

Networking urban water to adapt to a changing climate

January 24 2018, by Clare Milliken



Credit: Northwestern University

"When it comes to sustainability, I think the train left the station. We didn't do it. So now I'm more concerned with resilience and adaptation."

As chair of Northwestern's Civil and Environmental Engineering Department, Kimberly Gray has spent much of her time recently thinking about how cities can better cope with a rapidly changing

climate.

"There's nothing about the 20th century city, which North American cities so vividly exemplify, that's sustainable," Gray says. "The [city](#) is not an adaptive system under rapidly changing climate circumstances."

Nature, by contrast, is a very adaptive system, and Gray is pioneering strategies to help cities integrate nature into their [infrastructure](#). She says that only by embracing nature can cities provide vital services and deal with climate change.

"The U.S. is getting hit by extreme rain events with greater frequency," Gray says, pointing to Hurricane Harvey in Houston and the ongoing crisis in Puerto Rico following Hurricane Maria. "And what we see is that flooding carries with it a fair amount of ecological and economic damage, in addition to health hazards."

As [extreme weather](#) gets worse, innovative solutions are more urgent and necessary than ever. Yet, paradoxically, the problems we face with nature can be improved by relating to the natural world in new ways.

Green infrastructure

Gray says research shows marshes would have helped protect against the damage caused by Hurricane Sandy in 2012. These areas of low, treeless land are one of several forms of "[green infrastructure](#)" that could make cities more adaptive to a changing climate.



Credit: Northwestern University

"A marsh is not damaged by floodwater," she says. "It can very easily store floodwater. It adapts to extreme flooding and extreme dryness, without us having to do anything."

Green infrastructure uses nature to help manage water amid changing climate patterns in cities, where deteriorating pipes and undersized tunnels exacerbate flooding and [extreme weather events](#). Other green infrastructure projects could include natural grasses, prairie, streams and wetlands. Gray says integrating networks of green infrastructure—dotting highways with natural grasses or weaving streams through neighborhood yards—can help cities manage storm water in an adaptive, sustainable way. This network would complement, not replace, the existing built infrastructure of underground pumps and pipes.

Gray's research has demonstrated the benefits of installing green infrastructure networks. She and a team of students worked with a

Chicago suburb to determine the impact of installing rain gardens in homeowners' yards. These gardens work in concert with the area's pipes and drains to handle storm water. Gray and her students found that installing rain gardens in just a few yards on a given block would help that block better cope with periods of heavy rain. The more houses installed these gardens, the more flooding relief the residents would see.

Ecology and economy

Green infrastructure networks would also promote economic development, and Gray intends to prove it. She recently submitted to the National Oceanic and Atmospheric Administration a proposal to make communities along Chicago's Calumet Waterway "resilient."

"One of these communities still has prairies—a tremendous ecological resource—and I want to go to these low-income communities and build more prairies," Gray says. "Building a prairie network through these communities could help deal with flooding issues."

Installing natural grasses and waterways on otherwise decrepit or downtrodden land could also help revitalize these areas, Gray says.

"If a developer is looking for a location for some new enterprise, and the whole place is flooded, you're not going to sell the development of a particular parcel," Gray says. "But if you can show that you've got an adaptive water management system that both beautifies the community and works by itself—that's a force for economic development, social stability and educational richness."

Provided by Northwestern University

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