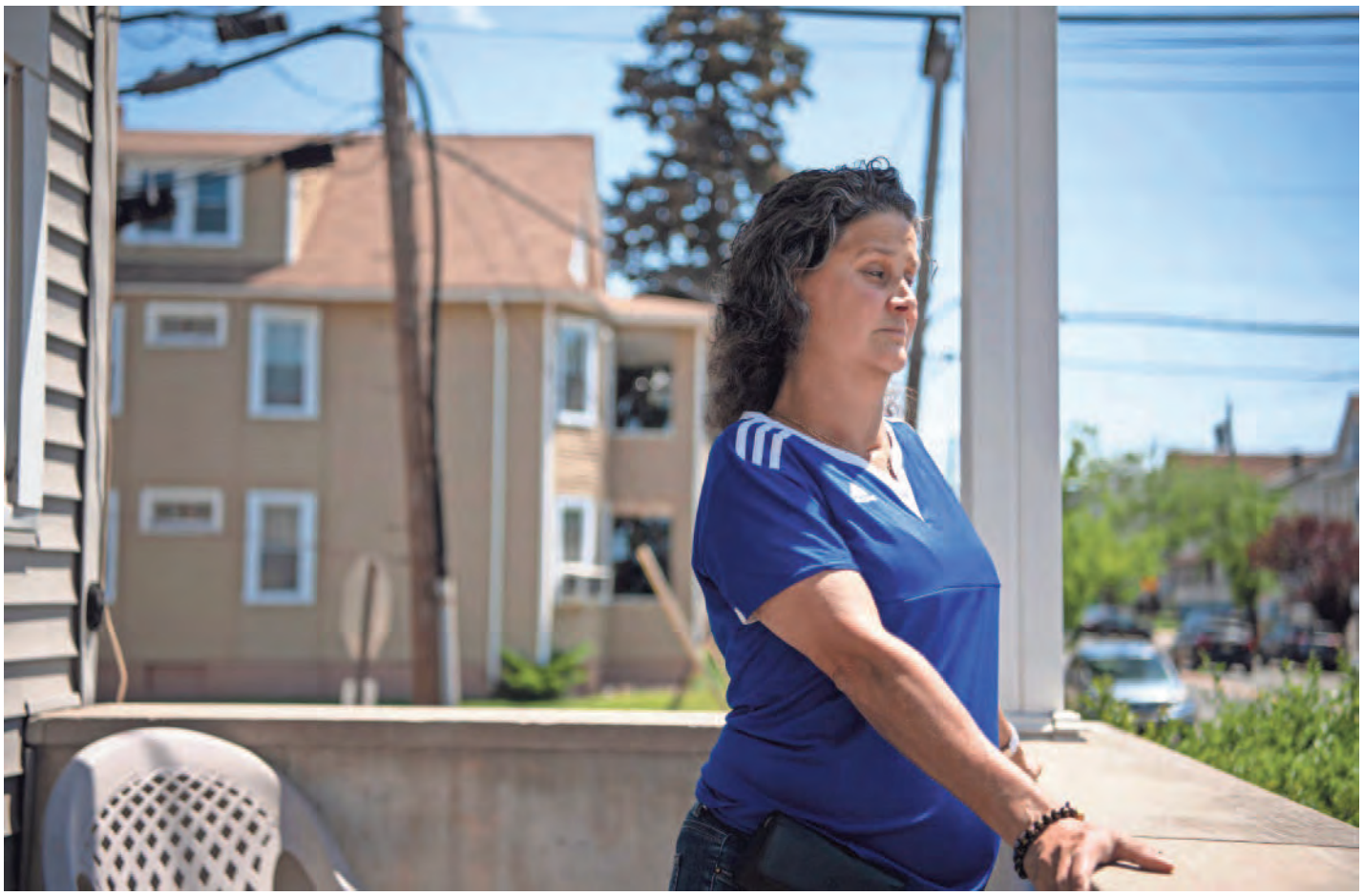
USA TODAY
THE NATION'S NEWS | $2 | TUESDAY, DECEMBER 7, 2021

DOWNPOUR A USA TODAY SPECIAL REPORT

US sewer systems weren't built for climate change



Martha Arencibia lives in Paterson, N.J., where rainwater, snowmelt and wastewater funnel into the same sewer system pipes. Her home has been flooded with wastewater when the system gets overwhelmed. MICHAEL KARAS/USA TODAY NETWORK

A 2018 storm dumped 5 inches of rain in Paterson, overwhelming the sewer system. PROVIDED BY MARTHA ARENCIBIA

Heavier rainfall can overwhelm systems, causing toxic spills in communities that can least afford it

Kyle Bagenstose and Kevin Crowe
USA TODAY

Martha Arencibia watched from her front porch in Paterson, New Jersey, as the skies unleashed a torrent of rain.

Within hours, water that started as puddles around storm drains grew into a swiftly moving current that carried vehicles away. Across Paterson, the downpour stranded drivers and flooded homes, businesses and schools. In the nearly five decades she has lived in the historic, ethnically diverse city, Arencibia had never seen such an inundation.

What she could not see was the trouble unfolding under the streets.

Paterson, like 728 other U.S. communities, has an antiquated sewage system that combines rainwater, snowmelt and toilet waste into the same pipes and then discharges it all into rivers, lakes and even homes when filled to capacity.

About this series

USA TODAY analyzed more than a century of weather data and talked to dozens of scientists about the impact of climate change on our nation's precipitation patterns. What we found is a stunning shift in the way rain and snow fall and how that affects our environment, our infrastructure and our lives. See how your community's patterns have changed at **localrainfall.usatoday.com** and read more at **downpour.usatoday.com**.

The storm that day in August 2018 dumped 5 inches of rain in Paterson. When the city's sewage system could take no more, it belched wastewater into the nearby Passaic River, as well as

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Sewers

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onto the streets and back through basement toilets.

The stench of raw sewage, Arencibia said, lasted for days.

Stretched beyond their lifespans by overdevelopment and population growth, these so-called combined sewer systems altogether spilled 850 billion gallons of raw sewage into the open waters in 2004 alone, the last time the federal government estimated it. Rife with feces, pathogens, debris and toxic pollutants, their discharges pose a risk to human health and the environment.

But now, a new threat looms as the warming planet produces heavier and more frequent storms.

USA TODAY spent a year investigating how climate change is exacerbating overflows, parsing national rainfall data and reports of spilled sewage in dozens of states and cities. It found that, across the board, communities saddled with these systems now face harder and more frequent rainfalls that can lead to even more toxic spills.

"It's not even theoretical; they're already experiencing an increase in rainfall," said Becky Hammer, deputy director for federal water policy at the Natural Resources Defense Council. "And their plans were not designed to accommodate it."

Among the investigation's findings:

- Most combined sewer systems exist in the same regions inundated with climate-driven rainfall extremes – the Midwest, Mid-Atlantic and Northeast. An analysis by USA TODAY shows that 97% of cities with combined sewers have experienced an uptick in both annual precipitation and extreme rainfall over the past 30 years.
- But the U.S. Environmental Protection Agency tracks only the number of discharges and not the amount of sewage they release, meaning it's impossible to verify how much sewage is discharged annually.
- Critics also say the EPA also has done little to ensure that cities with combined sewer systems prepare for a changing climate. Despite its own study that predicted more overflows from a warmer planet, the agency allows cities to use outdated rainfall data when planning upgrades.
- The cost of upgrading these systems often falls to those least able to afford it. Families in communities with combined sewers have disproportionately lower incomes and higher poverty rates than national averages. Expensive plans to fix combined sewers have led to a doubling or tripling of sewer rates.
- Those same cities are receiving little help from Congress, which has cut its investment in public sewer projects dramatically since the 1980s.

When it passed the Clean Water Act in 1972, Congress sought to restore the health of U.S. waterways by regulating discharges of pollutants from multiple sources. Combined sewers contribute to pollution by contaminating drinking water, befouling shellfish and contributing to algae blooms in lakes and bays.

The EPA turned its focus to combined sewers in the early 1990s, pressuring communities to upgrade their systems and reduce the number of discharges. Although many cities, like Milwaukee and Chicago, invested billions of dollars into upgrading their combined sewer systems, nearly all were modeled on rainfall patterns of the past century. Climate change could lessen the effectiveness of some of those improvements, experts say.

Detroit, for example, has already spent $1.4 billion to fix its combined sewers. But the city discharged nearly 5 billion gallons of sewage-tainted water during the last week in June when damaging storms swept across Michigan.

At a news conference, Detroit Mayor Mike Duggan expressed his frustration.

"The infrastructure in this country was built for the climate of the 20th century," Duggan said. "It was not built for what we have today."

Other communities have yet to begin fixing their combined sewers or are just getting started.

Paterson and 19 other New Jersey cities reached a deal with the state Department of Environmental Protection just last year, agreeing to spend up to $2.7 billion to stop more than 23 billions gallons of overflowing wastewater. But Arencibia's street isn't due for a fix until 2040, which would leave her vulnerable to growing deluges for nearly two decades.

"The water is getting higher," she said. "We're not addressing the situation."

While many blame the EPA and municipal officials for this problem, others trace the origins of inaction back to Congress. In 1987, bipartisan legislation cut the federal government's share of funding of sewer infrastructure from about 70% to less than 5% today.

Tony Murray, wife Leah Brown, and daughter Tierney stand outside their Northwest Baltimore home. The family has experienced numerous sewage backups through a shower and a toilet in their finished basement in recent years, costing them thousands of dollars. PHOTOS BY KYLE BAGENSTOSE/USA TODAY

That shifted the financial burden of cleansing sewage from the nation's waterways from all Americans to just the residents of those communities with combined sewer systems. And this congressional change came just as urban tax bases eroded from white flight and deindustrialization.

"If you don't have the local tax base to support and provide dollars for capital improvements, then most often they won't get made," said Marccus Hendricks, a researcher and director of the Stormwater Infrastructure Resilience and Justice Lab at the University of Maryland.

A new climate

One week in early September 2018 showed the damage that deluges can bring to combined sewer systems.

A pair of severe storm systems swept across the Midwest and Northeast, inundating combined sewer systems in small cities like Lima, Ohio; Cumberland, Maryland; and Binghamton, New York. Each city was overwhelmed, dumping a combined 330 million gallons of sewage-laden water into nearby rivers.

The cities dot a swath of the country, stretching from the Great Lakes across Appalachia and into New England, that has experienced the greatest increases in extreme rainfall events over the past 30 years.

Scientists attribute that to climate change. Higher temperatures mean the Gulf of Mexico, long a contributor of moisture that feeds the storms in those regions, is now producing even more moisture, generating more rain.

In addition, research shows that recent trends in the summertime movement of the jet stream, which moves from west to east across the country, can allow storms to slow or stall out more often over the Rust Belt, dumping even greater amounts of rain.

Across the United States, 706 of the 728 cities and towns with combined sewer systems have seen both an annual increase in precipitation and an increase in the number of extreme deluges over the past three decades, according to a USA TODAY analysis of rainfall data compiled by climatologist Brian Brettschneider and the National Oceanic and Atmospheric Administration.

Many cities already struggled for decades to keep their sewers up to date because of increased urban development and runoff. But now the increased rainfall is taxing their sewer systems with more water.

"We are seeing larger storms more frequently, and with higher intensity," said Devona Marshall, director of engineering and construction with the Northeast Ohio Regional Sewer District, which serves Cleveland. "But it's also the aging infrastructure that's out there ... and on top of it you had poor practices in development that also contribute to the problem. So it's like this perfect storm."

A warning unheeded

In the early 2000s, John Furlow was the water team leader in the EPA's Global Change Research Program, studying how climate change might degrade rivers and lakes. He and a team of scientists compiled rainfall projections and modeled how an increase in extreme rainfall could impact hundreds of combined sewer systems across New England and the Midwest.

While models for the Northeast were too uncertain, the group found that in the Midwest, climate change could push beyond infrastructure capacity, spilling more sewage into lakes and rivers.

In the worst cases, they found, the increases could nearly double, meaning a city could invest heavily to fix overflows only to see no progress. Instead, if cities based their plans on updated models or built in extra capacity, they could account for climate change at "little additional cost," the study's authors wrote.

The report, released in 2008, remains the EPA's last comprehensive document studying how climate change could impact combined sewers. In the meantime, the EPA has made no changes to its regulations. Cities still regularly use rainfall data from the 20th century when planning sewer upgrades.

Lima began negotiating with the EPA in the 1990s on a fix to its combined sewer system. But it wasn't until 2014 that the city finally agreed to a nearly $60 million plan. The majority – $40 million – was slated for a massive underground storage tank to hold 13 million gallons of wastewater and prevent it from spilling into the Ottawa River. Under last century's rainfall patterns, the design would stop all but five overflows a year. Shovels went in the ground in May 2018.

But less than four months later came the September storm that sent nearly a hundred million gallons of wastewater into the Ottawa River. The downpour was classified as a 1-in-500-year event. Just a few weeks later, another storm of the same magnitude struck the city.

To the town's longtime mayor, David Berger, it all now feels precarious. The storage tank – the largest single public works project in the city's history – came online earlier this year. It may already be obsolete.

"The frequency and the intensity of storm events is such that we may have undersized this $40 million investment," Berger said.

The EPA told USA TODAY it has taken steps to account for climate change.

In 2014, the agency updated a modeling tool with future rainfall scenarios that cities can use – but are not required to use – when planning combined sewer upgrades, a spokesperson said. The agency has also worked directly with cities on advancing climate resiliency by providing technical assistance and tools and supporting green infrastructure.

"Addressing climate change, and its impacts on water infrastructure and communities, is a significant priority for the agency," the EPA said in a statement. "Recognizing that certain portions of the country will receive both more rainfall and more intense storms, EPA has been developing tools and policies that support resilient and adaptive infrastructure."

Families underwater

Leah Brown and her family live in a red brick home in Northwest Baltimore. In the front yard, toys line a shaded front porch. In the back, cooped chickens regularly deliver fresh eggs.

But underground, a danger lurks.

When heavy rains come, the city's century-old sewer system fails. Stormwater infiltrates sewage pipes, increasing the pressure and often forcing waste back into homes.

Seven times in five years, feces have erupted from a shower and toilet into Brown's finished basement. During the worst of the floods, the high-water mark reached 3 feet up the basement's knotty-pine walls, destroying valuables, a leather couch, family photos and other mementos.

The family has paid thousands of dollars over the years addressing the problem. The expenses stymie the efforts of Brown, a special education teacher, and her husband, Tony Murray, an Amazon delivery driver, from getting ahead financially.

"The American dream is only when you're sleeping," Brown said. "Because the rest of the time you're just worried about bills."

Across the country, a review of census data by USA TODAY found the median household income in the 728 cities and towns with combined sewer systems is $45,520, compared with $67,520 nationally. The poverty rate is 50% higher than the national average.

And in the worst-hit areas – 13 large cities containing a quarter of the nation's problematic combined sewer outfalls – the median nonwhite population is 56%, compared with 39% nationally.

Experts say the problem is exacerbated by a decision made decades ago in Congress to greatly reduce the federal government's role in funding wastewater infrastructure.

For nearly two decades after the passage of the Clean Water Act, Congress assisted communities in meeting the new environmental regulation by providing $60 billion in grants for public wastewater treatment projects.

But in 1987, President Ronald Reagan argued that the federal government had met its goal and could scale back entirely. A Democratic-controlled Congress put forth a bill that phased out the grants in three years and replaced them with a program that lent funds to sewer authorities, with expectation of repayment.

The transition meant that Congress went from paying as much as 70% for major sewer projects to less than 5%.

Now, residents of cities and towns with combined sewers must foot the majority of the bill for EPA-mandated improvements. In Baltimore, sewer rates have doubled since 2012 and are expected to nearly double again by 2029, rising to an estimated $1,819 a year for a typical homeowner, according to the nonprofit Food and Water Watch.

It's a dynamic that spans the country, said Hendricks, the University of Maryland researcher.

"The case of Baltimore City is sort of reflective of the issue that we're currently experiencing in about every major, smaller and mid-size city in this country," Hendricks said. "These systems are past their prime, and decaying infrastructure is essentially all around us."

A sign warns passersby not to touch the water of Herring Run in Baltimore. The city's decrepit sewer system regularly releases sewage into the waterway and others in Baltimore during heavy rains.

Biden bills 'historic' yet not enough

Utility officials across the U.S. held out hope this year that major spending bills in Congress – the roughly $1.2 trillion bipartisan infrastructure bill and proposed $1.75 trillion Build Back Better Act – would reverse the decades-long decline in federal funds to repair sewers.

The bills together provide about $14 billion in new funding over five years that could help cities and towns address combined sewer overflows, more than double current funding.

While the National Association of Clean Water Agencies called the funding a "historic investment," the group also told USA TODAY that it's "just a drop in the bucket" toward addressing the hundreds of billions of dollars needed to upgrade the nation's combined sewers.

In response, Senate staffers who worked on the bill told USA TODAY that the funding levels reflect estimates of what could actually be spent in a given year by the EPA and state agencies. They added that a return to funding levels similar to those in the 1980s isn't feasible in the modern political environment, and that utilities need skin in the game to maintain their own infrastructure.

U.S. Sen. Tom Carper, D-Del., chair of the Environment and Public Works committee, told USA TODAY he believes the bill is "worth celebrating."

"The simple fact is a lot of families are going to have safer water systems because of our bipartisan infrastructure bill," Carper said. "We make historic investments in our nation's wastewater infrastructure and unlock the door for future improvements."

Contributing: Dinah Voyles Pulver