

Clouds loom over New Orleans.

# The Water Within

Rain poses a more regular threat than hurricanes  
in New Orleans—but it's also an untapped asset.

By EMILIE BAHR, AICP

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Water rose to more than five feet at the Franklin Avenue underpass near I-610 on August 5, 2017.

**I**T STARTED OUT AS A FAIRLY TYPICAL AUGUST SATURDAY in New Orleans: hot and steamy, with a music festival to help make summer in the subtropics a bit more bearable. Caitlin and Vanessa Shroyer-Ladeira hopped into the car with their 18-month-old son, Theo, and headed to the French Quarter to catch a little of Satchmo SummerFest. Soon it started raining. While a little rain can feel like a good omen during a New Orleans summer, when it didn't let up, the family decided to head home. Street flooding from a rainstorm a few weeks earlier had pushed water into one of their cars, so they were understandably skittish.

Their concerns were validated as they saw water rise on Esplanade Avenue, which runs along relatively high ground edging the French Quarter. As they pulled onto their street, the situation was growing dire.

They parked their car on the front lawn—the highest point available—and went inside their home, a 1950s-era slab-on-grade cottage of a sort fairly common in their working-class neighborhood near the Fair Grounds Race Course. Before long, water was seeping into the house and the couple left, wading through the waist-deep floodwater across the street to a neighbor's house, with Theo, a few essentials, and their dog and cat in tow.

"Theo was just laughing and saying, 'Water! Water!'" Caitlin Shroyer-Ladeira says. "My wife and I were crying."

They returned the next day to find their home uninhabitable, the gray water mark about six inches high. The family, who as of October was living in suburban Arabi while negotiating insurance settlements, weren't the only ones affected. The August 5

storm was no routine summer downpour. It dumped almost one-sixth of the city's annual expected rainfall tally over the span of about five hours, flooding hundreds of homes, cars, and businesses. And it's the type of weather event experts say we can expect to see more frequently.

More than a decade after Hurricane Katrina exposed the inadequacy of the federal levee system designed to keep water out, this summer's flooding underscored the threat from the water within. The retooled, \$14.6 billion levee system doesn't guard against heavy rain—a far more regular occurrence than hurricane storm surges in this city that receives more than 60 inches of rain each year.

The August event laid bare the fragility of the aging system of pipes, canals, and pumps on which New Orleans has long relied for drainage. It also underscored the inadequacies of the city's longstanding approach to managing water in this low-lying delta, whose vulnerability is compounded by the effects of subsidence, coastal land loss (which Louisiana's underfunded, \$50 billion *Comprehensive Master Plan*

for a Sustainable Coast is supposed to help mitigate), sea-level rise, and predictions of more and stronger storms in the climate change era.

### **Sinking city**

New Orleans was established in 1718 on land created over the course of several thousand years by sediment deposited through routine flooding of the Mississippi River. Early settlers populated the natural levee created by this process, building on piers and taking other steps to reign in nature.

Despite the land-building benefits of river floods, man-made levees were eventually constructed to staunch the annual deluges. Absent the regular sediment dump that accompanied the floods, the land started to sink.

By the turn of the 20th century, a complex municipal drainage system built of pumps, canals, and pipes was under development, aimed at quickly removing floodwater from the city. That system also allowed expansion of the city by making once off-limits, lower-lying swampland inhabitable. But without saturation of their highly organic, unstable soils, those former wetlands sank.

For much of the past century, the city's pump-based drainage strategy has done what it was designed to do. But New Orleans's unrelenting reliance on pumping water out (not just stormwater but groundwater, too, so that the system is better able to absorb a heavy rain), combined with the spread of impervious surfaces that hasten runoff and prevent recharge of the water table, has both exacerbated the city's susceptibility to flooding and made pumping more necessary.

Only about half of New Orleans today lies at or above sea level, says Tulane geographer Richard Campanella, a prolific researcher and author of *Delta Urbanism: New Orleans* and other works on the historic development of the city.

Based on his research, low-lying parts of the region have sunk by as much as 12 feet over the past century, helping give rise to the city's infamous bowl shape. The biggest culprit in all of this sinking is the drainage system.

"Everyone who lives in New Orleans sees the impact of poor groundwater management," said Tyler Antrup, representing New Orleans Mayor Mitch Landrieu's office at a forum at Loyola University in September. "They just don't know that's what they're seeing," he added, pointing to the city's infamously crumbling roads, listing houses, and cracking foundations.

### **Pumping alone is insufficient**

Officials overseeing New Orleans's drainage system initially said of this summer's flood that the system had simply been overwhelmed by the intensity of the storm. They later admitted it had not been working properly, and several members of the city's top brass resigned. As of October, when this article was being written, stabilization efforts and an investigation into the causes of the system's malfunction continued.

The drainage system has long been in need of a major overhaul to replace decaying equipment, but insufficient funding and other challenges have hampered repair prospects. A citizen-led task force in 2012 outlined numerous deficiencies afflicting the system, noting that it was barely capable of handling a heavy rain of the sort expected to occur annually. Its report noted that even relatively high parts of the city are susceptible to flooding from routine storms thanks to inadequate infrastructure, clogged catch basins, bureaucratic oversight, and related problems.

Most agree that a fundamentally different approach is needed to manage the city's stormwater. For a decade, New Orleans architect David Waggonner has advocated that water is an asset and should be a prominent feature of the urban landscape, rather than a nuisance hidden away by pipes and covered canals. In the wake of Hurricane Katrina in 2005, his firm, Waggonner & Ball Architects, along with APA, helped to convene a series of sessions called the Dutch Dialogues. That process brought together Dutch planners, architects, and engineers alongside their American counterparts to strategize how to improve New Orleans's urban water management by employing natural systems.

The result was the 2013 *Greater New Orleans Urban Water Plan*, developed by Waggonner & Ball and a team of water management experts. The plan, which received a National Planning Award from APA in 2015 ([planning.org/awards/2015/greaterneworleans.htm](http://planning.org/awards/2015/greaterneworleans.htm)) outlines a 50-year road map of projects and principles to reintroduce water to the landscape. In 2014, the Greater New Orleans Water Collaborative, a multisector coalition, was formed to work toward implementation.

The water plan envisions a dramatically different-looking city. Flood walls lining unsightly drainage canals are torn down, blights on the cityscape transformed into urban waterways; abandoned lots become rain gardens and bioswales, neighborhood parks that retain water and prevent flooding in storms; cratered streets and medians along the city's

many boulevards are reconfigured with permeability in mind. It's an approach, advocates say, that would reduce reliance on the city's overtaxed and resource-intensive drainage system while helping to recharge the water table, shoring up subsiding soils.

The concept of living with water rather than fighting against it is "becoming part of the common language," says Dana Eness, executive director of the Urban Conservancy, a local nonprofit that has been involved in various educational efforts around stormwater management.

There have been successes. In 2014 Jeff Hebert was hired as the city's first resilience officer—with funding and support from the Rockefeller Foundation's 100 Resilient Cities program—and was charged with focusing on mitigating the effects of sea-level rise and flooding. In 2015, the city enacted new regulations as part of its comprehensive zoning ordinance requiring commercial developments of at least 5,000 square feet to manage the first 1.25 inches of stormwater on-site.

Also that year, Landrieu's office unveiled its Resilient New Orleans strategy, which included actions on stormwater management such as implementing water plan projects and developing a program to encourage property owners to reduce flood risk by taking steps like elevating their homes and installing water-mitigation features. (That strategy received a National Planning Award, too: [planning.org/awards/2016/resilientneworleans.htm](http://planning.org/awards/2016/resilientneworleans.htm).)

In 2016, the mayor made the Office of Resilience and Sustainability permanent, keeping Hebert at the helm. The 12-person office is now responsible for many of the city's green infrastructure initiatives, and features a new job: urban water program manager, Antrup's official title.

Momentum is also building outside the corridors of City Hall. Eness says her organization can't keep up with demand for its Front Yard Initiative, a program administered with philanthropic support that pays home owners to rip up concrete in their front yards and install water-loving plants and permeable materials in its place. (She notes that the city's Board of Zoning Adjustments is also stricter than it used to be about holding property owners accountable for violating city code prohibiting paving over yards in the name of parking or reduced maintenance.)

There's more: The nonprofit Trust for Public Land is helping to develop New Orleans's first green schoolyard, designed to soak up stormwater, and has unveiled a GIS-based tool that is now in use by the resilience office to help weigh environmental and

health-related repercussions of proposed projects.

And incubator Propeller hosts an annual Water Challenge to encourage entrepreneurship and creativity around regional water woes, one of numerous initiatives now under way aimed at expanding the water-based economy through development of water-management infrastructure, coastal land preservation, and climate-mitigation strategies. Past winners include an art installation designed to teach the public about the city's relationship with water and an effort to replant storm surge-slowing cypress forests.

While the city has embarked on a number of green infrastructure projects to date, the most expansive—and expensive—of them so far is the Mirabeau Water Garden, one of several demonstration projects outlined in the water plan and one component of the Gentilly Resilience District, a collection of initiatives planned across a low-lying section of the city aimed at reducing flood risk and slowing subsidence. In a first for the city, the district will include a network of groundwater monitors, Antrup says.

The \$30 million project will convert a 25-acre former convent site to a park and water-retention and educational center that designers say will ultimately be capable of storing 10 million gallons of stormwater. Design on the project is under way, with construction expected to begin later this year. It is funded with \$12.5 million in Federal Emergency Management Agency hazard mitigation money, with the remainder covered by a \$141 million grant secured by the city through the U.S. Department of Housing and Urban Development's National Disaster Resilience Competition.

Still, some are concerned that the city isn't yet going far enough to get to where it needs to be.

"In a city like LA, earthquake proofing is standard issue. Everybody does it," says Jeffrey Thomas, a lawyer who sat on a task force that provided recommendations for reshaping the city's water systems in 2012. "It's existential. And I would say the same thing is true in the bowl. . . . Everybody needs to be constructing in such a way to be in service to flood protection."

Thomas says city leaders need to think beyond grand, one-off projects to explicitly integrate stormwater best management practices across all realms: Every public works project, street design, and private development should take stormwater into account. Despite important progress, he says this isn't happening yet. He notes, for example, that the new



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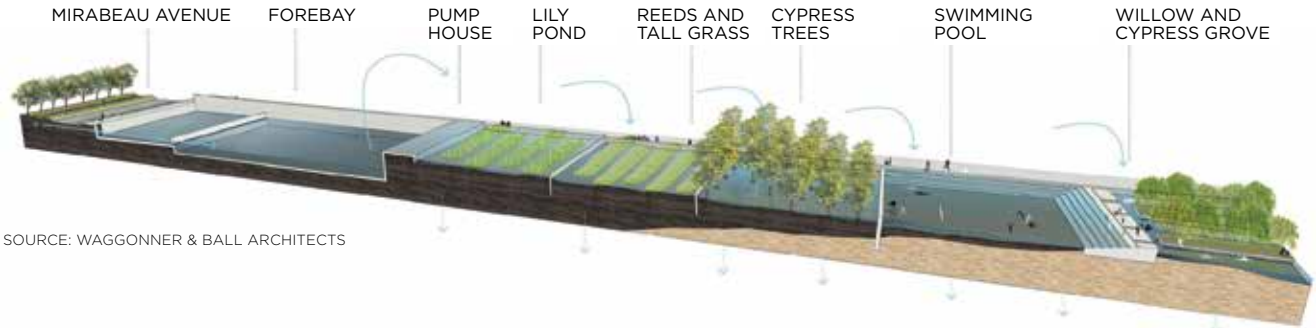
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**MIRABEAU WATER GARDEN**  
 Mirabeau Water Garden, one of several demonstration projects outlined in the water plan and one component of the Gentilly Resilience District, will work with water rather than fight it—combining the design features of a 25-acre city park (this rendering shows it during a dry period) that is also a natural filtration system to mitigate floods. Neighborhood-scale initiatives will also allow home owners to floodproof their homes.



SOURCE: WAGGONNER & BALL ARCHITECTS

**STORMWATER WORKS**

The Office of Resilience and Sustainability is also using Federal Emergency Management Agency Hazard Mitigation Grants to undertake other initiatives that aim to reduce flooding using gray and green infrastructure.

PROJECT	St. Roch Drainage Improvements and Green Infrastructure	Pontilly Stormwater Network	Hagan-Lafitte Drainage Upgrades and Green Infrastructure	Lakeview Drainage and Green Infrastructure	Drainage Pump Station 01
LOCATION	St. Roch	Ponchartrain Park and Gentilly Woods	Mid-City	Lakeview	Central City, Lower Garden District, Broadmoor (nine neighborhoods in all)
BUDGET	\$7.5 million	\$15 million	\$5.35 million	\$3.8 million	\$50 million
TIME LINE	2018	No time line determined	Under design	2018	2018 (Phase I)
GOAL	Increase underground rainwater storage capacity, add pervious parking, and install bio-retention mechanisms	Expand and beautify the Dwyer Canal and install bioretention features for streets, alleys, and vacant lots	Increase underground water storage capacity, increase permeable surfaces, and install rain gardens and other green infrastructure	Upgrade box culverts to direct stormwater out of the neighborhood and add bioretention features in alleys to capture and slow stormwater	Phase I: Expand stormwater storage capacity on vacant lots and public parks  Phase II: Replace drainage pipes and add pervious paving along streets

stormwater requirement in the zoning ordinance applies to a small fraction of city properties.

### Money, political will uncertain

One of the biggest obstacles to shifting the status quo is certain to be money. There is no source of dedicated funding in New Orleans for green infrastructure, and full implementation of the water plan—which its progenitors say would eliminate flooding from a five-year storm and substantially reduce the flooding from a 10-year event—is expected to cost upwards of \$6 billion.

It's a hefty price tag, to be certain, but one offered in a context in which there are, it has been pointed out, no low-cost options. One estimate to expand the city's existing stormwater management system to accommodate a 10-year storm came in at more than \$4 billion, not including the millions already spent each year on powering the pumps to get the water out or the problems uncovered in August.

Waggoner says even doubling the existing system's capacity would only solve 40 percent of the flooding problem while making subsidence worse.

Amid a multitude of demands on city resources and uncertainty out of Washington, D.C.—the source of much of the money to recover from and fortify against disaster to date—it is unclear where funding for stormwater improvements will come from. City drainage operations are now funded almost exclusively through property taxes, but current revenues are insufficient even to cover long-deferred maintenance and capital improvements, not to mention looming costs associated with the city's share of massive federal drainage investments post-Katrina.

One idea being floated is charging property owners based on the strain they place on the drainage system. Stormwater fees can be structured in a variety of ways, but the general concept is that owners of bigger properties with more impervious surfaces pay more for drainage. The concept has gained some traction locally, although two past attempts at adopting stormwater fees in New Orleans fell flat. That frustrates people like Antrup. "We are one of the only cities of our size in the country that doesn't have a stormwater fee," he says.

In addition to encouraging property owners to reduce runoff from their properties, such a fee could also broaden the base of users paying into the system, since it would ostensibly include educational institutions, churches, and other tax-exempt entities, which don't pay property taxes. Antrup said the city is also exploring opportunities for green bonds

and the possibility of offering developers struggling to comply with new stormwater requirements a fee-in-lieu-of-compliance option that could be put toward a green infrastructure fund.

At a public gathering on stormwater management in September, Landrieu said the residents of New Orleans will face tough choices ahead. He pointed to the August 5 flooding, which underscored the shortcomings of the power system, the renovation of which—if pursued—would likely carry a price tag "equivalent to building a new Superdome." He pledged to outline the various options available before leaving office in May, when the term-limited mayor concludes his eight-year tenure and several city council seats will also change hands.

Another unknown is whether political will for a new approach will prove sustainable into the administration of LaToya Cantrell, who was elected mayor in November, particularly given a public that hasn't always shown a keen awareness of the unique challenges confronting their city.

The August flood seems to have made some impact, however. A September poll conducted in advance of the October 14 primary found the top three issues on voters' minds heading into the election were crime, housing affordability, and flood control.

"New Orleans," Waggoner said at Loyola in September, "has for a period of time a possibility to prosper. But it doesn't have very long to get its act together. A flood, the Dutch say, is a terrible thing to waste." ■

Emilie Bahr is a planner and writer based in New Orleans.

## RESOURCES

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