

By: Mike Seemuth

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## **Sea Level Rise: The City of Fort Lauderdale is taking it seriously – but often, fighting the effects of climate change can be a lonely job.**

**Periodic floods** due to the Atlantic Ocean's high tides, especially the annual king tides in fall, have become a soggy fact of life in Fort Lauderdale. In September 2015, king-tide flooding left standing water on Las Olas Boulevard and side streets for several days. Some owners of posh Las Olas shops barricaded their businesses with sandbags.

That was mild compared to damage done in October 2012 when king tides coincided with powerful waves propelled by Hurricane Sandy offshore, eroding big chunks of the city's northern beach, shattering a sidewalk, knocking down traffic signals and ripping asphalt off A1A. The street was so badly damaged that residents of the Finger Streets neighborhood just west of A1A – the only road into and out of the neighborhood – were unable to leave their homes by car for five days.

Yet we may look back on this flood-prone era as the good old days. As sea level rises, periodic flooding in low-lying areas of Fort Lauderdale could give way to permanent inundation. "What we're seeing with these tidal flooding events now could be a permanent condition going forward," says Nancy J. Gassman, assistant public works director of the City of Fort Lauderdale.

For planning purposes, the City of Fort Lauderdale has adopted a projection that sea level will rise 3 to 7 inches by 2030. "And if we look out to 2060, 2 feet of sea level rise is likely, and even higher than that is possible; 34 inches by 2060 is a possibility," says Gassman, who heads the sustainability division of the city's public works department. "This is something we live with, and we're going to have to figure out how to deal with it."

Fort Lauderdale and other municipalities are on the front line of a climate-change fight with little reinforcement, so far, from the private sector. Real estate developers essentially do what the law allows. "They're going to have their buildings built and sold and be out of there, and the problems are going to belong to the unit owners and the condo associations," says Jack McCabe, a Deerfield Beach-based real estate

analyst. "I'm worried about it myself, and quite frankly, I don't understand why the business community hasn't gotten more involved in trying to find a cure or something to remediate the problem, or delay it."

But it's wrong to assume that developments on the beach face the greatest risk from sea level rise because the beach side of the barrier island has one of the higher elevations above sea level in the entire city. All around Fort Lauderdale, land that is just a few feet higher in elevation is being noticed. Indeed, comparatively high elevation in northwest Fort Lauderdale is one reason why the Urban Land Institute has urged the city to steer more real estate development to the Cypress Creek area. Other areas fare less well in sea level rise scenarios. A map of Fort Lauderdale developed by Broward County shows that, assuming no change in the city's resilience, one foot of sea level rise would permanently inundate Birch State Park, the back of Bonnett House, and some areas along the New River. Two feet of sea level rise would put the back side of the city's barrier island and many sections of Las Olas Isles underwater.



And elevation isn't the only issue. Some areas are so paved over there is no vegetation to absorb excess water. A Florida Atlantic University study of North Beach Village, between the beach and the Intracoastal just south of Sunrise Boulevard, found that "75 to 80 percent of the area is impervious surface. That's a tremendous amount," Jeffrey Huber, an assistant professor of architecture at the FAU location in downtown Fort Lauderdale, said at a May conference on sea level rise. Used as a flood-control tool, "landscape can become infrastructure in our built environment."

Figuring out how to deal with sea level rise is a rising priority in Fort Lauderdale, which has 165 miles of canals and promotes itself as the Venice of America. But Mother Nature is a relentless opponent, and handling her excesses isn't easy.

Fort Lauderdale has equipped some storm water drainage pipes with a

device called a back-flow preventer. It operates like a valve, letting storm water flow out to sea and preventing sea water from back-flowing up through drainage pipes, flooding streets and yards. The city has installed 50 back-flow preventers and plans to install another 100 where this type of flooding occurs.

But despite these devices, low-lying streets flooded during the king tides in September 2015, because the sea topped many of the seawalls that are supposed to protect Fort Lauderdale properties. Even when the sea level subsequently receded, it remained above the level of the drainage system for a while, "and the tidal valves couldn't let the water off the streets," Gassman says. "So people were getting flooded from behind their homes and in their yards and streets."

Fort Lauderdale also has installed four storm-water pumping stations, two in Las Olas Isles and two downtown, to reduce tidal flooding when sea level rises above the storm-water drainage system. The city government also has started to develop a climate element for its comprehensive plan of development and a storm-water master plan. "Our geology is very, very porous, and during these extreme tides, we see the entire groundwater table come up," Gassman says. "It's not just that water is coming at us from the ocean; it's actually coming up from underneath."

The back-flow preventers are not perfect, but their installation is a step in the more resilient direction. The Fort Lauderdale City Commission took another step in November when it directed city staff to work on a revision of the city's seawall ordinance, which has set a maximum seawall height of 3.9 feet, but no minimum height.

A draft of the revised ordinance would turn the maximum height into a new minimum height of 3.9 feet. The revision also would include a seawall maintenance requirement for owners and fines for failure to comply, which is missing from the existing ordinance. Part of the tidal flooding in Fort Lauderdale pours through cracks in aging seawalls, and the city wants property owners to maintain their seawalls as they would their roofs.



"It's not just the sustainability division spearheading the thing. It's more of a comprehensive effort by everyone, all the employees of Fort Lauderdale, to change the culture," Gassman says. "If you're a guy who jumps into a hole to fix a pipe and it keeps filling up with water, you could start making that connection, 'Oh it's high tide. This is groundwater that's being influenced by high tide.' So that was one of the reasons to change the culture of the city."

Better awareness of climate change led city staff to notice that Fort Lauderdale's street sweepers were rusting out from the inside because of salt residue on streets from seawater that made landfall. Now the city buys street sweepers with rustproof galvanized parts that make contact with the street, extending the useful life of the sweepers to as many as 10 years from just five years when they prematurely rusted. Miami Beach has attracted national attention for its tidal flooding and its heavy investment in street elevations and pump installations. But Gassman contends Fort Lauderdale's approach to flood control has been more holistic. "Miami Beach certainly has spent more money," she says, "but I think that the City of Fort Lauderdale has spent more time in carefully planning our activities so we can deal with this challenge."

But it is an overwhelming challenge for municipal governments alone, according to several experts who spoke publicly at a conference on sea level rise in May at the Hyatt Regency Pier 66 hotel in Fort Lauderdale.

"In South Florida, it's very hard to engage the business community, which I think has to be involved to make the changes necessary to build our infrastructure," said **Wayne Pathman, managing partner of Miami law firm Pathman Lewis LLP**. Pathman, an authority on issues related to water law, said about 60 buildings are in development in Miami from NW 36th Street to south Brickell Avenue, and "none of those buildings is designed to be resilient for sea level rise because the code doesn't require it." In Florida, the building code is a state code, but "zoning codes are local," he said, "and they can be changed to build a more resilient future."

Another speaker at the conference, Mitch Chester, founding member of the Mitchell A. Chester P.A. law firm in Plantation, said the legislative and legal systems have been slow to respond to climate change. "Sea level rise is being made exponentially worse by our failure to create the human tools, the financial tools, to work on this," Chester said. Among other shortcomings, "we don't have legislation that deals with how you modify a mortgage when a property is repeatedly inundated ... We don't even have a tax code provision that deals with progressive, gradual sea level rise."

Nathalie Olijslager, counsel general of the Netherlands in Miami, put the

climate-change challenge in a doable context: “I was born and raised below sea level. We don’t politicize climate change or sea level rise. We invest in it. We’re not really afraid of it.” The Netherlands stays dry below sea level thanks largely to 22,000 kilometers of dikes, dunes and levees. But the Dutch also have designated rural zones for periodic flooding and have moved former residents of these zones elsewhere. “We actually created places where the rivers can overflow,” Olijslager says. “We had to relocate people.” In an urban twist on this concept, a public square in Rotterdam is designed to fill with storm water and clean it.

But flood-control techniques must vary based on the geographies of the places where they’re employed. Copying flood-control techniques in the Netherlands and other places wouldn’t suit South Florida because of its porous limestone geology and high groundwater table, says Anthony Abate, associate provost for Broward campuses and a professor of architecture at Florida Atlantic University. “Our hydro-geology is different here than in the Netherlands and even Louisiana,” he says.



More than just tourist attractions are at risk in Fort Lauderdale. For example, sea level rise raises questions about public safety. Fort Lauderdale fire stations all are at relatively high elevations, but many of the lower-lying areas around them are prone to floods that can block road access for fire-rescue units. Among the city’s 90-plus public parks, 23 are vulnerable to permanent inundation if sea level rises two feet by 2060 and no mitigation is undertaken. And chronic floods could do plenty of damage before 2060. The king-tide flooding in September 2015, for example, fried ground-level electrical units for lights at Riverwalk, the linear public park along the New River, forcing the city to rewire them.

Also at risk are vestiges of the city’s history and culture. Fort Lauderdale developed historically along the same low-lying waterfront areas that are subject to tidal flooding and vulnerable to permanent inundation. For example, floods linked to king tides have been pounding the Historic Stranahan House Museum. “Stranahan House is our first house. It is our cultural birthplace, and that house is starting to be regularly impacted by these king tides,” Gassman says. “It’s the conservation areas and the

more cultural areas that are lower lying, and they're being impacted."

Today, Fort Lauderdale's history is on the front lines of climate change. Tomorrow, it could be Fort Lauderdale's present.

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