewage overflows were a chronic problem for the city of Toledo. In 1991, the U.S. EPA sued the City of Toledo to put an end to frequent and heavy sewage discharges into the Ottawa River, the Maumee River and many other streams feeding into Maumee Bay and Lake Erie.

The lawsuit, which carried on for 11 years, led to the establishment of a 15-year program called the Toledo Waterways Initiative, which was designed to improve the city's aging sewer system.

Since the creation of this program in 2002, the city has invested more than $158 million to upgrade its wastewater infrastructure in projects like a new wastewater treatment plant. But like any large problem, there are many solutions. To succeed, city officials understood that residents needed to get actively involved in efforts to reduce storm water runoff.

As part of this new way of thinking, a decree was put into place in 2004 that required residents to disconnect downspouts from their homes. Disconnecting a downspout might seem insignificant, but for every 1,000 square feet of roof area served by a downspout, 600 gallons of water is produced during a 1-inch rain event.

By keeping a portion of that storm water out of the sanitary sewers, residents have reduced sewage overflows and flooding; reduced basement flooding from sanitary sewer backups; lowered sewer usage rates; and reduced water used for landscaping.

Grand Rapids Transforming into a 'Sewerhero' - DISCONNECTING CSO PIPES

The city of Grand Rapids, Michigan, was long considered the poster child for combined sewer overflows in Michigan.

Now the west Michigan community is the poster child for reducing CSOs.

The city's transformation from CSO villain to CSO hero was the result of a long, costly and difficult journey. The city has spent $210 million over the past decade to reduce CSO discharges by separating combined sewer pipes.

The results have been remarkable. Grand Rapids has eliminated 59 of 66 CSO outlets and reduced the annual volume of its CSOs by 99 percent from the amounts discharged in the 1960s.[71]

In the 1960s, Grand Rapids discharged as much as 12 billion gallons of untreated sewage each year into the Grand River, one of the largest rivers flowing into Lake Michigan. The city continued to discharge up to 1 billion gallons of untreated sewage annually into the river until the early 1990s.

Discharges polluted the water, threatened the health of swimmers at popular Lake Michigan beaches and enraged people in the downstream community of Grand Haven. Critics demanded the state of Michigan impose heavy fines or halt all new development in Grand Rapids until the city stopped using the river as a toilet every time it rained hard.

In 2008, Grand Rapids discharged 217 million gallons of diluted sewage into the river — a 99 percent reduction from the annual volume discharged in the 1960s. Moreover, the 217 million gallons of diluted sewage that Grand Rapids discharged during CSO events in 2008 was disinfected before it was released into the Grand River.[72]

The city is also using green infrastructure to reduce storm water runoff and move toward its ultimate goal of being an environmentally sustainable community.

To realize this goal, Grand Rapids must do more to eliminate all CSOs. The city will spend another $100 million over the next decade to separate the last of its combined sewer pipes and eliminate the last 1 percent of its CSO discharges.

Once that work is complete, the transformation of Grand Rapids into a Sewerhero will be complete.

The Grand River and Lake Michigan — along with millions of people who rely on the waterways for recreation and drinking water — will be the beneficiaries of that change.

Milwaukee Easing into the Future – GREENSEAMS

The steady growth and expansion of the greater Milwaukee metropolitan area—an area encompassing 28 communities, more than 1.1 million people and a 420-square-mile area—has created a dilemma for the region's sewer district: How to efficiently deal with storm water to prevent flooding and combined sewer overflows when land is being developed and impervious concrete is replacing fields and forests?

To solve the problem, the Milwaukee Metropolitan Sewer District turned to a simple, yet innovative solution: purchasing land and allowing nature to absorb storm water so that it does not overwhelm municipal infrastructure.

Back to Nature: Milwaukee is purchasing land around the city to absorb storm water and prevent CSOs.

The program, called Greenseams, has made Milwaukee a leader when it comes to green infrastructure and community involvement to reduce combined sewer overflows.

Since 2002, the Milwaukee Metropolitan Sewer District has spent more than $14 million to acquire 2,000 acres of land and conservation easements, with the state DNR contributing an additional $4.25 million toward costs of the acquisitions.[73]

The program purchases undeveloped, privately owned properties in areas expected to experience major growth within the next 20 years. Purchases are focused on land which holds great potential to absorb rainwater—land near rivers, streams and springs with absorbent soils, called hydric soils. Greenseams returns hydric soils to their natural condition so that plant and animal life are able to thrive. Most importantly, converting land to its natural state creates a landscape able to absorb more rainfall and supports vegetation which acts as a natural filter of water pollutants.

Since the program began, more than 2,000 acres of land along streams and rivers has been purchased in and around Milwaukee. The land purchased is also enrolled into conservation easements, permanently protecting it from suburban sprawl, and providing people with open spaces to enjoy hiking, bird watching and other outdoor recreation.

Grayling Growing - RAIN GARDENS

The northern Michigan city of Grayling is using dozens of rain gardens to protect its most valuable community asset: the famed Au Sable River.

The Au Sable is a nationally designated "Wild and Scenic River" and is considered one of the nation's premier trout streams. However, a growth spurt in Grayling threatened to destroy the river's greatest attributes: rain and snowmelt that flowed off the surrounding developed landscape was giving the cold-water river an unhealthy dose of warm, polluted water, along with oil, grease and debris.

Warm, dirty water can be lethal in trout streams, where the delicate fish need water that is cold, clear and clean to survive.

Working with conservation organizations and the state of Michigan, the city of Grayling installed 86 rain gardens in a six-block area near the river to address the problem. The rain gardens, which span a total of 60 acres, are filtering pollutants out of 80 percent of the storm water in the affected areas of the city.

Grayling also installed seven devices in the downtown area that separate oil and grease from storm water, further reducing the volume of pollutants flowing into the Au Sable River.

Most of the funding for the pilot project came from the state of Michigan, which provided a $758,000 grant. Conservation groups contributed $142,000 and the city added another $127,000.

The result: Rain water and melting snow that flows into the Au Sable River from a large part of Grayling is cleaner and cooler, which will help sustain a magnificent river that attracts trout anglers from around the world.

Paddlers enjoying the treasured Au Sable River near Grayling, Mich.

Conclusion

Policy Recommendations

Since passage of landmark environmental laws in the 1960s and 1970s, cities, states and the federal government have invested billions of dollars to bolster the nation's wastewater infrastructure to prevent sewage from fouling our nation's waters.

The nation's water infrastructure, however, is aging and needs to be fixed.

Inadequate wastewater infrastructure is a chronic problem across the nation—including in the Great Lakes states of Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin.

Fortunately, there are manageable solutions to the problem.

The Clean Water State Revolving Fund is a successful federal program that provides low-interest loans to communities to improve wastewater infrastructure. The program invests in traditional construction projects, such as new sewers and wastewater treatment plants. The program also funds green infrastructure projects—the restoration of wetlands, the planting of vegetative buffer strips and the creation of rain gardens, for example—to deal with storm water naturally and prevent sewer overflows.

Federal funding for Clean Water State Revolving Fund, unfortunately, has not kept pace with the need of communities in the Great Lakes states and across the country.

The U.S. Congress has an historic opportunity to tackle the chronic problem of sewage contamination by boosting funding to the Clean Water State Revolving Loan Fund.

Federal Clean Water State Revolving Loan Funding Levels (in billions of dollars)

2004	$1.35
2005	$1.09
2006	$0.88
2007	$1.08
2008	$0.68
2009	$0.68
2010*	$2.1
2011	$2.0 (requested)

*$4 billion provided in the American Reinvestment and Recovery Act of 2009

Federal investment in wastewater infrastructure falls well short of the $23 billion the Great Lakes region needs to adequately deal with storm water. Congress recently has begun to increase funding to the popular Clean Water State Revolving Loan Fund.

Funding the successful program at $2.7 billion annually – Great Lakes states receive, by formula, about 36 percent of those funds – will be a shot in the arm for local communities looking to stop sewage overflows. It will also help accelerate the progress that the nation is making to restore the Great Lakes. The Healing Our Waters-Great Lakes Coalition also supports investing 20 percent of Clean Water State Revolving Fund funds towards green infrastructure.

Failure to invest in this important program will exacerbate the threat that sewage contamination poses to people, wildlife and communities. It will also cost more to fix.

Being Part of the Solution

Actions People Can Take to Reduce Storm-water Runoff

Confronting the serious problem of sewage contamination will require a robust commitment by the nation in collaboration with local and state partners. There are also steps people can take at home to deal with storm water and prevent basement backups and sewer overflows. By following just a few of these suggestions, people can save money, help their community and protect one of the greatest resources in the world, the Great Lakes, from polluted runoff.

Solutions Key

- Easy
- Inexpensive
- Potential increase in property value
- Greatly reduces personal impacts
- Potential savings in water bill
- Possibly tax credit eligible

Fix water leaks around your home

Running toilets, dripping faucets, and other household water leaks lead to 11,000 gallons of water loss every year for the average home, according to the U.S. EPA. Fixing leaks saves water, saves money, and helps prevent combined pipes from being overwhelmed.

Install a rain barrel

Rain barrels collect and store rainwater from roofs to hold storm water that would otherwise run directly into the sewer system.

Replace sidewalks, driveways and patios with permeable pavers or porous pavements

Permeable materials like pavers allow water to be absorbed into the ground and eventually the water table, reducing runoff into the sewer pipes.

Refrain from using water during heavy rain events

Using less water during rain events–refraining from showering, washing clothes or cleaning dishes–can significantly reduce the impact on local sewer systems.

Landscape with trees and native plants

Trees slow the speed or rain hitting the ground and their large root systems absorb generous amounts of water, reducing storm-water runoff. Native plants and shrubs require little to no water beyond normal rain fall.

Plant rain gardens

Rain gardens–shallow depressions, planted with native, water-loving plants and grasses–can absorb more water than a regular lawn, helping reduce run-off.

Replace water fixtures with low flow products

Converting water outlets to low-flow products can save thousands of gallons of water from entering sewer systems each year.

Disconnect downspouts

Disconnecting downspouts–which generally connect directly to sewer pipes–and redirecting the water to a rain barrel or garden can help prevent local pipes from being overwhelmed.

Install gray water systems

Grey water recycling systems lower water use and prevent overtaxing sewers by taking household water that has been used for another purpose (like washing dishes, laundry, or showering) and re-using it for a secondary purpose like irrigation.

Endnotes

[1] Data provided by the cities of Detroit, Cleveland, Gary, Milwaukee and Buffalo and the U.S. Environmental Protection Agency.

[2] "Flushing Out the Truth: Sewage Dumping in Ontario," ecojustice, June 2009.

[3] Cost numbers for Detroit: "Aging sewage systems breed record bacteria in our waters," Detroit Free Press, Jan. 19, 2010. For Cleveland: "Big bills in balance as sewer talks step up," The Plain Dealer, Sept. 26, 2009. For Buffalo: "Statement of the American Society of Civil Engineers Before the Northeast-Midwest Institute On the Need for Wastewater Infrastructure Investment for America's Urban Areas," by Maria Lehman, Aug. 15, 2008, Buffalo, NY). For Gary Ind.: Personal communication with Dan Vicari on April 26, 2010. For Milwaukee: "Milwaukee's not the worst -- or best -- lake polluter," Milwaukee Journal Sentinel, Nov. 30, 2006.

[4] Great Lakes Regional Collaboration Strategy: http://www.glrc.us/

[5] "A Screening Assessment of the Potential Impacts of Climate Change On Combined Sewer Overflow Mitigation in the Great Lakes and New England Regions," Global Change Research Program, USEPA, Washington, D.C., February 2008, p. 10.

[6] "A Screening Assessment of the Potential Impacts of Climate Change On Combined Sewer Overflow Mitigation in the Great Lakes and New England Regions," Global Change Research Program, USEPA, Washington, D.C., February 2008, pp. 6, 14.

[7] "Chicago discharges 99 billion gallons of storm water into lake," Milwaukee Journal-Sentinel, Sept. 17, 2008.

[8] "Statement of the American Society of Civil Engineers Before the Northeast-Midwest Institute On the Need for Wastewater Infrastructure Investment for America's Urban Areas," by Maria Lehman, Aug. 15, 2008, Buffalo, NY.

[9] "FY 2010 Conference Summary: Interior Appropriations," press release from conference Committees on Appropriations, U.S. Senate and U.S. House of Representatives, Oct. 27, 2009.

[10] American Rivers fact sheet, p. 2. Accessed at: http://www.americanrivers.org/assets/pdfs/Infrastructure_factsheet_12-9-086762.pdf

[11] "Global Climate Change Impacts in the United States," Thomas R. Karl, Jerry M. Melillo, and Thomas C. Peterson, (eds.). Cambridge University Press, 2009, p.120, accessed at: http://downloads.globalchange.gov/usimpacts/pdfs/climate-impacts-report.pdf

[12] State of the Great Lakes 2009 Highlights, U.S. EPA and Environment Canada. P. 10. Accessed at: http://binational.net/solec/sogl2009/sogl_2009_h_en.pdf

[13] "Climate Change and Waterborne Disease Risk in the Great Lakes Region of the U.S.," Jonathan A. Patz, Stephen J. Vavrus, Christopher K. Uejio and Sandra McClellan, Center for Sustainability and the Global Environment, University of Wisconsin-Madison, published in American Journal of Preventive Medicine, Vol. 35, Issue 5, November 2008, pp. 451-458.

[14] Ibid.

[15] "Report to Congress: Impacts and Controls of CSOs and SSOs," U.S. Environmental Protection Agency, Office of Water, Washington, D.C., August 2004, p. 4-4.

[16] "Testing the Waters: A Guide to Water Quality at Vacation Beaches," Natural Resources Defense Council, July 2009, p. 2.

[17] "Swim At Your Own Risk: Harmful Bacteria a Growing Danger at the Beach," U.S. Centers for Disease Control Data, cited in The Tennessean, Nashville, Tenn., Aug. 6, 2007.

[18] "Aging sewage systems breed record bacteria in our waters," Detroit Free Press, Jan. 19, 2010.

[19] Ibid.

[20] "Report to Congress: Impacts and Controls of CSOs and SSOs," U.S. Environmental Protection Agency, Office of Water, Washington, D.C., August 2004, p. 4-4.

[21] "Testimony of Milwaukee Mayor Tom Barrett, during "Efforts to Address Urban Stormwater Runoff," a hearing before the U.S. House of Representatives Subcommittee on Water Resources and Environment, March 19, 2009, p. 8.

[22] "Storm sewers oozing human fecal bacteria to beaches, rivers, study finds," Milwaukee Journal Sentinel, Aug. 2, 2009.

[23] Ibid.

[24] "Testimony of Milwaukee Mayor Tom Barrett, during "Efforts to Address Urban Stormwater Runoff," a hearing before the U.S. House of Representatives Subcommittee on Water Resources and Environment, March 19, 2009, p. 8.

[25] "Storm Water Solutions That Hold Water: Envisioning Green Best Practices in the Metropolitan Water Reclamation District of Greater Chicago," summary of workshop held by the Center for Neighborhood Technology, Chicago, 2007.

[26] "Burnsville Stormwater Retrofit Study," prepared for the city of Burnsville by BARR, June 2006.

[27] "Green Infrastructure: What are those kids doing over at the church and why?" powerpoint presentation by Hal Sprague, Chicago's Center for Neighborhood Technology, at the Managing Wet Weather with Green Infrastructure Conference in Toledo, Ohio, Nov. 5, 2009.

[28] Ibid

[29] Ibid

[30] Clean Watersheds Needs Survey 2008 Report to Congress fact sheet, page 2. Accessed at: http://epa.gov/cwns/2008rtcfactsheet.pdf

[31] 2008 Clean Watersheds Needs Survey, U.S. EPA, p 50

[32] Clean Watersheds Needs Survey 2008 Report to Congress fact sheet, page 2. Accessed at: http://epa.gov/cwns/2008rtcfactsheet.pdf

[33] "Clean Water State Revolving Fund Programs: 2008 Annual Report," U.S. EPA, cover sheet.

[34] "Sudden Impact: An Assessment of Short-Term Economic Impacts of Water and Wastewater Construction Projects in the United States," Clean Water Council, Arlington, VA, 2009.

[35] "Sudden Impact: An Assessment of Short-Term Economic Impacts of Water and Wastewater Construction Projects in the United States," Clean Water Council, Arlington, VA, p. 10, 2009.

[36] "Sudden Impact: An Assessment of Short-Term Economic Impacts of Water and Wastewater Construction Projects in the United States," Clean Water Council, Arlington, VA, p. 22, 2009.

[37] "Testimony of Nancy Stoner, Natural Resources Defense Council, during "Efforts to Address Urban Stormwater Runoff," a hearing before the U.S. House of Representatives Subcommittee on Water Resources and Environment, March 19, 2009, p. 37.

[38] "Region's sewer: Grand Cal faces long recuperation," Post-Tribune, March 8, 2010.

[39] "Region's sewer: Grand Cal faces long recuperation," Post-Tribune, March 8, 2010.

[40] "Grand Calumet River Area of Concern," U.S. EPA, Aug. 31, 2009.

[41] "Region's sewer: Grand Cal faces long

recuperation," Post-Tribune, March 8, 2010.

[42] Personal communication with Dan Vicari on April 26, 2010.

[43] "Grand Calumet River Area of Concern," U.S. EPA, Aug. 31, 2009.

[44] "Gary Sanitary District presentation for Relief to the Distressed Unit Appeals Board," January 6, 2010.

[45] "Fresh Coast Solutions: Weaving Milwaukee's Green & Grey Infrastructure Into A Sustainable Future," a message from Kevin Shafer, executive director, Milwaukee Metropolitan Sewerage District, accessed via: http://v3.mmsd.com/AssetsClient/Documents/sustainability/SustainBookletweb1209.pdf

[46] "Combined sewer overflow nearly 1 billion gallons Friday," Milwaukee Journal-Sentinel, June 23, 2009.

[47] Ibid.

[48] "Executive Director's 2035 Vision," by Kevin Shafer, Milwaukee Metropolitan Sewerage District, Sept. 9, 2009, accessed at: http://v3.mmsd.com/NewsDetails.aspx.

[49] "Storm Update," April 5, 2008, Milwaukee Metropolitan Sewerage District.

[50] "Fresh Coast Solutions: Weaving Milwaukee's Green & Grey Infrastructure Into A Sustainable Future," a message from Kevin Shafer, executive director, Milwaukee Metropolitan Sewerage District, accessed via: http://v3.mmsd.com/AssetsClient/Documents/sustainability/SustainBookletweb1209.pdf.

[51] City of Detroit data.

[52] "Aging sewage systems breed record bacteria counts in our waterways," Detroit Free Press, Jan. 19, 2010.

[53] "Eliminating Pollution from the Largest U.S. Sewage Treatment System to the Great Lakes," Alliance for the Great Lakes, Sept. 24, 2007.

[54] State of Michigan data, cited in "Eliminating Pollution from the Largest U.S. Sewage Treatment System to the Great Lakes," Alliance for the Great Lakes, Sept. 24, 2007.

[55] "Alternative Rouge River CSO Control Program Executive Summary," Dec. 15, 2009, Detroit Water & Sewerage Department.

[56] Ibid.

[57] "Sewage Overflow: Billions of Gallons of Sewage Contaminate Lake Erie," 2007, Environment Ohio Research and Policy Center, pp. 13-14.

[58] "Northeast Ohio Sewer District seeks compromise with EPA top keep rates down while improving system," Sept. 25, 2009, Cleveland Plain-Dealer.

[59] http://www.epa.ohio.gov/portals/35/cso/ohiocsoinventory.pdf

[60] "Northeast Ohio Sewer District seeks compromise with EPA top keep rates down while improving system," Sept. 25, 2009, Cleveland Plain-Dealer.

[61] "Cities move from grey to green infrastructure," by Mark Lefkowitz, Green City Blue Lake web site, Sept. 29, 2008, accessed at: http://www.gcbl.org/land/green-infrastructure/cities-move-from-grey-to-green-infrastructure.

[62] "58 'green infrastructure' projects move Cleveland's ReImagine study into reality," by Marc Lefkowitz, Green City Blue Lake, Nov. 11, 2009. Accessed at: http://www.gcbl.org/blog/marc-lefkowitz/58-green-infrastructure-projects-move-clevelands-reimagine-study-reality

[63] "Sewer Board unanimously approves storm water program," Water World, posted January 7, 2010, accessed via http://bit.ly/5t4qSy.

[64] "Groups file suit to stop Northeast Ohio Sewer District from charging storm water fees," March 17, 2010, Cleveland Plain Dealer.

[65] Ibid.

[66] $17 million to correct problem with sewer: Drain dumped debris into inner harbor," by Sandra Tan, Buffalo News, April 4, 2009.

[67] "Buffalo's Hamburg Drain CSO and the Revitalization of the Erie Canal," by Franklin DiMascio, Christopher Martin and Daniel Bentivogli, in Clearwaters, Spring 2007, pp. 29-33.

[68] "Statement of the American Society of Civil Engineers Before the Northeast-Midwest Institute On the Need for Wastewater Infrastructure Investment for America's Urban Areas," by Maria Lehman, Aug. 15, 2008, Buffalo, NY.

[69] Interview with Jill Spisiak Jedlicka.

[70] http://www.greatlakes.org/mwrd

[71] "City of Grand Rapids Combined Sewer Overflow Elimination Status & History," city of Grand Rapids, November 2009, accessed at http://www.grand-rapids.mi.us/download_upload/binary_object_cache/epsd_CSO%20Update.pdf.

[72] Ibid.

[73] Milwaukee Riverkeeper.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