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# Acknowledging sea level rise, Connecticut legislature passes sweeping climate change bill

The bill would reign in coastal development and establish new pollution targets.

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## Connecticut's vanishing shoreline: One storm away from disaster

By Jan Ellen Spiegel, CTMIRROR.ORG Updated 9:14 pm EST, Saturday, December 1, 2018



IMAGE 1 OF 223

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A garage off its foundation on Binney Lane during the aftermath of Hurricane Sandy in Old Greenwich, Tuesday, Oct. 30, 2012.

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As the 2018 hurricane season nears its official end, Connecticut can count itself lucky.

Again.

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The state has not been hit with a hurricane or tropical storm since the successive storms of Irene and Sandy in 2011 and 2012 swamped the coasts, illuminating their vulnerabilities to the effects of climate change not only from storms, but also nuisance flooding from sea-level rise.

Yes, lucky again — because a general consensus is that if either of those storms were to hit now, they would be just as damaging.

Despite the elevation of hundreds of shoreline homes, scattered improvements in drainage systems and other small infrastructure components, extensive tree trimming around utility lines, and many assessments, there have been only a few modest statewide changes to boost shoreline resiliency — a concept that may prove to be no better than a temporary fix.

The state's shoreline cities and towns, while in some cases well-intentioned, have found the process of addressing their problems slow at best and impossible at worst – with issues of money, political will and private property rights often proving insurmountable.

Lending increased urgency to the issue of Connecticut's shoreline vulnerability is the release last week of the National Climate Assessment that, among other things, details how more intense precipitation and increasing sea level rise threaten the northeast.

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None of this is lost on the experts responsible for protecting the shoreline.

"I think we've reduced risk, but could do a better job still," said Brian Thompson, director of the land and water resources division of the state Department of Energy and Environmental Protection. He cited the creation of the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) – a joint government and University of Connecticut research and funding clearinghouse, and noted the formation of the State Agencies Fostering Resilience (SAFR), an interagency workgroup.

But he acknowledged that seven years after the first storm hit, with many communities still figuring out where their problems are, shoreline risk reduction efforts have been slow and complicated by unresolved questions about who will pay for the projects.

"I don't know that any of us should feel satisfied that we've done enough," Thompson said. "I do suspect that if we get another severe storm that we'll see significant damage. We need to do more. We need to focus more. The memory fades a bit as we get further out from those storms. So we really do need to keep the attention focused and things moving forward."

### The policy of putting things back

Some communities have managed remediation designed to improve recovery time from an Irene or Sandy repeat. But with few exceptions, damaged properties are back where they once were, meaning most of them are just as vulnerable as they were, if not more so, as sea level rise creeps higher and the threat of more intense storms increases.

A big part of the problem is the federal government's flood insurance and emergency management systems, which are designed to replace what was there before a storm. It's a philosophy that confounds climate scientists and shoreline experts like Rob Young at Western Carolina University who runs the Program for the Study of Developed Shorelines – like Connecticut's.

"The biggest problem is we're still supporting development in places that are absolutely crazy to be developing," said Young. He believes very little has changed along U.S. shorelines in the last half-dozen years, including the government funding paradigms for recovery.

"It's essentially a system that is underwriting the vulnerability and the risk of investing in areas that are exposed to coastal hazards and sea level rise," he said. "People who are still building in vulnerable areas are not making bad decisions, they're making economically reasonable decisions because federal taxpayers are assuming the risk."

The Federal Emergency Management Agency (FEMA) has had a buyout program for many years, but nationally it accepts

only a fraction of applicants, instead financing rebuilding in vulnerable locations - sometimes multiple times.

While people like Young often are regarded as purists who see retreat – the “r word” as it is often called – from the coastline as the only genuine solution, they are also well aware that cities and towns are loathe to give up the taxes paid by owners of pricey waterfront property.

“Moving things does not have to be an abandonment of the coastal economy,” Young said. “If you do it the right way, it’s the best way to preserve the coastal economy.”

West Haven has been just about the only shoreline community that bought into that philosophy after homes along Old Field Creek were devastated by Irene and again by Sandy. Figuring the lost property taxes would be less than perpetual cleanup costs – to say nothing of the perpetual anxiety of homeowners – 20 of those homeowners opted for what essentially are buyouts through the Natural Resources Conservation Service of the federal Department of Agriculture, which grants floodplain easements to vulnerable homes, though not the most vulnerable ones.

But in the rest of the state, the numbers are sparse. There are fewer than a handful of additional property owners in three of Connecticut’s 24 shoreline municipalities that are doing the same as those in West Haven.

Home elevations are far more common - and often required in cases of severe damage to homes with mortgages. But with flooding from lesser storms than hurricanes and sea level rise leading to nuisance flooding, such as during high tide full moons, elevated homes may stay dry, but frequently may wind up being difficult, if not impossible, to reach.

### **Managing risk, short term versus long term**

“You’re buying time,” said Andy Keeler, program head, Public Policy and Coastal Sustainability, at the University of North Carolina’s Coastal Studies Institute, who is also an economist and a former member of climate change policy teams in the Clinton and Bush administrations. “Having said that, buying time is a perfectly good thing to do,” he added. “But you have to realize THAT’S what you’re doing.”

In the meantime, he and others say, communities have to start making longer-term decisions. But given that municipal planning cycles are generally five to 10 years, longer term climate predictions are less reliable than shorter ones, and the general taxpayer antipathy to spending public money for something they may never see means that such planning typically doesn’t get far.

Other complications come from the recognition that it’s impossible to eliminate risk, or at least do it at a price anyone or any government can afford. That leads to a battle over how much risk a community is willing to accept. And once you get into a cycle of rebuilding - with or without risk - the natural instinct is to continue to protect your investment.

Keeler and others recommend that municipalities, and even individuals, come up with a system to trigger actions on some pre-announced schedule for an observable variable – such as agreeing to rebuild a bridge until sea level rise hits a particular point. “The virtue is you’re not making anybody do anything immediately, but you’re telling the market to start to price in – ‘gee this is going sunset,’” he said.

“It gives people time to adjust. It lets the real estate market drop, but not precipitously.”

### **Baby steps**

Connecticut is taking baby steps, however. Much touted legislation passed in the last General Assembly session incorporates the sea level rise projection that CIRCA is required to report every 10 years, and which is now estimated to be about 20 inches by 2050, as a consideration for various state and municipal planning documents. But there’s no requirement to do anything other than consider CIRCA’s projection unless it involves a project in a coastal zone that receives federal or state money.

Band-Aids, said Bruce Hyde, land use educator for the University of Connecticut's Center for Land Use Education and Research (CLEAR). That's the word Hyde and others use for the kinds of solutions towns use now — elevations of building and roads, tide gates to release water, barriers around infrastructure like wastewater treatment plants, and sub stations.

Since people don't want to spend money now for something they think won't affect them, Hyde recommends the state's coastal towns start building in budget allowances for long-term sea level rise and climate-change impact remediation. This would include everything from moving gas stations or hospitals that are in flood zones to figuring out how to make up for the loss of taxes from homes that are no longer inhabitable.

"There are all sorts of questions out there that nobody seems to be paying any attention to. If this stuff is true, we really need to start dealing with it now and planning for the expense over the long term," he said. "I honestly believe it's going to take another, I don't want to say catastrophic, but catastrophic event that's going to wake people up."

### Statistics and more statistics

Statistics from various sources show there's a lot the state ought to be worried about even without another Sandy or Irene — let alone a major hurricane like this season's Michael or Florence. Any number of interactive mapping tools show large swaths of the state's shoreline that are already in flood zones, destined to be underwater in multiple sea-level rise scenarios.

The National Climate Assessment offered grim scenarios of increasing heat, drought, fire, intense storms, and floods, with pronounced economic losses for the U.S. economy as a result. The report, which was released by the Trump administration the day after Thanksgiving, is congressionally-mandated every four years.

For the northeast in particular the report focused on issues of flooding related to sea level rise and more intense rainfall, particularly in relationship to existing infrastructure that is old and inadequate, and development along the shoreline.

The report said ocean warming in the region from 2007 to 2016 was four times faster than the long-term trend, and sea-level rise projections were greater than the global average projections and could be higher than 11 feet by the end of the century in a worst-case scenario.

NOAA's 2017 State of U.S. High Tide Flooding Report and 2018 Outlook found that three of the top five cities with the highest number of flood days, and which broke records, were Boston, Atlantic City, and Sandy Hook in New Jersey. Connecticut, of course, is right in the middle of them. For places like the Long Wharf area of New Haven, built on fill in what was once a harbor, the end game could be catastrophic.

NOAA's prediction is that when this meteorological year ends in April 2019, high tide flooding will be 60 percent higher than it was 20 years ago and double what it was 30 years ago.

Using tide gauge data and information from the real estate group Zillow, the Union of Concerned Scientists calculated the risk to just shoreline homes — not commercial properties, infrastructure or anything government owned — nationwide from the kind of chronic inundation related to sea level rise. That's without storms.

For Connecticut, NOAA determined that by 2045 there will be about 4,500 homes at risk just of chronic inundation. Those homes are currently valued at nearly \$3.5 billion and contribute more than \$52 million in terms of property taxes. By the end of the century, with a high sea level rise scenario, Connecticut would be looking at about 25,000 homes at risk with a value of nearly \$15.5 billion and property taxes of more than \$252 billion.

Fairfield tops the list for both number of properties impacted and their value.

But do homeowners in Connecticut typically have flood insurance to help deal with potential catastrophes? Don't count on it. After spiking following Irene and Sandy, the number of flood insurance policies in Connecticut have dropped again.

Let's be clear — it's not that individual communities and the state are doing nothing to address the threat that climate change and sea level pose to the shoreline. (More on specific community actions in tomorrow's story.)

It's just that they aren't doing enough.

### **The home rule conundrum**

Because Connecticut is a home rule state, state government is limited in many ways in terms of what it can mandate. Local regulations on climate change resiliency or land use and other zoning policies are left to individual municipalities to determine.

For example, a number of shoreline communities are largely or entirely serviced by septic systems, not central wastewater treatment facilities. Sandy and Irene ripped many of those septic systems right out of the ground, exposing pipes, flooding them, and risking releasing sewage into Long Island Sound.

While it's clearly more efficient and effective from an environmental standpoint to get rid of septic systems, the state can't force towns or property owners to do that. The Department of Public Health, which oversees septic, also has no statewide standard for new septic systems to be able to handle sea level rise, which doesn't even have to be considered unless state funding is involved.

"They're not there yet," said Jennifer Perry, assistant director of infrastructure management at DEEP, which has to review waste systems. "As far as sea level rise, they're not saying 'add x number of feet in elevation when you site your septic system.' They really haven't tackled that yet at that level. Is it coming? Maybe."

It's been discussed, Perry said, but she doesn't expect any concerted policy consideration in the near future. Meanwhile, it's left to the towns. Perry said there are scattered individual efforts to switch some beachfront private neighborhoods to sewers, but that's about it.

"The septic systems, they're going to be underwater, there's no question about it," she said, adding that towns can make a centralized pump station resilient. "You have 1,000 septic systems. How do you address that?"

The state Department of Transportation has quietly upped its game on preparing for climate change and the potential for more intense precipitation and runoff. The state is using stricter standards to control runoff and employing green infrastructure solutions to help address the problem.

Arguably the biggest statewide change involves the state's building code and that's one area where the state - not local government - rules. Cities and towns must follow the state code, though enforcement of it is local. After years of being woefully behind in implementing the International Code Council regulations, the state has caught up, putting the 2015 building code into effect on Oct. 1 while preparing the implementation process for the 2018 code.

In doing so, the state has put in place a number of provisions that increase the resiliency of residential structures along the shoreline. New construction and renovation in vulnerable areas - especially between I-95 and Long Island Sound — will need greater wind resiliency, including impact resistant glass that can handle even higher wind speeds and stronger structural components. But if a home is just being elevated — those enhancements are not required.

"That's mission number one of things we're going to look at toward resiliency for the next code cycle," said Joseph V. Cassidy, the state building inspector.

The building code also allows individual communities to set their own standards for how high a structure has to be elevated when necessary. While most still just require FEMA's standard, known as base flood elevation, several towns require additional elevation - known as freeboard - which can mean anywhere from an extra foot to three feet, depending on the community.

George Bradner, property and casualty director with the Connecticut Insurance Department, lobbied from the time Irene hit in 2011 for more stringent standards. He called the building code changes a huge win, but wished they had gone further.

"We're taking small steps," he said. "It's just the economics. People don't want to have to spend the dollars to incur those costs." That's despite studies showing you save \$6 for every dollar spent on disaster mitigation projects.

Bradner would like to see the federal government spearhead an incentive system that offers higher reimbursement percentages to a state after a disaster if the state implements stricter climate change mitigation practices. And he wants shoreline cities and towns to begin to embrace the reality that homes and other buildings may not be able to remain close to the water indefinitely.

"There is research that shows that if towns started planning now, taking climate change into consideration, over time you can change that tax base so you're moving people away from that hazard and you're not having the severe tax effect you'd have if you did nothing," he said.

That means changing land use policies to keep new construction away from vulnerable areas. And maybe considering a radical change to flood insurance, such as a community flood policy in which a town assesses all homeowners for flood insurance that covers everyone — coupled with stronger building codes so people elevate and strengthen homes.

Homeowners who don't live in floodplains would benefit because they're the ones that pick up the tab if a community starts losing its tax base to climate change and sea level rise.

"Communities have to start looking at and considering the whole retreat discussion — they really have to look hard internally about what areas eventually they're not going to be able to say 'you can rebuild,' " Bradner said. "We haven't really addressed those hard questions because it's not politically palatable."

*Jake Kara contributed to this story.*

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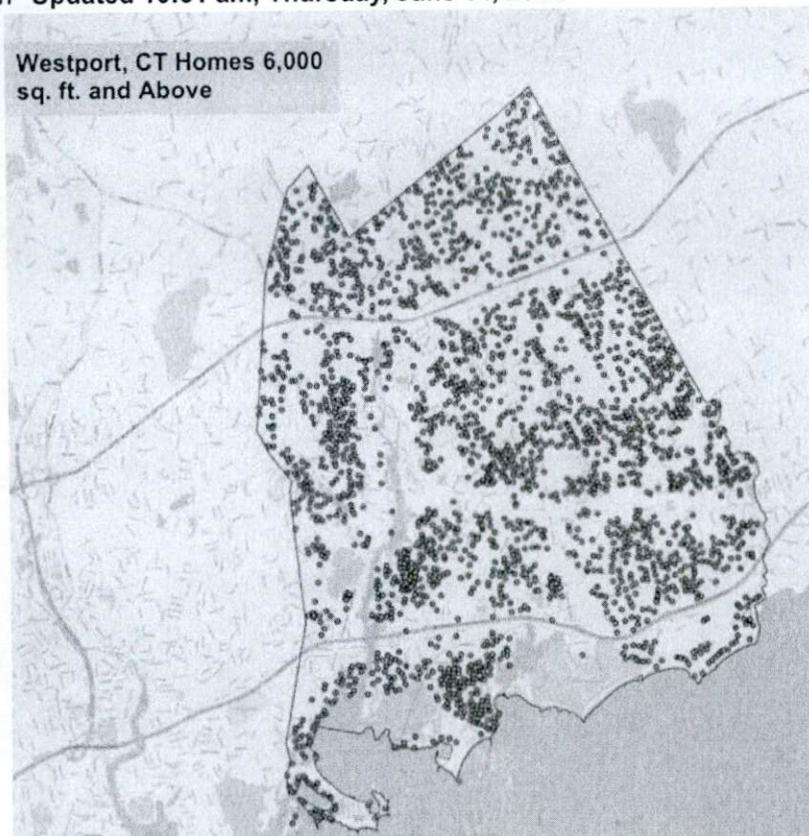
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Westport News

<https://www.westport-news.com/news/article/We-are-no-longer-able-to-protect-you-12988288.php>

## 'We are no longer able to protect you,' Westport fire union president declares

By Sophie Vaughan Updated 10:31 am, Thursday, June 14, 2018



### IMAGE 1 OF 2

In his letter to residents saying the fire department does not have enough manpower to protect town residents, Westport firefighter union President Nick Marsan included a map of Westport homes that he says are ... more

WESTPORT – There are not enough firefighters in town to properly protect Westport residents, Westport Uniformed Firefighters union President Nick Marsan said in a letter to town residents.

"As firefighters in the Town of Westport, your family's safety is our number one priority –unfortunately, we have reached a point where we are no longer able to protect you in a way your family deserves," Marsan said in a statement released to the media and on social media.



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Two of the town's fire houses — Greens Farms and Coleytown, have two firefighters, which poses a serious threat to the safety of residents and firefighters, Marsan said.

"In the event of a fire, a two-person fire engine arriving on scene would be very limited in what they can do —they would be faced with the hard choices of rescuing a trapped family member, attempting to extinguish the fire, or waiting for others to arrive—which could be many minutes later," Marsan said.

Three firefighters are needed on each engine to keep residents safe, but as the town develops and grows in population, the number of firefighters has remained stagnant, Marsan said. "The current resources given to the fire department are irresponsible and place increased risks on residents," Marsan said.

A two-person engine cannot fight a fire at the average-sized Westport home of 5,500 square feet safely or effectively, Marsan said, adding that town officials have acknowledged the danger of a two-person engine since 2007 but continuously decline to staff full crews on all of the town's fire engines.

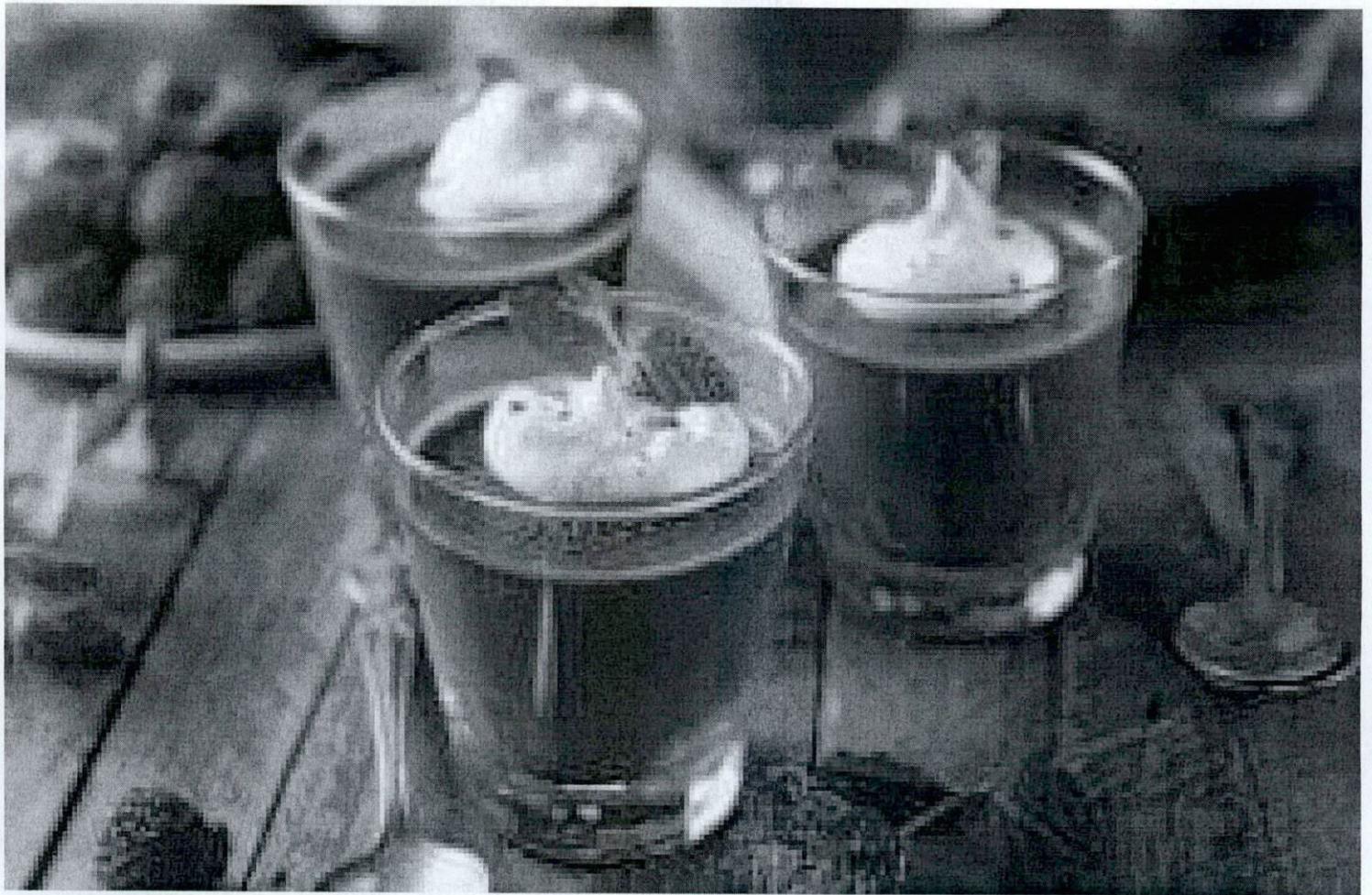
According to national standards, a fire in a 2,200 square foot house requires each engine have four firefighters on board, and the Westport department is only requesting three per engine, Marsan said.

Marsan urged residents to call elected officials, especially the First Selectman's office, to request each engine in town have three firefighters on board.

### **Town officials respond**

In response to Marsan's letter, First Selectman Jim Marpe rejected the claim Westport residents are not properly protected from the risk of fire. "I'm confident that current staffing levels and fire stations don't undermine the safety of the community. Our funding bodies have made every effort to ensure safety while being fiscally responsible and fair to all taxpayers," Marpe said.

Mutual aid agreements with neighboring communities ensure fire safety professionals have been able to respond with appropriate force and speed to all areas of Westport, Marpe said. "Over the last decade, we've had various fires but no significant injury or



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## **Chocolate Mousse** (<https://www.bluezones.com/recipe/chocolate-mousse/>)

Many recipes for plant-based chocolate mousse include melted chocolate chips for an overly sweet result...

loss of life for firefighters or residents that could have been prevented by additional staffing," Marpe said.

Meanwhile, Westport Fire Department Chief Robert Yost said he agreed with the substance of Marsan's letter and noted his department made the case ten years ago to up the department's staffing given the fire safety risks posed by town's newer and larger homes.

The fire department's staffing woes go back a decade, at least, when the town committed to adding a third person to each of town's four firehouses but then reneged on the plan when the economic downturn hit, Yost said.

The town said union firefighters pension and retirement benefits were so expensive that the town could not support adding more staff, Yost said. Now that the firefighters union recently negotiated a new pension plan with the town that included concessions on the firefighters side, especially for new members, Yost said union members are frustrated the town hasn't moved forward on its decade-old promise to up staffing, especially because Westport's peer towns, such as Greenwich, Fairfield, and new Canaan all have a minimum of three person staffing per firehouse.

Nonetheless, Yost acknowledged the town has finite resources that it needs to balance. "The whole job of firefighting is very labor intensive and expensive. It's not cheap, so the town has to weigh where it puts its resources," Yost said.

Board of Finance Chairman Brian Stern reiterated the town's need to staff with an eye towards both safety and fiscal security. "There will always be a case to spend more money, buy more equipment, do more training, buy more personnel, but there's a balance there," Stern said, adding, "Overall our fire department is excellent."

The majority of town's in the state have volunteer fire department's but Westport has a fully-paid professional firefighter workforce, which has a high rating from third party insurance rating agencies, Stern said. "For those people who think the fire department is somehow deficient in terms of safety, I think they should think again," Stern sai.

*svaughan@hearstmediact.com; 203-842-2638; @SophieCVaughan1*



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SEPTIC SYSTEM EVALUATION SUMMARY

Street	Likelihood of available reserve area	Incidence of Repairs		Suitability of Soil for Septic System		Sum of Values* (weighted)	Sewer Need	
	Value	Value	Value	Value				
Abbotts Lane	low	5	low/moderate	2	low/moderate	4	21	moderate/high
Acorn Lane	low	5	low	1	low/moderate	4	19	moderate/high
Adams Farm Road	low	5	low	1	low	5	22	moderate/high
Allen Lane	low	5	low	1	low/moderate	4	19	moderate/high
Alpine Lane	low	5	moderate	3	high	1	14	moderate
Ambler Road West	low	5	low	1	low	5	22	moderate/high
Anchor Lane	low	5	moderate/high	4	low	5	28	high
Angora Road	low	5	high	5	high	1	18	moderate
Bayberry Commons	high	1	low/moderate	2	high	1	8	low/moderate
Bayberry Lane (Cross to Long Lots)	high	1	low/moderate	2	low/moderate	4	17	moderate
Baywood Lane	high	1	none	0	high	1	4	low
Bedford Drive	low	5	low/moderate	2	high	1	12	low/moderate
Belaire Drive	low/moderate	4	low	1	high	1	9	low/moderate
Black Birch Road	low/moderate	4	none	0	low/moderate	4	16	moderate
Blue Coat Lane	low	5	low/moderate	2	low	5	24	moderate/high
Bradley Lane	low	5	low	1	low	5	22	moderate/high
Breezy Knoll	low	5	low	1	high	1	10	low/moderate
Brookside Drive	low/moderate	4	none	0	low/moderate	4	16	moderate
Bulkley Avenue (Post to Old)	low	5	none	0	low	5	20	moderate/high
Burr Farms Road	low	5	low/moderate	2	low	5	24	moderate/high
Burnitts Landing	low	5	low	1	low/moderate	4	19	moderate/high
Calumet Lane	low	5	none	0	high	1	8	low/moderate
Calumet Road	low	5	low	1	high	1	10	low/moderate
Canning Lane	low	5	low/moderate	2	low	5	24	moderate/high
Carlos Place	low	5	low	1	low	5	22	moderate/high
Carolyn Place	low/moderate	4	low/moderate	2	low	5	23	moderate/high
Center Street (Morningside S. to Hillandale)	low	5	low	1	low	5	22	moderate/high
Center Street (Lazy Brook to Greens Farms)	high	1	low	1	low	5	18	moderate
Charbeth Lane	low/moderate	4	low/moderate	2	low/moderate	4	20	moderate/high
Cherry Lane	low	5	none	0	low	5	20	moderate/high
Chic-a-dee Lane	low	5	low	1	low	5	22	moderate/high
Church Street North	low	5	low	1	low/moderate	4	19	moderate/high
Clover Lane	low	5	low/moderate	2	low	5	24	moderate/high
Cobble Hill Road	low	5	low/moderate	2	moderate	3	18	moderate
Colonial Road	low	5	none	0	low	5	20	moderate/high
Compo Road North	low	5	low	1	high	1	10	low/moderate
Cottage Lane	low	5	none	0	high	1	8	low/moderate
Country Lane	low	5	none	0	high	1	8	low/moderate
Country Road	low	5	low	1	high	1	10	low/moderate
Court of Oaks	low	5	low	1	low	5	22	moderate/high
Cricket Lane	low	5	none	0	moderate	3	14	moderate
Cross Highway	low/moderate	4	low	1	low/moderate	4	18	moderate
Darbrook Road	low/moderate	4	low	1	low	5	21	moderate/high
Davenport Avenue	low	5	low	1	high	1	10	low/moderate
Davis Lane	low	5	none	0	low	5	20	moderate/high
Debra Lane	low	5	none	0	high	1	8	low/moderate
Deerwood Lane	moderate	3	moderate	3	low/moderate	4	21	moderate/high
Deerwood Road	low/moderate	4	moderate	3	low/moderate	4	22	moderate/high
Dorchester Drive	low	5	low	1	low/moderate	4	19	moderate/high
Dover Road	low	5	low	1	high	1	10	low/moderate
East Main Street (Post to Whitney)	low	5	none	0	moderate	3	14	moderate
East Meadow Road	low/moderate	4	none	0	low	5	19	moderate/high
Echo Lane	low	5	low	1	low	5	22	moderate/high
Edge Hill Lane	low	5	low	1	high	1	10	low/moderate
Elizabeth Drive	low	5	low	1	low	5	22	moderate/high
Elmwood Road	low	5	low/moderate	2	high	1	12	low/moderate
Elwil Drive	low	5	none	0	low/moderate	4	17	moderate
Eno Lane	high	1	low	1	high	1	6	low
Evans Court	low	5	none	0	low	5	20	moderate/high
Evergreen Parkway	low	5	low/moderate	2	high	1	12	low/moderate
Fernwood Road	high	1	low	1	low/moderate	4	15	moderate
Ferry Lane	low	5	low	1	moderate	3	16	moderate
Ferry Lane West	high	1	none	0	low	5	16	moderate
Field Crest Road	low/moderate	4	low/moderate	2	low/moderate	4	20	moderate/high
Forest Drive	low/moderate	4	low	1	low	5	21	moderate/high
Fox Run Lane	high	1	low	1	low/moderate	4	15	moderate
Fragrant Pines Court	low	5	low	1	low	5	22	moderate/high
Gilbert Lane	low	5	none	0	moderate	3	14	moderate
Gillette Circle	low	5	low/moderate	2	high	1	12	low/moderate
Godfrey Lane	low	5	low/moderate	2	high	1	12	low/moderate
Gorham Avenue (Evergreen to Compo)	low	5	low	1	low	5	22	moderate/high
Gorham Island Road	high	1	none	0	low	5	16	moderate
Greens Farms Road (Hills Point to Center)	low/moderate	4	low	1	moderate	3	15	moderate
Greens Farms Road (Woodhill to Westway)	low/moderate	4	low	1	high	1	9	low/moderate
Greenwood Lane	moderate	3	low/moderate	2	high	1	10	low/moderate
Grist Mill Lane	low	5	low	1	low	5	22	moderate/high
Gudzik Court	low	5	low	1	moderate	3	16	moderate
Hawthorne Lane	high	1	none	0	low/moderate	4	13	moderate
Heather Hill	low	5	low	1	low/moderate	4	19	moderate/high
Henhawk Lane	low	5	low	1	high	1	10	low/moderate
Hiawatha Lane	low	5	none	0	high	1	8	low/moderate
Hickory Drive	low	5	none	0	low	5	20	moderate/high

\* Sum of Values (weighted) = (Likelihood of reserve area) x 1 + (Incidence of repair) x 2 + (Suitability of soil) x 3

# The Places that are Most At Risk to Rising Sea Levels in America

July 09, 2018

On one hand, living near the sea has a host of obvious advantages. You can walk to the beach, soak in unparalleled ocean views from your balcony, or maybe even take up a coastal hobby like boating or surfing.

On the other hand, your house could flood or be demolished entirely by nature. Hurricanes, tidal waves, and tropical storms have long made living by the beach almost as risky as it is pleasurable.

But with global warming and the long documented trend (<https://climate.nasa.gov/vital-signs/sea-level/>) of rising sea levels, there's a new risk for owning a home by the sea: your plot of land will simply become part of the seascape and never be habitable again.

With some of the most populated and desirable locations in America located near the sea, just how many people will be displaced when the sea levels rise?

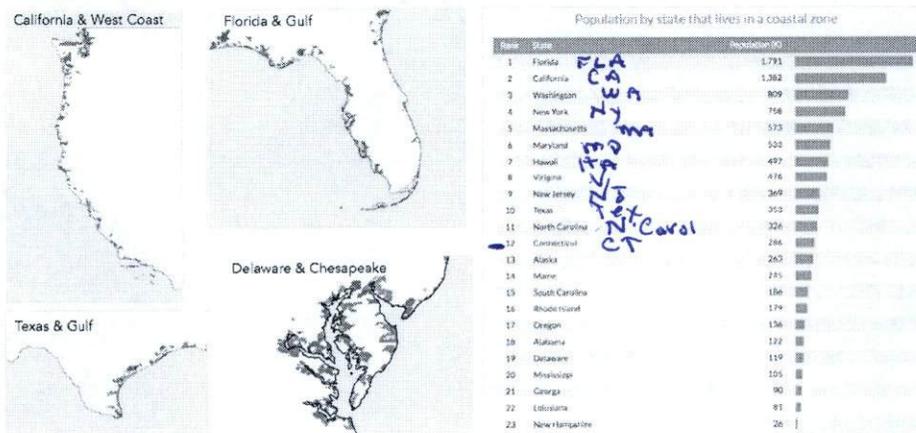
We decided to analyze how many people in America live near the sea to see where devastation from rising sea levels will be the greatest. We started with the United States Census data (<https://www.census.gov/geo/maps-data/maps/2010tract.html>) on coastal tracts of land, and calculated which of these zones were most populated in areas likely to be vulnerable to rising sea levels. We also looked at how much homes cost in these zones and how much home insurance premiums cost.

The state with the most people living in coastal zones susceptible to rising sea levels is Florida, where almost 1.8 million people live near the water. The US cities most at risk to global flooding are New York, Seattle and San Francisco, the nerve centers of the financial and technology industries.

However, the two areas with the most expensive properties that are at risk to rising sea levels are both in Connecticut: Riverside and Darien are both high risk zones where the median home costs almost \$2 million. Lastly, though homeowners insurance does not typically cover flooding, comparable home owners insurance is much more expensive closer to the sea, especially in Texas.

To begin we looked at which states have the most people living in coastal zones near the sea. These are the states with the most homes potentially at risk to rising sea levels:

## The States & Places Most at Risk to Rising Sea Levels



**GAVOP**

23 of the 50 states in America have some level of their population living in coastal zones. Florida, however, has by far the most people living in areas that could flood with rising sea levels.

Since the state is a peninsula surrounded by the Atlantic Ocean and the Gulf of Mexico, much of the development is near the beaches. California and Washington, both of which abutt the Pacific ocean rank as the places with the second and third most people at risk to rising sea levels. The map above highlights the challenging geographies of these places with high population levels living in coastal zones.

Diving deeper into the data, which cities are most populated in places where the sea levels may someday rise?

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# The Cities Most At Risk to Rising Sea Levels

Population by city that lives in a coastal zone

Rank	Place	Population (K)	Rank	Place	Population (K)
1	New York, NY	364	26	Quincy, MA	32
2	Seattle, WA	104	27	Lynn Haven, FL	31
3	San Francisco, CA	82	28	Long Beach, CA	31
4	Corpus Christi, TX	78	29	Boston, MA	30
5	St. Petersburg, FL	73	30	Homeslead, FL	30
6	Tampa, FL	69	31	Bellingham, WA	30
7	Anchorage, AK	66	32	Miway, FL	30
8	Miami, FL	62	33	Niceville, FL	29
9	San Diego, CA	53	34	Clearwater, FL	29
10	Virginia Beach, VA	51	35	Santa Monica, CA	29
11	Los Angeles, CA	49	36	Stamford, CT	28
12	Norfolk, VA	47	37	Monterey, CA	28
13	Miami Beach, FL	43	38	Tacoma, WA	27
14	Newport News, VA	42	39	Half Moon Bay, CA	27
15	Baltimore, MD	42	40	Hampton, VA	26
16	Huntington Beach, CA	42	41	Santa Cruz, CA	25
17	Alameda, CA	41	42	Key West, FL	25
18	Galveston, TX	41	43	Fort Walton Beach, FL	25
19	Camp Pendleton, CA	41	44	Millford City, CT	24
20	Panama City, FL	36	45	Oxnard, CA	24
21	Laguna Beach, CA	35	46	Salem, MA	24
22	Santa Barbara, CA	34	47	Mount Pleasant, SC	24
23	Long Beach, NY	34	48	West Haven, CT	24
24	Texas City, TX	33	49	Baytown, TX	24
25	Warwick, RI	32	50	Everett, WA	23

Data source: US Census coastal zone tracts

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New York City, a place completely surrounded by water has 346K people living near the coast. Some of the most notable cities in America will be hugely impacted by global warming if projections of higher sea levels hold true: Seattle (<https://www.gavop.com/hi/11519-seattle-wa/>), San Francisco (<https://www.gavop.com/hi/10174-san-francisco-ca/>), St. Petersburg (<https://www.gavop.com/hi/11619-st-petersburg-fl/>), Miami (<https://www.gavop.com/hi/157-miami-fl/>), and San Diego (<https://www.gavop.com/hi/7089-san-diego-ca/>) all make the top ten list of flood-risk cities.

From the prior list, one can't help but notice that many of these places that are vulnerable to elevated sea levels are also desirable places to live and as a result have expensive real estate. To investigate further, we next looked at which places in coastal zones had the most expensive median home prices.

# The Cities with the Most Expensive Homes with Flooding Risk

Price of homes in flood prone areas

Rank	Place	Median Home Value (\$K)	Rank	Place	Median Home Value (\$K)
1	Riverside, CT	\$1,924	26	Mill Neck, NY	\$1,238
2	Darien, CT	\$1,850	27	Stinson Beach, CA	\$1,236
3	Topanga, CA	\$1,838	28	Sea Girt, NJ	\$1,227
4	Belvedere, CA	\$1,739	29	Sullivan's Island, SC	\$1,218
5	Ole Greenwich, CT	\$1,732	30	Hermosa Beach, CA	\$1,216
6	Kings Point, NY	\$1,725	31	Burlingame, CA	\$1,212
7	East Hampton, NY	\$1,635	32	Stone Harbor, NJ	\$1,191
8	Palos Verdes Estates, CA	\$1,611	33	Rye, NY	\$1,182
9	Newport Beach, CA	\$1,548	34	Sausalito, CA	\$1,182
10	Strawberry, CA	\$1,524	35	Great Neck Plaza, NY	\$1,179
11	Oyster Bay Cove, NY	\$1,518	36	Sands Point, NY	\$1,166
12	Kailua, HI	\$1,516	37	Southampton, NY	\$1,166
13	Malibu, CA	\$1,509	38	Carmel-by-the-Sea, CA	\$1,148
14	Manhattan Beach, CA	\$1,479	39	Corte Madera, CA	\$1,128
15	Coronado, CA	\$1,447	40	Coral Gables, FL	\$1,127
16	Laguna Beach, CA	\$1,434	41	Westport, CT	\$1,123
17	Manalapan, FL	\$1,383	42	Hewlett Bay Park, NY	\$1,097
18	Lloyd Harbor, NY	\$1,373	43	Santa Barbara, CA	\$1,096
19	Kentfield, CA	\$1,353	44	Dillon Beach, CA	\$1,092
20	Plandome, NY	\$1,333	45	Seal Beach, CA	\$1,090
21	Spring Lake, NJ	\$1,314	46	Del Monte Forest, CA	\$1,070
22	Rancho Palos Verdes, CA	\$1,287	47	Fisher Island, FL	\$1,063
23	Bay Head, NJ	\$1,279	48	Larchmont, NY	\$1,061
24	Key Biscayne, FL	\$1,274	49	Los Angeles, CA	\$1,061
25	Bridgehampton, NY	\$1,243	50	Avalon, NJ	\$1,061

Data source: US Census coastal zone tracts

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Riverside, Connecticut (a section of the town Greenwich and near New York City) has the most expensive homes in America that are at risk to flooding.

The case of Riverside illustrates a common phenomenon that takes place when governments try to regulate building in flood zones: the residents fight back against the added cost (<https://www.greenwichtime.com/local/article/Residents-push-back-against-flood-zone-regs-5153455.php>). Even with some of the most expensive homes in the world at risk, residents of Riverside and Old Greenwich have fought against new zoning laws requiring homes to become compliant with best practices like raising the homes above levels of flooding.

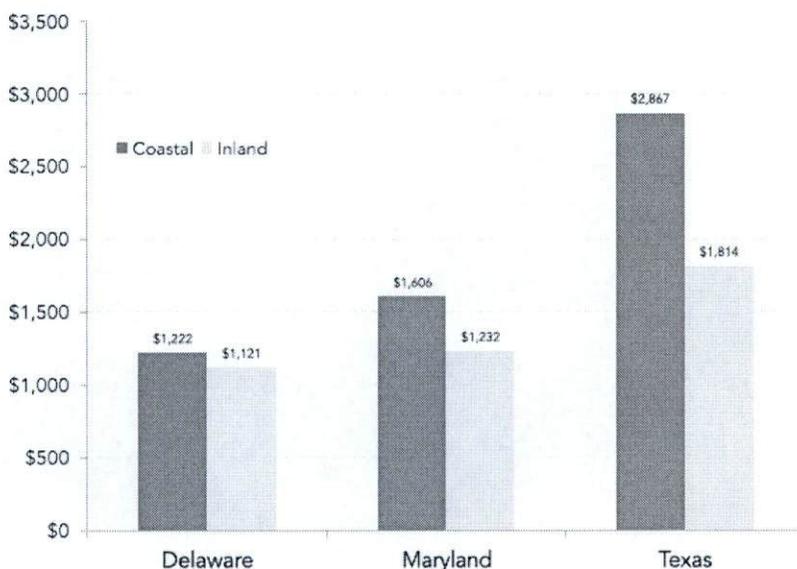
Many of the most expensive suburbs of California, New York and Los Angeles have homes at risk to rising sea levels. For many years, people have paid a premium to live in such beautiful locations like Malibu or East Hampton, but with global warming the homes are now face an ever present risk of flooding.

We decided to investigate further to see if the insurance markets are somehow pricing for the risk of rising sea levels. It's important to note that homeowners insurance does not cover flooding (that's a different policy typically sold through the government). Nevertheless, are homes near the coast riskier from the insurance companies perspective?

The chart below shows the annual homeowners insurance premium in Delaware, Maryland and Texas for homes that are inland versus on the coast.

### Homeowners Insurance is More Expensive on the Coast

Average annual premium of coastal vs inland homes for comparable policies



Note: Comparable home price for Texas \$200K, for Delaware \$350K, for Maryland \$400K

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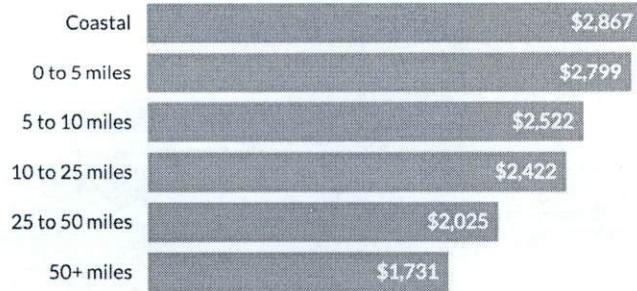
In each of the states, but particularly Texas, the home owners insurance policies are more than twice as expensive on the coast than inland.

Because there was such a discrepancy in prices in Texas, we decided to dig further. As a next step, we analyzed at homes that were valued at \$200K and looked at their annual homeowners premium depending on how far away from the coast the home was.

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**Home Insurance Premiums in Texas Are General More Expensive Near the Coast**

Home insurance premiums by distance to the coast



Data source: US Census coastal zone tracts

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Even for homes of the same value, the cost to insure the home drops significantly the further you are from the coast. While a home in a coastal zone costs \$2,868 to insurance, one that is 50 miles or more away costs just \$1,731, a savings of 40%.

America's coastline offers us great opportunities for leisure and enjoyment, but increasingly greater risks.

While hurricanes and storms have always posed a threat to coastal cities, those threats are becoming more frequent and severe (<http://www.climatecentral.org/news/study-projects-more-frequent-and-stronger-hurricanes-worldwide-16204>). Not only that, but in the not so distant future some of the most beautiful (and expensive) real estate in America may be eviscerated by rising sea levels. These rising sea sea levels may affect all Americans in one way or another, but they'll be felt especially in Florida, California, Washington, and New York, where huge numbers of people live in the shadow of this ever present threat of flooding.

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**ctpost**<https://www.ctpost.com/politics/article/Connecticut-s-vanishing-shoreline-One-storm-13424766.php>

## Connecticut's vanishing shoreline: One storm away from disaster

By Jan Ellen Spiegel, CTMIRROR.ORG Updated 9:14 pm EST, Saturday, December 1, 2018

**IMAGE 1 OF 223****Buy Photo**

A garage off its foundation on Binney Lane during the aftermath of Hurricane Sandy in Old Greenwich, Tuesday, Oct. 30, 2012.

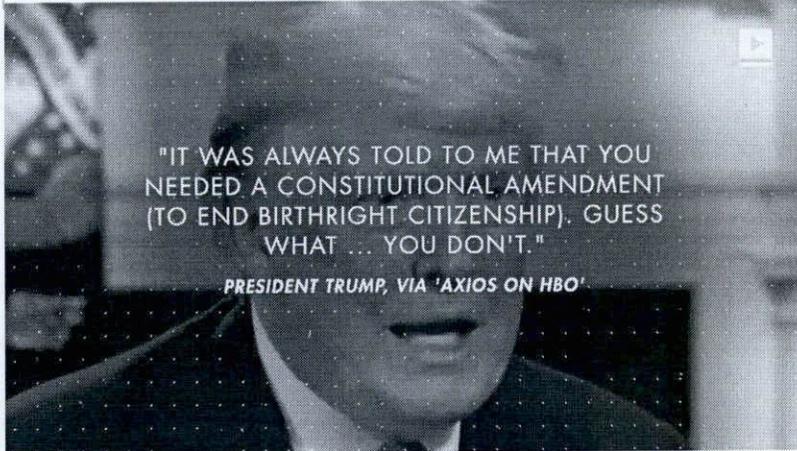
**Click through for more scenes from Superstorm Sandy's path through Connecticut.**

As the 2018 hurricane season nears its official end, Connecticut can count itself lucky.

Again.

The state has not been hit with a hurricane or tropical storm since the successive storms of Irene and Sandy in 2011 and 2012 swamped the coasts, illuminating their vulnerabilities to the effects of climate change not only from storms, but also nuisance flooding from sea-level rise.

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Yes, lucky again – because a general consensus is that if either of those storms were to hit now, they would

scattered improvements in...  
 nents, extensive tree trimming  
 been only a few modest  
 cept that may prove to be no

ses well-intentioned, have  
 best and impossible at worst –  
 ights often proving

insurmountable.

Lending increased urgency to the issue of Connecticut's shoreline vulnerability is the release last week of the National Climate Assessment that, among other things, details how more intense precipitation and increasing sea level rise threaten the northeast.

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None of this is lost on the experts responsible for protecting the shoreline.

"I think we've reduced risk, but could do a better job still," said Brian Thompson, director of the land and water resources division of the state Department of Energy and Environmental Protection. He cited the creation of the Connecticut Institute for Resilience and Climate Adaptation (CIRCA) – a joint government and University of Connecticut research and funding

\_\_\_\_\_ clearinghouse, and noted the formation of the State Agencies Fostering Resilience (SAFR), an interagency workgroup.

But he acknowledged that seven years after the first storm hit, with many communities still figuring out where their problems are, shoreline risk reduction efforts have been slow and complicated by unresolved questions about who will pay for the projects.

"I don't know that any of us should feel satisfied that we've done enough," Thompson said. "I do suspect that if we get another severe storm that we'll see significant damage. We need to do more. We need to focus more. The memory fades a bit as we get further out from those storms. So we really do need to keep the attention focused and things moving forward."

### **The policy of putting things back**

Some communities have managed remediation designed to improve recovery time from an Irene or Sandy repeat. But with few exceptions, damaged properties are back where they once were, meaning most of them are just as vulnerable as they were, if not more so, as sea level rise creeps higher and the threat of more intense storms increases.

A big part of the problem is the federal government's flood insurance and emergency management systems, which are designed to replace what was there before a storm. It's a philosophy that confounds climate scientists and shoreline experts like Rob Young at Western Carolina University who runs the Program for the Study of Developed Shorelines – like Connecticut's.

"The biggest problem is we're still supporting development in places that are absolutely crazy to be developing," said Young. He believes very little has changed along U.S. shorelines in the last half-dozen years, including the government funding paradigms for recovery.

"It's essentially a system that is underwriting the vulnerability and the risk of investing in areas that are exposed to coastal hazards and sea level rise," he said. "People who are still building in vulnerable areas are not making bad decisions, they're making economically reasonable decisions because federal taxpayers are assuming the risk."

The Federal Emergency Management Agency (FEMA) has had a buyout program for many years, but nationally it accepts only a fraction of applicants, instead financing rebuilding in vulnerable locations - sometimes multiple times.

While people like Young often are regarded as purists who see retreat — the “r word” as it is often called — from the coastline as the only genuine solution, they are also well aware that cities and towns are loathe to give up the taxes paid by owners of pricey waterfront property.

“Moving things does not have to be an abandonment of the coastal economy,” Young said. “If you do it the right way, it's the best way to preserve the coastal economy.”

West Haven has been just about the only shoreline community that bought into that philosophy after homes along Old Field Creek were devastated by Irene and again by Sandy. Figuring the lost property taxes would be less than perpetual cleanup costs — to say nothing of the perpetual anxiety of homeowners — 20 of those homeowners opted for what essentially are buyouts through the Natural Resources Conservation Service of the federal Department of Agriculture, which grants floodplain easements to vulnerable homes, though not the most vulnerable ones.

But in the rest of the state, the numbers are sparse. There are fewer than a handful of additional property owners in three of Connecticut's 24 shoreline municipalities that are doing the same as those in West Haven.

Home elevations are far more common - and often required in cases of severe damage to homes with mortgages. But with flooding from lesser storms than hurricanes and sea level rise leading to nuisance flooding, such as during high tide full moons, elevated homes may stay dry, but frequently may wind up being difficult, if not impossible, to reach.

### **Managing risk, short term versus long term**

“You're buying time,” said Andy Keeler, program head, Public Policy and Coastal Sustainability, at the University of North Carolina's Coastal Studies Institute, who is also an economist and a former member of climate change policy teams in the Clinton

and Bush administrations. "Having said that, buying time is a perfectly good thing to do," he added. "But you have to realize THAT'S what you're doing."

In the meantime, he and others say, communities have to start making longer-term decisions. But given that municipal planning cycles are generally five to 10 years, longer term climate predictions are less reliable than shorter ones, and the general taxpayer antipathy to spending public money for something they may never see means that such planning typically doesn't get far.

Other complications come from the recognition that it's impossible to eliminate risk, or at least do it at a price anyone or any government can afford. That leads to a battle over how much risk a community is willing to accept. And once you get into a cycle of rebuilding - with or without risk - the natural instinct is to continue to protect your investment.

Keeler and others recommend that municipalities, and even individuals, come up with a system to trigger actions on some pre-announced schedule for an observable variable – such as agreeing to rebuild a bridge until sea level rise hits a particular point. "The virtue is you're not making anybody do anything immediately, but you're telling the market to start to price in – 'gee this is going sunset,'" he said.

"It gives people time to adjust. It lets the real estate market drop, but not precipitously."

### **Baby steps**

Connecticut is taking baby steps, however. Much touted legislation passed in the last General Assembly session incorporates the sea level rise projection that CIRCA is required to report every 10 years, and which is now estimated to be about 20 inches by 2050, as a consideration for various state and municipal planning documents. But there's no requirement to do anything other than consider CIRCA's projection unless it involves a project in a coastal zone that receives federal or state money.

Band-Aids, said Bruce Hyde, land use educator for the University of Connecticut's Center for Land Use Education and Research (CLEAR). That's the word Hyde and others use for the kinds of solutions towns use now – elevations of building and roads, tide gates to release water, barriers around infrastructure like wastewater treatment plants, and sub stations.

Since people don't want to spend money now for something they think won't affect them, Hyde recommends the state's coastal towns start building in budget allowances for long-term sea level rise and climate-change impact remediation. This would include everything from moving gas stations or hospitals that are in flood zones to figuring out how to make up for the loss of taxes from homes that are no longer inhabitable.

"There are all sorts of questions out there that nobody seems to be paying any attention to. If this stuff is true, we really need to start dealing with it now and planning for the expense over the long term," he said. "I honestly believe it's going to take another, I don't want to say catastrophic, but catastrophic event that's going to wake people up."

### **Statistics and more statistics**

Statistics from various sources show there's a lot the state ought to be worried about even without another Sandy or Irene – let alone a major hurricane like this season's Michael or Florence. Any number of interactive mapping tools show large swaths of the state's shoreline that are already in flood zones, destined to be underwater in multiple sea-level rise scenarios.

The National Climate Assessment offered grim scenarios of increasing heat, drought, fire, intense storms, and floods, with pronounced economic losses for the U.S. economy as a result. The report, which was released by the Trump administration the day after Thanksgiving, is congressionally-mandated every four years.

For the northeast in particular the report focused on issues of flooding related to sea level rise and more intense rainfall, particularly in relationship to existing infrastructure that is old and inadequate, and development along the shoreline.

The report said ocean warming in the region from 2007 to 2016 was four times faster than the long-term trend, and sea-level rise projections were greater than the global average projections and could be higher than 11 feet by the end of the century in a worst-case scenario.

NOAA's 2017 State of U.S. High Tide Flooding Report and 2018 Outlook found that three of the top five cities with the highest number of flood days, and which broke records, were Boston, Atlantic City, and Sandy Hook in New Jersey. Connecticut, of course, is right in the middle of them. For places like the Long Wharf area of New Haven, built on fill in what was once a harbor, the end game could be catastrophic.

NOAA's prediction is that when this meteorological year ends in April 2019, high tide flooding will be 60 percent higher than it was 20 years ago and double what it was 30 years ago.

Using tide gauge data and information from the real estate group Zillow, the Union of Concerned Scientists calculated the risk to just shoreline homes – not commercial properties, infrastructure or anything government owned – nationwide from the kind of chronic inundation related to sea level rise. That's without storms.

For Connecticut, NOAA determined that by 2045 there will be about 4,500 homes at risk just of chronic inundation. Those homes are currently valued at nearly \$3.5 billion and contribute more than \$52 million in terms of property taxes. By the end of the century, with a high sea level rise scenario, Connecticut would be looking at about 25,000 homes at risk with a value of nearly \$15.5 billion and property taxes of more than \$252 billion.

Fairfield tops the list for both number of properties impacted and their value.

But do homeowners in Connecticut typically have flood insurance to help deal with potential catastrophes? Don't count on it. After spiking following Irene and Sandy, the number of flood insurance policies in Connecticut have dropped again.

Let's be clear – it's not that individual communities and the state are doing nothing to address the threat that climate change and sea level pose to the shoreline. (More on specific community actions in tomorrow's story.)

It's just that they aren't doing enough.

### **The home rule conundrum**

Because Connecticut is a home rule state, state government is limited in many ways in terms of what it can mandate. Local regulations on climate change resiliency or land use and other zoning policies are left to individual municipalities to determine.

For example, a number of shoreline communities are largely or entirely serviced by septic systems, not central wastewater treatment facilities. Sandy and Irene ripped many of those septic systems right out of the ground, exposing pipes, flooding them, and risking releasing sewage into Long Island Sound.

While it's clearly more efficient and effective from an environmental standpoint to get rid of septic systems, the state can't force towns or property owners to do that. The Department of Public Health, which oversees septic, also has no statewide standard for new septic systems to be able to handle sea level rise, which doesn't even have to be considered unless state funding is involved.

"They're not there yet," said Jennifer Perry, assistant director of infrastructure management at DEEP, which has to review waste systems. "As far as sea level rise, they're not saying 'add x number of feet in elevation when you site your septic system.' They really haven't tackled that yet at that level. Is it coming? Maybe."

It's been discussed, Perry said, but she doesn't expect any concerted policy consideration in the near future. Meanwhile, it's left to the towns. Perry said there are scattered individual efforts to switch some beachfront private neighborhoods to sewers, but that's about it.

"The septic systems, they're going to be underwater, there's no question about it," she said, adding that towns can make a centralized pump station resilient. "You have 1,000 septic systems. How do you address that?"

The state Department of Transportation has quietly upped its game on preparing for climate change and the potential for more intense precipitation and runoff. The state is using stricter standards to control runoff and employing green infrastructure solutions to help address the problem.

Arguably the biggest statewide change involves the state's building code and that's one area where the state - not local government - rules. Cities and towns must follow the state code, though enforcement of it is local. After years of being woefully behind in

implementing the International Code Council regulations, the state has caught up, putting the 2015 building code into effect on Oct. 1 while preparing the implementation process for the 2018 code.

In doing so, the state has put in place a number of provisions that increase the resiliency of residential structures along the shoreline. New construction and renovation in vulnerable areas - especially between I-95 and Long Island Sound – will need greater wind resiliency, including impact resistant glass that can handle even higher wind speeds and stronger structural components. But if a home is just being elevated – those enhancements are not required.

"That's mission number one of things we're going to look at toward resiliency for the next code cycle," said Joseph V. Cassidy, the state building inspector.

The building code also allows individual communities to set their own standards for how high a structure has to be elevated when necessary. While most still just require FEMA's standard, known as base flood elevation, several towns require additional elevation - known as freeboard - which can mean anywhere from an extra foot to three feet, depending on the community.

George Bradner, property and casualty director with the Connecticut Insurance Department, lobbied from the time Irene hit in 2011 for more stringent standards. He called the building code changes a huge win, but wished they had gone further.

"We're taking small steps," he said. "It's just the economics. People don't want to have to spend the dollars to incur those costs." That's despite studies showing you save \$6 for every dollar spent on disaster mitigation projects.

Bradner would like to see the federal government spearhead an incentive system that offers higher reimbursement percentages to a state after a disaster if the state implements stricter climate change mitigation practices. And he wants shoreline cities and towns to begin to embrace the reality that homes and other buildings may not be able to remain close to the water indefinitely.

"There is research that shows that if towns started planning now, taking climate change into consideration, over time you can change that tax base so you're moving

people away from that hazard and you're not having the severe tax effect you'd have if you did nothing," he said.

That means changing land use policies to keep new construction away from vulnerable areas. And maybe considering a radical change to flood insurance, such as a community flood policy in which a town assesses all homeowners for flood insurance that covers everyone — coupled with stronger building codes so people elevate and strengthen homes.

Homeowners who don't live in floodplains would benefit because they're the ones that pick up the tab if a community starts losing its tax base to climate change and sea level rise.

"Communities have to start looking at and considering the whole retreat discussion — they really have to look hard internally about what areas eventually they're not going to be able to say 'you can rebuild,' " Bradner said. "We haven't really addressed those hard questions because it's not politically palatable."

*Jake Kara contributed to this story.*

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**H E A R S T**

**ctpost** <https://www.ctpost.com/politics/article/Connecticut-s-vanishing-shoreline-Towns-trying-13427996.php>

## Connecticut's vanishing shoreline: Towns trying to beat the odds

By Jan Ellen Spiegel Updated 11:28 am EST, Wednesday, November 28, 2018



IMAGE 1 OF 223

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A garage off its foundation on Binney Lane during the aftermath of Hurricane Sandy in Old Greenwich, Tuesday, Oct. 30, 2012.

Click through for more scenes from Superstorm Sandy's path through Connecticut.

*This is the second in a two-part series.*

Rebecca French is blunt when she's asked about hurricanes and Connecticut's preparedness for them.

"Have we figured out as a state, as a region, individually figured out how to not have damage from those storms? No!" she said.

French ought to know.

Recommended Video

Until recently, she was with the



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added. "The vision is you recover as quickly as possible."

But whether the state is significantly closer to even that is doubtful. A quirk of Connecticut government as a home-rule state means the state has only limited authority to supersede local governments. Individual cities and towns handle their own zoning and development regulation and that mostly - though not entirely - puts resiliency matters in the hands of local governments.

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Conn.'s vanishing shoreline, part I: One storm away from disaster



Connecticut sawmill finding uses for Sleeping Giant's fallen trees



Major U.S. Study Says Unchecked Climate Change Will Shrink the Economy Significantly

With finances tight and local budgets reliant on high-tax shoreline properties, the idea of changing anything that would decrease property tax revenue is nothing short of municipal poison.

Councilman helps repair homes  
destroyed by Hurricane Maria

Authorities: Hurricane Michael killed at  
least 43 in Florida

"Most of these communities have been making decisions about what goes where for about 350 years. This is going to take decades and decades to unwind or to change the path and change the mindset," said Adam Whelchel, science director for the Nature Conservancy's Connecticut office who has also advised many of the state's shoreline communities on sea level rise adaptation.

He believes changing the mindset could take a lesson as devastating as the 1938 Category 3 hurricane that decimated shoreline towns and caused such severe interior flooding that it is still considered the worst natural disaster in Connecticut history.

"If we had a big reset like that, I think you would see some serious, more deliberate, more permanent types of steps that would actually move structures out of harm's way."

In the meantime Whelchel and others are willing to live with baby steps - a bioswale here, a tide gate there. "It's something. It's moving."

"Policy wise at the state level, things have moved slowly," said Leah Lopez-Schmalz, chief program officer of Connecticut Fund for the Environment. "But the idea of shoreline resiliency has become an issue for legislators. I wouldn't have predicted that."

She pointed to the creation of CIRCA and the little bits of legislation that have gone through. "I'd say that the state has really started some of the major steps that are needed and I think were really wise."

A resiliency planning survey conducted for CIRCA by the University of Connecticut's Center for Land Use Education and Research and Connecticut Sea Grant of 20 shoreline communities affected by Sandy determined their biggest concern is flooding.

"Whether it's from coastal storms or heavy precipitation events, flooding is clearly the number one issue in communities," said Juliana Barrett, a UConn extension educator with Sea Grant who worked on the survey and who has advised coastal communities on resiliency.

But she found communities essentially are paralyzed by a combination of factors - the daunting finding by CIRCA that sea level rise is likely to increase 20 inches by 2050, the cost of remediation, and the lack of expertise in most municipalities.

"The politics and the state of the budget," she said is what she hears from local officials: "There's no money for it, so what can we possibly do within my four-year term?" That's not to say that communities aren't moving forward."

The state received a little more than \$159 million in Community Development Block Grant Disaster Recovery (CDBG-DR) funds from the federal Department of Housing and Urban Development for resiliency projects in shoreline areas affected by Sandy - more than a dozen communities.

Most of it went to home rebuilding not covered by FEMA. About a quarter of it went to infrastructure repair and resilience. But it was all used to rebuild more or less where structures existed originally - theoretically stronger than they were before, but generally in the same location. Many view that as a failure of federal policy that essentially assumes federal liability for keeping structures in vulnerable locations.

Bridgeport is changing that dynamic a little, using additional federal funding to help make a few fundamental changes - emphasis on few and, in the scheme of things, not very much funding.

### **Resilient Bridgeport**

Bridgeport received awards in two national resiliency competitions - now combined into a project the city calls Resilient Bridgeport. But at \$10 million for one and \$42.5 million for the other, those efforts will not come anywhere close to achieving the goal of reimagining Bridgeport as a genuinely climate change-resilient city.

This vastly scaled back plan focuses on the city's south end, a lower income area that took the brunt of the flooding and damage in Irene and Sandy. Key components of the plan are to raise University Avenue by 12 feet in some locations, build a berm to protect the immediate shore area (including the rail corridor), and to create a so-called resilience hub as a staging area for disaster response, including providing amenities like charging stations.

There have been community meetings and other forms of outreach for three years to get everyone on board with the concept. But while the money is committed, only about \$5.5 million has been allocated so far to pay the design team, and basically nothing structural has started and probably won't until 2020.

"I think if a new storm comes in within the next two years or so, no I don't think anything has changed," said David Kooris of the state Department of Economic Development, who was Bridgeport's director of planning and economic development when the storms hit.

Until recently Kooris was the point-person in the state Department of Housing overseeing implementation of the two competitive awards - the position now held by French - as well as coordinating State Agencies for Resilience (SAFR, pronounced safer), an inter-agency climate resilience strategy, which he still handles.

The Resilient Bridgeport project - despite the many design firms that have worked on it - is still generally referred to as "David's plan," throughout Bridgeport.

"I think the biggest thing that's changed is, prior to the storms if we had been talking about this type of infrastructure, we would have had a hard time getting people to meetings and there would have been a lack of tolerance for the type of impact in their neighborhoods that infrastructure we're talking about would create," Kooris said.

Elizabeth Torres, executive director of Bridgeport Neighborhood Trust, said the design team and government officials did an "awesome job" communicating with south end residents.

"I felt like my voice has been heard," she said. "To say that the community is excited about Resilient Bridgeport would be an understatement."

Lydia Silvas, who lives in Seaside Village, a housing project that regularly faces flooding, and not just during storms, was skeptical of the plans. "I think it's going to be a Band-Aid truthfully," she said. "Eighty years from now it's going to be wet, real wet, around here."

Kooris points to I-95 and the rail line as areas that, while facing hazards from climate change and sea level rise, are not really movable. But Avangrid, an electric-gas utility company, is moving two substations farther inland - an action often described as impossible and too expensive.

The University of Bridgeport is also moving its athletic facilities to a more vulnerable area closer to the water now occupied by the Health Sciences building, which will move to a safer place where the athletic area is now. The athletic area will become the expendable part of the campus.

The goal, many people involved in the Bridgeport work point out, is to make even the small projects the city does now, further adaptable long term, remembering that no so-called resilience is foolproof let alone permanent.

"Adaptation is an incremental process that allows people to get their minds around the problem," said David Waggoner, a founder of Waggoner and Ball Architects in New Orleans. He's been involved in resilience planning all over the world including New Orleans after Hurricane Katrina and is working with Bridgeport on the current resilience plans.

"The thing that has to be broken is the idea that we can engineer our way out of this," said Waggoner, who worked with the city going back to the first competition after Irene. "You're always managing risk."

### **Nothing for New Haven, but...**

The state also applied for money for New Haven through the same project in which Bridgeport is participating. In fact, the state applied for even more money for New Haven - nearly \$59 million.

And what did New Haven get? Nothing, zip, nada.

But you'd never know that. As part of its Climate and Sustainability Framework unveiled in January, the city is moving ahead on all kinds of projects anyway - faster than Bridgeport.

The federal money sought for New Haven had been targeted for a new pumping station - a \$40-\$60 million investment - to deal with the largest of the city's problems, which is how to get water out of low-lying areas, especially in the face of sea level rise-induced nuisance flooding that is growing more frequent. The Long Wharf area, including - most critically - the rail yards, built on 200 acres of fill where New Haven's harbor was once located, faces that kind of flooding routinely now. (Read about that here and here.)

When that plan fell through due to lack of federal funds, the city found a work-around solution. It is installing more than 300 bioswales - about two-thirds of them downtown.

These innocuous looking 5-by-15-foot, five-foot deep rain gardens use the area's sandy soil to soak up runoff.

While the bioswales might not eliminate the need for a new pumping station, they're likely to help the city get away with building a much smaller one, said Giovanni Zinn, the city's engineer.

"We're leveraging the way nature does things over millions of years, not trying to bend nature to the will of man," Zinn said. "The big philosophical shift we've had since Irene and Sandy is you really have to rethink the shoreline. Even the term itself - if you think shoreline - a line - it's really an area - it moves, it creeps, it erodes."

That philosophical shift is apparent in multiple projects in New Haven.

Instead of the sheet pile sea wall promised to Morris Cove residents whose homes were damaged in Irene and Sandy, the city has everyone on board with a berm and additional sand as a natural barrier. It could be in place by the summer of 2019.

Living shorelines - also natural barriers that work with a shoreline's movement - are planned for East Shore Park near Morris Cove and Long Wharf.

But the city still faces criticism for its determination to pour money into Tweed Airport, which sits in a floodplain that every sea level rise scenario shows will be underwater by the end of the century, if not sooner. Tide gates have helped some with flooding, but not entirely.

"We would much rather have a flooded runway than a flooded neighborhood," Zinn said. "So from that point of view it works."

The state also just spent nearly \$2 million in bond funds to rebuild a fishing pier that was badly damaged by Irene before being totally destroyed by Sandy.

"We built it understanding it will get flooded and frankly it's designed to get flooded early on in these storms so that the heaviest of the wave action is above it," Zinn said. "I'm sure you can pick a bone with us that we shouldn't be building that type of infrastructure in a place that gets flooded. On the other hand, do you just not simply build any more piers at all or do you build them all way high up in the air?"

The city is also likely to face criticism as it moves ahead with plans to redevelop Long Wharf into a pedestrian and commercial district. The area was underwater once and all projections are that it will be again.

Making these decisions involves finding a balance between growth and climate change, Zinn said.

"Every infrastructure discussion we have in the city is very much driven by climate change," he said. "We're very much concerned about climate change and resiliency, but we're also very much concerned about providing opportunities for our residents and having economic growth.

"At this point, I don't think it's conceivable, given the quantity of infrastructure that is in the Long Wharf area, that it would go back to open water. Where would 95 go? We don't see it."

### **Fairfield flooding risk great**

Fairfield has the dubious distinction of having the most residential real estate in Connecticut at risk from future nuisance flooding due to sea level rise, according to data released by the Union of Concerned Scientists earlier this year.

Among its many shoreline vulnerabilities is a large area of homes adjacent to Penfield Beach that is basically located in a bowl. It floods. And it did so big-time during Sandy, along with other parts of town located near several creeks, rivers and the beach - including an area perilously close to downtown.

Since then more than 100 homes in Fairfield have been elevated - and that doesn't include the teardowns that were rebuilt at higher elevations. But with sea levels encroaching, how accessible will the roads to those houses be in the future? Along Fairfield Beach Road, some houses hang over the water at high tide even now.

And that's how it will stay.

"There's no retreat strategy, so to speak," said Joe Michelangelo, Fairfield's public works director.

Michelangelo said if a storm like Sandy were to hit the town today, streets would flood and there'd be no access to elevated structures, but the town would be able to pump out areas much faster than last time. "We're talking half a day instead of five days," he said. "There'd be a lot less property damage - we'd return to a sense of normalcy much quicker."

The town is trying to push forward with a number of projects. It already has one microgrid operating for town buildings and is planning another along with a flood control barrier at the wastewater treatment plant, which sits at the edge of Pine Creek not far from where it intersects with Long Island Sound. There are plans for more tide gates, in addition to a new one that's already installed. And the town is considering a pumping station in the Jennings Beach area, as well as a berm of some sort to protect Penfield Beach - both of which are likely to draw the ire of residents trying to protect their views and beach access.

Even if all the projects are built - will it be enough, or be completed quickly enough, to protect Fairfield?

"I think it's almost a race against the clock," said Laura Pulie, the town engineer. "It's just a matter of time. Are we going to have things done in time?"

Ask Pulie, Michelangelo, and Flood and Erosion Control Board chairman Dick Dmochowski – who learned about storm flooding the hard way and elevated his own house by 16.5 feet – whether the town's current efforts will get it to the end of century - and all the heads in the room shake "no."

## **Roadblocks**

Even communities genuinely trying to prepare for climate change and sea level rise encounter roadblocks. The top three - money, money and money

1. Not enough in the budget.
2. The potential loss of tax revenue from waterfront property.
3. Reluctance to spend for projects residents may never see.

The fourth roadblock is reality versus political will – essentially the recognition that certain properties will simply no longer be usable and the willingness, or lack of it, to plan for that now.

Take Stonington. In 2015, the town used \$150,000 from the big pot of Sandy funding to prepare a coastal resilience plan. It was finished about a year ago and was adopted as an appendix for town's plan of conservation and development.

The report stated that 27 percent of the town, accounting for 53 percent of its total tax base, was at risk from a 1,000-year storm event in 2050. And while it identifies the top 25 at-risk assets, there's no real priority list of what to do first because there's no money to do it.

Work is planned to upgrade a breakwater in Stonington Borough. It was built in 1827 and portions of it are underwater right now at high tide, which means it's ineffective during a storm when it's needed.

"Now you could fix it by dropping a couple of rocks on it and maybe that works during high tide today, but wouldn't the better solution be fixing it to meet the 30-year sea level rise time frame?" asked Jason Vincent, director of planning, rhetorically. "We will continue to seek funding from community leaders to implement the recommendations in this plan."

But when asked whether the town will act fast enough or do enough, period, Vincent said that probably depends on whether Stonington gets hit with a catastrophic storm.

"I think the fast enough will only come with a storm that creates enough chaos, he said. "Even though there was chaos from those two storms in this town, I don't think it created enough chaos that there's an urgency to act."

Guilford was among the first, if not the first, shoreline community to address climate change and sea level rise in the immediate aftermath of Irene, which swamped its coastal areas - especially the salt marshes that had been filled and developed.

Working with the Nature Conservancy and Yale, the town developed a radical approach that opted for letting some of the most vulnerable areas go over time, eventually removing structures and retreating. The plan was approved, but not much has been done since then.

Three small roads were elevated and there have been seemingly endless discussions about what to do with Route 146 - a state road that runs through Guilford and Branford and that floods regularly.

"We're sort of muddling through with that project," said George Kral, Guilford's planning director.

While there was pushback from residents once they realized how drastic some elements of the plan were, Kral said he didn't see it as a doom and gloom scenario.

"It's not some kind of crushing dystopia," he said. "It might be a positive place to live - albeit with a lot more water. It made thinking about these things less pessimistic.

"It's adapting to a continued desire to continue to live near water," he added. "Of course you might have to take a boat."

*Jake Kara contributed to this story.*

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ctpost <https://www.ctpost.com/local/article/Mold-concerns-rise-with-sea-level-13113671.php>

## Mold concerns rise with sea level

By Christine Woodside, Conn. Health I-Team Writer Published 12:00 am EDT, Sunday, July 29, 2018



### IMAGE 1 OF 23

A house on Park Lane in Harborview is raised to meet post-Superstorm Sandy flood standards on Friday, July 27 in Norwalk. But the flooding from storms like Sandy and Irene before that, don't just leave property ... more

In the last days of October 2012, Superstorm Sandy's remnants pushed seawater over roads and through the first floors of Fairfield's idyllic beach neighborhoods. The tide found nowhere to recede because the storm kept pushing more water against the closed tide gates.

Some people left and some people, the tough old Yankees who'd seen storms before, stayed in their houses, recalled Assistant Fire Chief Scott Bisson, who was the unified commander, overseeing evacuations and the aftermath from a building that almost had to be evacuated.

Within hours, the mold came and so did its musty odor. "People were removing all of the wet, porous materials," Bisson remembered, "rugs, toys, wood, furniture, couches, chairs,

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After flooding, mold quickly multiplies into fuzzy blobs on walls and furniture. When people try to clean up, they breathe in airborne microbes that can trigger breathing problems, skin rashes and infections, mucous membrane illnesses, and problems in internal organs, according to fungal scientist Eckardt Johanning and his colleagues, writing in an **article** in Environmental Health and Preventive Medicine.

Health researchers said residents should view floods as hazardous to their health and doctors need to beef up their training to recognize flood-related illnesses.

### Getting worse

Mold itself can make people sick, but mold also signals the presence of other bacteria and disease, said Paula Schenck, director of the **Center for Indoor Environments and Health** at UConn Health. She said doctors “can advise their patients to have the appropriate protective gear on hand before the flood, and then avoid exposures that would cause illness, so I’m sort of on a disease-prevention soapbox here.”

This little-discussed public health threat — **exposure to mold** — is rising slowly into the public consciousness. Nuisance flooding has increased on the United States coasts, and it will increase dramatically after 2050.

Sands Cleary, the **Fairfield health director**, said that after Hurricane Sandy the town decided not to enforce its blight ordinance, under which the town could fine residents \$100 a day for flood-soaked objects or debris. "For several months, we had large numbers of houses that were putting debris out on the streets, and we weren't enforcing that because people had just gone through a terrible experience," he said.

Around New England, most coastal areas have been inundated several inches over the past century. Bridgeport's sea level has risen nearly 1 foot and New London's slightly less, according to the **National Oceanographic and Atmospheric Administration's** calculations. The yearly increase is almost 3 millimeters.

In March, the **Connecticut Institute for Resilience and Climate Adaptation** at the University of Connecticut released a report predicting increases of another 20 inches by 2050. Major areas of the coast will flood regularly in the future.

Adam Whelchel, director of science for the **Connecticut Chapter of the Nature Conservancy**, has worked on coastal resilience planning with dozens of municipalities. "There's a whole lot of emotional stress that goes along with living along the coast," he said.

### **Fungi mysteries**

High-tide flooding along the U.S. coastline has increased 300 to 900 percent in the last half century. NOAA's map of projected high-tide flooding can be zoomed to street-level detail for any town in Connecticut. A perusal around the state shows that inundation by floods will cover large swaths of Guilford south of Interstate 95, and large areas of Madison, Bridgeport, Middletown, Old Saybrook, Haddam, Hartford and Stamford in the future.

Buildings in the floodwaters' path will be prone to mold and all that mold signifies.

All molds are part of the kingdom of fungi. Scientists haven't yet identified 90 percent or so of all the fungi that exists, said De-Wei Li, a research mycologist at the Connecticut Agricultural Experiment Station's Valley Laboratory in Windsor. Scientists who study fungi spend much of their time simply identifying species.

The hundreds of molds scientists have identified in this part of the world can trigger allergies like asthma and skin reactions, and some of them contain mycotoxins or volatile

organic compounds in their spores. Mycotoxins and VOCs can cause serious diseases or reactions when ingested, when they come in contact with skin, or when someone breathes them in. The microscopic spores penetrate deep into the lungs.

A month after Sandy hit in the Northeast, scientists collected samples of mold from houses in Brielle and Manasquan, New Jersey. They found 36 types of mold, including six that killed flies in the lab. Molds found included *Aspergillus niger*, which the CDC reports can cause lung infections and allergic reactions; *Aspergilloma* (fungus ball); and the most common found in damp or water-damaged structures, *Penicillium chrysogenum*; among others.

The presence of mold also indicates a whole soup of biological materials, including bacteria. If someone sees mold growing inside, they are witnessing a risk to respiratory health, Schenck said.

She added that flood waters can be dangerously contaminated. Certain medical conditions make one vulnerable to airborne mold.

"Many materials – wallboard, fabrics themselves (clothes, curtains) and those that trap dust (carpet) are a grand meal for mold," Schenck has written. "Even some well-constructed buildings that haven't had moisture concerns in the past become wet from wind-driven rain and flood waters in severe storms." Schenck wants people to know that any time they see mold, they should consider it an indicator that "moisture is available for biological growth." The wetter it is, the greater the chances of severe respiratory illnesses.

An increase in floods will cause wood and drywall and other building materials to become saturated more often, causing an increase in people's exposure to airborne mold spores, since that is how they reproduce. This means that people whose immune systems have been weakened by disease are more vulnerable to health effects from mold.

The most urgent advice about a flooded living space is to get out until the standing water has subsided. "Once it's flooded, don't go wading unprotected in that environment," Schenck said.

*This story was reported under a partnership with the Connecticut Health I-Team ([www.c-hit.org](http://www.c-hit.org))*

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# Acknowledging sea level rise, Connecticut legislature passes sweeping climate change bill

The bill would reign in coastal development and establish new pollution targets.

E.A. CRUNDEN 

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UPDATED: MAY 9, 2018, 7:27 PM



PROTECTIVE BERMS ARE VIEWED ON COMPO BEACH AS THE FIRST SIGNS OF HURRICANE SANDY APPROACH ON OCTOBER 28, 2012 IN WESTPORT, CONNECTICUT. CREDIT: SPENCER PLATT/GETTY IMAGES

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legislation centers on adapting to accommodate rising sea levels as well as setting new pollution targets.

[Senate Bill 7](#), “An Act Concerning Climate Change Planning and Resiliency,” passed overwhelmingly early Wednesday morning. In a 34-2 vote, the state senate agreed to adopt recommendations to reduce greenhouse gas by 45 percent below 2001 levels within the next 12 years, [the Connecticut Post reported Wednesday morning](#).

Assuming a sea level rise of nearly two feet by 2050 based on projections by the Connecticut Institute for Resilience and Climate Adaptation, the bill also updates pre-existing statutory references guiding building and development.

The legislation [would require](#) all federally-funded development projects or similar endeavors funded or undertaken by a state agency to adhere to the new restrictions. Meaning these new projects will have to take sea level rise into account when being built.

“Climate change is real, it’s man-made, and it’s here,” said Gov. Dannel P. Malloy (D) following the vote.

Environmental advocates and organizations cheered the bill’s passage. In a statement sent to ThinkProgress and other publications, the Nature Conservancy Connecticut Chapter’s director of government relations, David Sutherland, emphasized the importance of accounting for sea level rise in particular.

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"Tide gauge records from the last several decades in Long Island Sound show that not only is sea level rising, but the rate at which it is rising is increasingly alarmingly," said Sutherland. "These rising waters not only increase the frequency of 'routine' flooding, but also give storm surges a higher platform from which to attack our neighborhoods."

"Good planning, based on scientific data, as called for in this legislation, can help communities reduce the damage from coastal flooding," he continued.

The bill now heads to the Connecticut House for further consideration. House representatives were set to vote on the legislation as of Wednesday afternoon.

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## of rising sea levels

Climate change legislation on a state-wide level has seen growing popularity across the United States as the Trump administration has been working to unravel Obama-era environmental initiatives. Two weeks before Hurricane Harvey hit the Texas coast, for example, the president [signed an executive order rolling back flood risk assessment standards](#). The administration's push to undo protections has [spurred a number of states and cities to implement their own policies mitigating and accounting for the impact of global warming](#).

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[Washington State](#) and [Oregon](#) have been particularly active in their efforts to promote climate resilient practices and policies. But Connecticut's bill is somewhat unique on the East Coast, particularly with regard to sea level rise. Much of the region is coastal, something that hasn't factored overwhelmingly into policy and legislative decisions, despite [increasing signals](#) that property prices, for example, are increasingly impacted by threat of sea level rise, storms, and flooding.

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New York adopted a law in 2017 requiring the state Department of Environmental Conservation to acknowledge and adopt official sea level rise projections in an effort to protect and fortify coastal communities. That law does not impose substantive restrictions, however. In South Florida, activists and local publications have also called upon lawmakers to address the threat sea level rise poses to the area.

Louisiana, another Southern state, has opted for a slightly different approach. Rising waters in the Gulf of Mexico are quickly rendering parts of the state uninhabitable. According to a U.S. Geological Society study, that state is losing wetlands at the rate of a football field every hour and a half.

Louisiana has drafted a plan, obtained by Bloomberg in December, that would move thousands of people away from directly threatened areas. According to the draft, the state would buy out many current homeowners and tax those unwilling to abandon the area. That approach is unpopular with residents and the state has not indicated how such efforts would be funded.

Connecticut's plan, in comparison, takes a slightly less aggressive approach, both to sea level rise and climate targets more broadly. Co-chair of the Senate Environment Committee Ted Kennedy Jr. (D-Branford) criticized the legislation as a "reduced" bill, noting that it will keep the state on track to meet benchmarks but that it does not dramatically accelerate those efforts, the Connecticut Post reported.

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Kennedy also noted that it will not require private development companies to account for sea level rise, or effect local zoning. But the senator did hail the bill as a step forward regardless.

“This bill will help to better equip our state and coastal municipalities in planning for and mitigating the impacts of sea level rise by requiring current sea level rise models to be incorporated into our state’s plans of conservation and development, our Civil Preparedness Plan and hazard mitigation plans,” he said.

Local environmental organizations have indicated they feel optimistic about the bill’s chances of passing the House and heading to the governor’s desk for approval. Laura McMillan, the Connecticut Fund for the Environment’s communications director, told ThinkProgress via email that “many of the [state] legislature’s best climate champions are representatives” and that support for the legislation appears to be broad. If the bill is approved by the governor it would then officially become law.

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**UPDATE:** The Connecticut House of Representatives overwhelmingly passed the bill by a margin of 137 to 11 on Wednesday evening. The legislation heads now to Gov. Malloy, who is expected to give the bill his signature.