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THINGS WON'T GET THIS BAD. BUT THE CLASH BETWEEN SCIENCE  
AND POLITICS OVER RISING SEA LEVEL COULD HAVE  
DIRE CONSEQUENCES FOR OUR ECONOMY.

November 2014

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COVER STORY

# Land's end



**AS THE SHORELINE CREEPS CLOSER,  
COASTAL LEADERS DEBATE THE NEED FOR  
BOLD ACTION OR QUIET RESTRAINT.**

BY EDWARD MARTIN

Choppy Bogue Sound spatters the boat's windshield as dark clouds gather in the west. "The sea breezes will hold it back awhile," Todd Miller says. Now 57, he grew up a few miles from here in the mainland community of Ocean. He steers alongside uninhabited Long Island, slowing down as his Yamaha outboard sounds a shallow-water warning. "We'd come over here in the winter, get oysters and cook them on a fire. Then you had to face that cold north wind going home."

An elderly couple with a cooler and lawn chairs, their two dogs splashing behind, wade from their anchored boat to the narrow sliver of sand. Porpoises whoosh through their blowholes nearby. It's a postcard setting, hard to picture as a battleground. "This won't be here in another 30 years," says Miller, founder of the 10,000-member North Carolina Coastal Federation, an Ocean-based nonprofit that promotes environmental protection. "See the erosion? And these trees are already dying because of saltwater encroachment."

A consensus of scientists and oceanographers say the sea is inexorably rising and likely to cover as much as 2,000 square miles of coastal North Carolina this century. How the state should respond has sparked an intense debate. On one side are politicians and business groups who dispute the scientists' warnings and want to preserve the region's growth prospects. On the other are environmentalists who oppose development in places facing a rising sea. Both camps agree that, with nearly 6,000 miles of tidal and estuarine shoreline and more than 300 miles of oceanfront, North Carolina has much at stake. It's an issue of more than dollars and science. For those whose ancestors waded ashore centuries ago as well as those who have settled here since, permanently or in vacation homes or to build a business, it's personal.

Formal warning flags began unfurling a decade ago when Democrats led by Gov. Mike Easley, a former Southport prosecutor, and Senate Pro Tem Marc Basnight, a Manteo restaurateur, ruled Raleigh. In 2005, the General Assembly created the Legislative Commission on Global Climate Change. Its 34 members included legislators, academics and environmentalists, along with several business people and representatives of trade associations. The group's final report, in 2010, divined dire consequences. It urged the legislature to crack down on seawalls and other measures that sustain development and direct local governments to calculate how badly tax revenue would be dampened if water inundated homes. Put detailed maps of sea-level rise on the Internet, it urged, so everyone could see what the future might look like.

If you believe the scientists, it isn't a pretty picture. Property losses related to a 32-inch sea level rise in just four coastal counties — New Hanover, Bertie, Carteret and Dare — would be \$6.9 billion in today's dollars, according to a 2007 report by economists and climate researchers at East Carolina, UNC Wilmington, Duke and Appalachian State universities. Recreation-related losses in Brunswick, Pender, Onslow and Carteret would amount to \$4 billion or more, and business-interruption, agricultural and forestry losses in New Hanover, Dare, Carteret and Bertie, from higher sea level and increasingly destructive hurricanes, would total \$2 billion to \$3 billion.

"I'm more worried now than I was then," says Chris Dumas, a UNC Wilmington economics professor and one of the authors. "There's more evidence every year."

Another report in 2010 — this one from the Science Panel on Coastal Hazards, appointed by the N.C. Department of Environment and Natural Resource's Coastal Resources Commission — concluded there is "indisputable evidence that sea level has been steadily rising in North Carolina." The 13-member panel predicted a likely increase of 1 meter — about 39 inches — this century and urged the state to improve its monitoring by adding gauges and reassessing its forecasts every five years or so. If sea level rises a meter, 230,000 homes and businesses would be imperiled. That would affect more than a half-million people, based on current census data and enrollment in state and federal wind- and flood-insurance programs. Agricultural and tourism businesses would face the biggest losses.

That same year, a political sea change swept the state: Tar Heel Republicans captured both the state House and Senate for the first time in more than a century. In 2012, they increased their majorities and Pat McCrory, who expressed doubts about man-made climate change during his campaign, won the governor's race. Almost overnight, the issue of sea-level rise — long synonymous with concerns over "global warming" — turned into a toxic political topic. A similar reversal occurred in Florida, where Republican Gov. Rick Scott and the state's GOP-dominated legislature is pushing to unwind climate-change initiatives approved by Democratic predecessors. Engineers at the N.C. Department of Transportation have revised plans for a widening of U.S. 64 near the Albemarle Sound in Tyrrell and Dare counties by raising the road's elevation 18 inches, though the change isn't publicly linked to potentially higher water. During an interview, a spokesman for Transportation Secretary Tony Tata declined to use the phrase "sea level," saying it isn't pertinent to department issues.

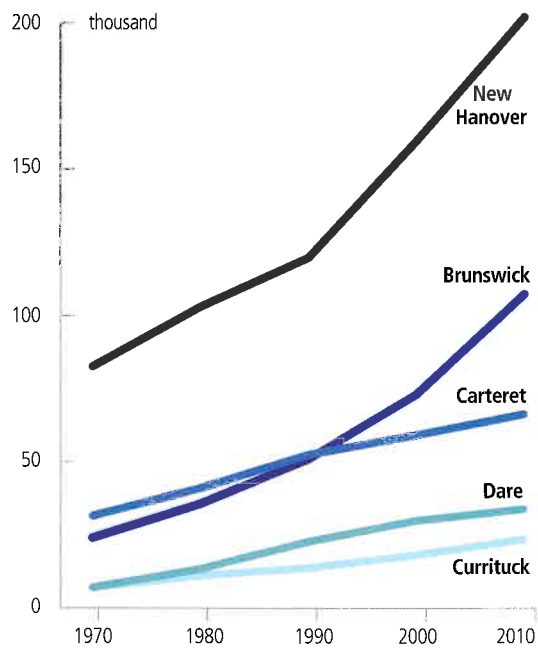
"This whole thing is distrust on the conservative side that this is just a way to take people's land away from them and not allow them to build," says state Rep. Pat McElraft, a Republican from Emerald Isle. A real-estate broker, she describes herself as a property-



Houses in South Nags Head, an area suffering some of the state's worst beach erosion, butt up against the effects of an encroaching sea in this 2010 photo.

## Living on the water

About 435,000 people live in these counties, nearly triple their combined population in 1970.



Source: U.S. Census Bureau

rights advocate. "I've been fighting this battle with environmental extremists for a long time. Nobody knows what's going to happen a hundred years down the road. They want to stop people from building on our barrier islands, but that makes no sense. Look at the

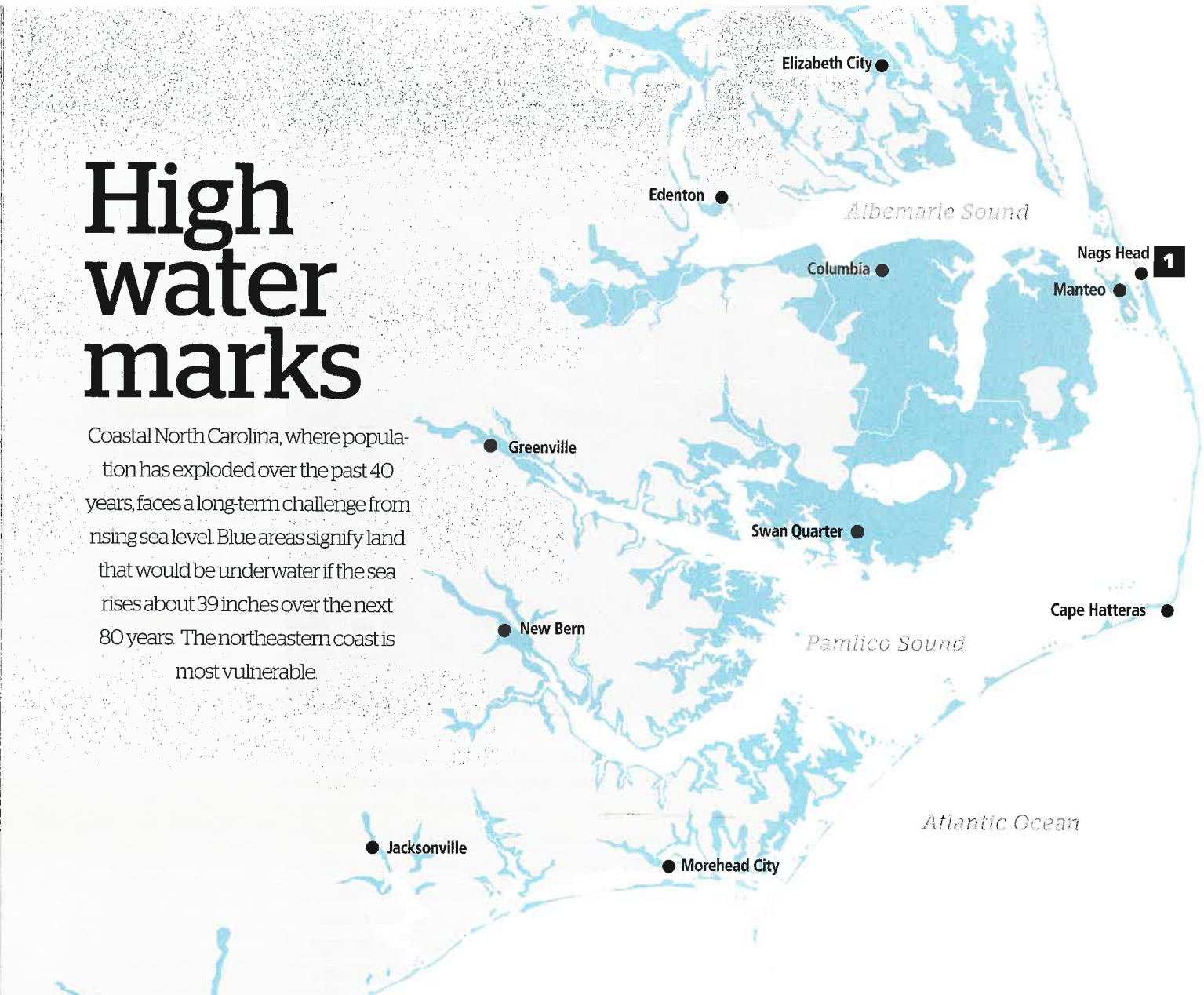
tourism industry we have on these islands and how many dollars it generates for the state. It's crazy."

Many business and public officials in coastal counties are fighting back against warnings of sea-level rise. They fear stricter development measures and higher flood-insurance rates will scare away homebuyers, businesses and developers. Forecasting a 39-inch sea-level rise is "a death sentence" for coastal home sales, says Willo Kelly, an Outer Banks real-estate agent. She's president of NC-20 Inc., a New Bern-based group of business and public officials formed in 2009 to challenge sea-level predictions and promote development. The group's director, Tommy Thompson, says the cost of relocating and rebuilding roads, bridges and other structures far exceeds potential real-estate losses. "People ask me what it would harm to prepare anyway," says the former director of economic development in Beaufort County. "The answer is, billions of dollars in public infrastructure alone."

In March 2012, the N.C. House passed a bill sponsored by McElraft that bars local and state agencies from acting on the science panel's forecast of a meter increase. The measure mandated that zoning and development policies be based on a continuation of histori-

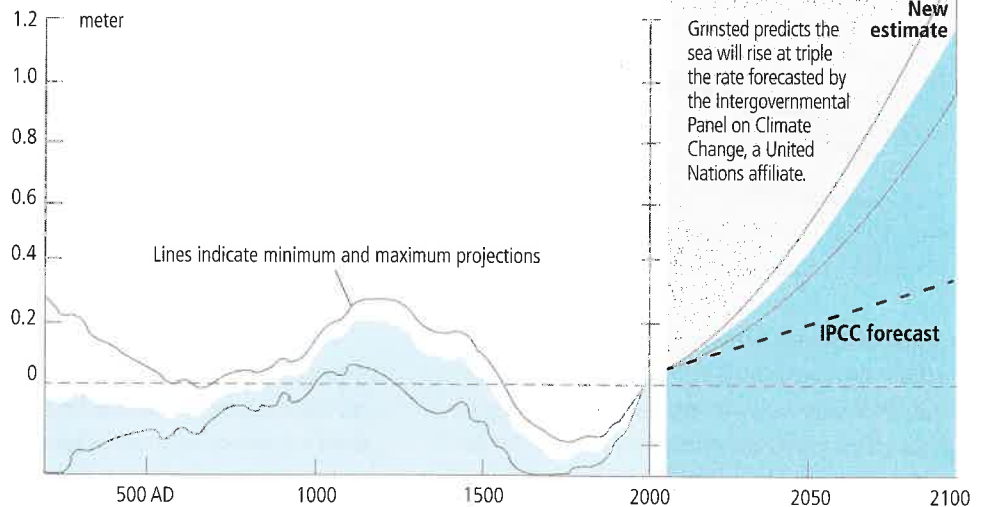
# High water marks

Coastal North Carolina, where population has exploded over the past 40 years, faces a long-term challenge from rising sea level. Blue areas signify land that would be underwater if the sea rises about 39 inches over the next 80 years. The northeastern coast is most vulnerable.

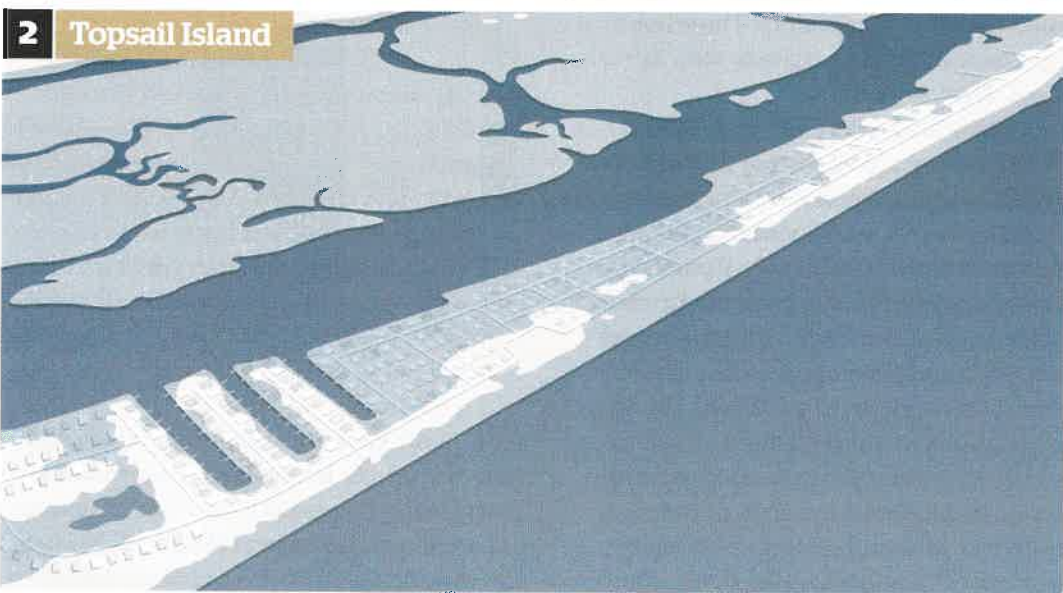
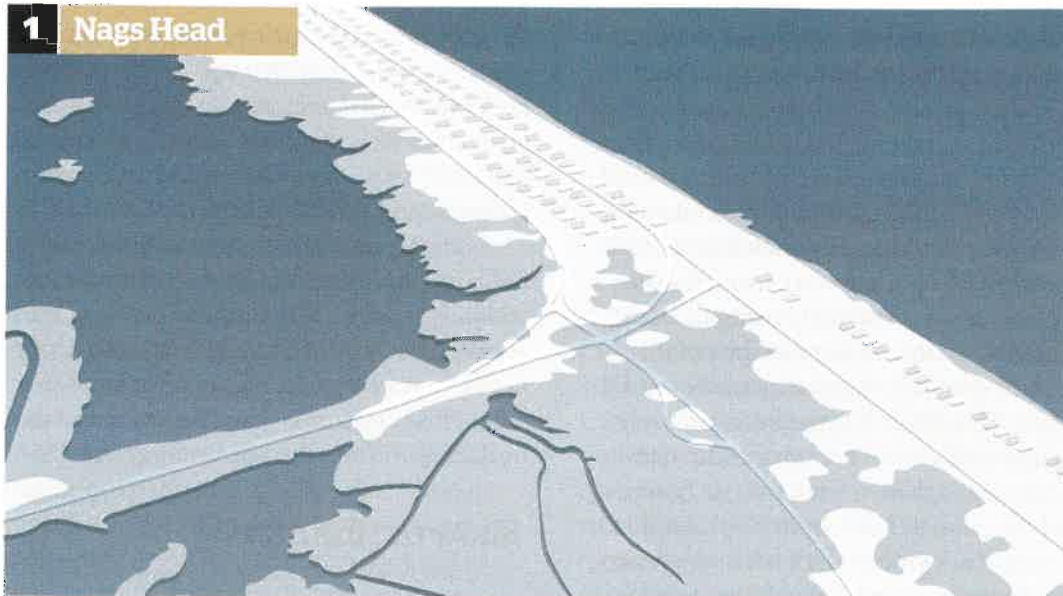


## Sea level since the year 200

Sea level reached its historical peak around 1150, according to researchers at the University of Copenhagen, then began rising again in 1730. Danish scientist Aslak Grinsted projects an increase of about 1 meter this century.



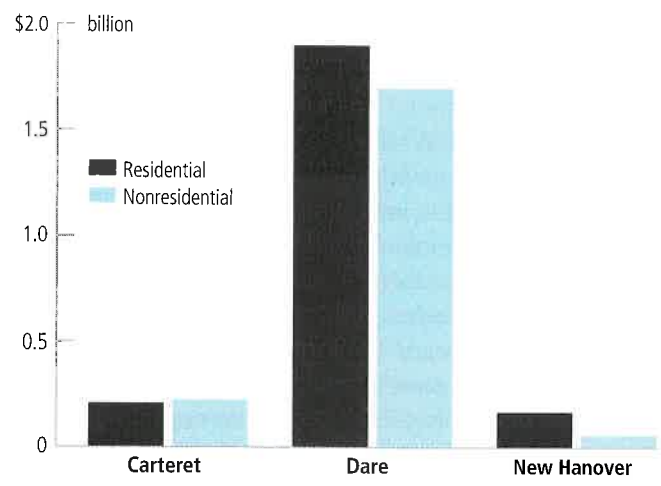
Source: Aslak Grinsted, Niels Bohr Institute



These maps show the possible impact of rising sea level at two popular beaches, according to Architecture 2030 Inc., a Santa Fe, N.M.-based nonprofit that promotes reduced greenhouse-gas emissions. The maps are based on remote-sensing technology and U.S. Geological Survey data. Light-blue areas show land expected to be underwater if the sea rises 1 meter.

## Eye of the storm

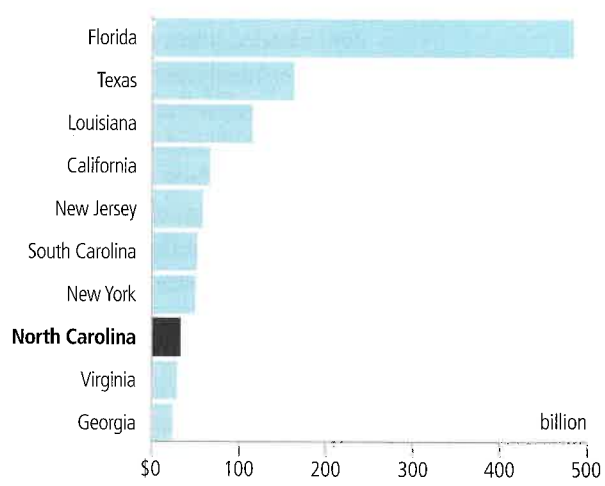
More than \$4 billion of property is at risk of flooding in these three coastal counties, based on a sea-level rise of 31.9 inches by 2080.



Sources: Researchers at UNC Wilmington, Duke, East Carolina and Appalachian State universities

## Safety net

North Carolina ranks eighth in property covered by the National Flood Insurance Program, which has accumulated \$24 billion of debt.



Source: Federal Emergency Management Agency

cal sea-level increases, which would amount to 8 inches by the end of the century. Legislators backed off after they were lampooned by TV comedians who depicted them as making it illegal for the sea to rise. The Senate passed a bill dictating that projections cover no more than 30 years and be re-examined every five. This conflicts with the consensus of scientists that sea-level rise will accelerate in the second half of this century as the polar ice caps melt — a view rejected by many coastal leaders. “The 39-inch hypothesis is purely hypothetical,” says Thompson, who cites his bachelor’s degree from the Air Force Academy and an MBA from East Carolina University as evidence he’s not anti-science. “There’s zero evidence of acceleration. We pointed that out to legislators. The whole thing was nothing but a scam to stop development. They agreed.”

Scientists are as certain about rising sea level as they are about gravity, says John Whitehead, an economics professor at Appalachian State University in Boone and an author of the 2007 study. Convincing skeptics isn’t easy, though, particularly when the state’s coast is far from uniform. Around Wilmington and the Cape Fear River, land rises relatively abruptly as part of the Carolina Platform geological formation. Sea-level rise would have less effect there than to the north, along the Outer Banks and shallow but vast Pamlico and Albemarle sounds and mighty estuaries such as the Chowan River, the boundary between Bertie and Chowan counties near historic Edenton.

On a map prepared by scientists and economists who charted potential losses in their 2010 study, implications are dramatic. Red-shaded areas depicting a 42-inch rise by 2100 are barely perceptible along the crescent-shaped swath of coast from Cape Fear to Cape Lookout, a slice of the state that includes many popular beaches. North of there, however, the red shading submerges most of the Outer Banks, much of Beaufort County, more than half of Hyde, almost all of Dare and Tyrrell and reaches 35 miles inland to the town of Columbia. Unlike most seaboard states, North Carolina has few population centers along its coast, but its cities won’t be entirely spared. River basins would spread dramatically as far inland as New Bern, Greenville and Elizabeth

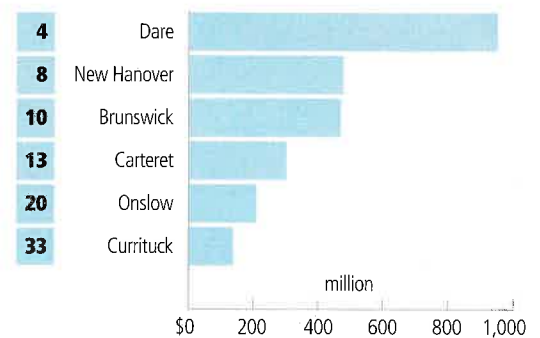
City. Even a modest 12½-inch rise would consume more than 900 square miles. “In northeast North Carolina, you can go 75 miles inland and still not be more than 75 feet above sea level,” says Stanley Riggs, an East Carolina geologist and science-panel member.

Not only does the terrain slope gradually, but some scientists say the entire northeast is slowly sinking. When storms strike or the sea rises, “it doesn’t take much to wash across fields,” says Keith Larick, an N.C. Department of Agriculture environmental specialist in Raleigh. “Then the salt water goes into

## Show me the money

Tourists spent more than \$2.5 billion in six coastal counties last year.

N.C. rank



Source: N.C. Department of Commerce

the ground. Crops aren’t tolerant of salt, and farmers have to let the land lie dormant for years until rain washes it out.” Larick unfolds a chart, showing farmland elevations. In Hyde County, nearly 80,000 acres of farmland is less than 2 feet above sea level. The county grew \$28 million of corn last year. In neighboring Beaufort County — the state’s second-largest corn producer, with a \$32 million crop last year — about 50,000 acres lie within 2 feet of sea level.

**THIS IS WHERE** the rubbish meets the road. A few days after Hurricane Arthur’s 100 mph winds buffeted the coast in July, diesel smoke billows from a road grader nudging drifts of sand and seaweed from N.C. 12 below the Herbert C. Bonner Bridge over Oregon Inlet. Since 2000, the state has poured more than \$100 million into salvaging this two-lane asphalt spine of the Outer Banks. More than 2.3 million people visited Cape Hatteras National Seashore last year,



with the typical three-night family visitor spending about \$900. Other than two often-crowded ferries, this highway is the only access and a critical evacuation route in storms.

Critics ask where the line is between property rights and foolhardy development. Is it across the Roanoke and Croatan sounds from here in blue-collar fishing villages such as Wanchese and Manns Harbor that depend on the water for subsistence? Or here, 25 miles down this windy, sea oat-lined island from the Bonner Bridge, in an infamously fragile strip near Rodanthe where houses topple into the ocean during storms even as new ones spring up nearby? About 200 new homes, many beachfront, were started in Dare County in 2013. Their combined value exceeded \$55 million.

Since 1990, nearly 75 million cubic yards of sand — equivalent to more than 7 million large dump-truck loads — have been pumped onto Tar Heel beaches in renourishment projects, costing several hundred million dollars, according to the Program for the Study of Developed Shorelines, based at Western Carolina University in Cullowhee. Only Florida and New Jersey have used more sand for replenishment. Nags Head recently completed a \$36 million, 10-mile replenishment, and Dare County announced in August that it's about to spend \$20 million on a practice widely accepted as the cost of supporting tourism.

All parties agree it's difficult to isolate storm versus sea-level effects, given that North Carolina is traditionally battered by hurricanes and nor'easters. For example, scientists predict storms will strengthen as the climate warms, exacerbating higher seas. "The real issue is North Carolina's inability to handle today's coastal issues," says Robert Young, director of the Western Carolina program. "The first step should be dealing with the storms we have right now every hurricane season." There's no rolling tally of homes and businesses lost to storms, but over the years they number in the thousands with damages in the billions. In 1999, Hurricane Floyd destroyed 968 buildings in the state, says Spencer Rogers, a coastal erosion and construction specialist with federally funded North Carolina Sea Grant at N.C. State University. He advises private-property owners,

builders and architects on coastal hazards. In 1954, Hurricane Hazel scored a direct hit. "Oak Island in Brunswick County had 350 houses before and five after," he says. "Not a very good performance."

Critics also attack margins of error. Though the law that the state adopted reins in projections to 30 years, the U.S. Army Corps of Engineers plans 100 years ahead. "Many of our projects are in place that long," spokeswoman Candice Walters says. The Corps budgeted nearly \$70 million for North Carolina projects this year, including channel dredging. Its 100-year estimates of sea-level rise in North Carolina vary from less than a foot to more than 5 feet, while the legislative commission said it could rise in a range of 15 to 55 inches.

**CAN ANY AMOUNT OF SPENDING** turn back the tide, rising or not? A windy pink dawn breaks in the fishing village of Engelhard, population less than 500, on the inland side of Pamlico Sound in Hyde County. Fishermen, shrimpers and farmers gas up their pickup trucks at a 1940s-vintage filling station. A dozen trawlers sway in the harbor. At the two-story Hotel Engelhard, owners Ursula and Bob Hayes greet their two guests and a half-dozen yarn-swapping regulars in the dining room. There's no menu. "Just tell us what you'd like," he says. The tide's in, and a few feet from the hotel's front-porch rockers, water from the Far Creek neck of Pamlico Sound is lapping 18 inches from the top of a man-made channel, as it does in roadside ditches throughout the village.

Two blocks from the hotel, Far Creek ducks behind Gibbs Store, a hardware emporium that has been in business since 1895. On the night of Hurricane Arthur, manager Renee Fisher, 43, got a phone call. "Our lumberyard is right out back, and all our wood — it was all banded together — was floating off out into the sound." Neighborly boatmen retrieved most, but Fisher, born here, knows it won't be the last time. "It's happening," she says of sea-level rise. "I might not be here to know anything about it, but it sucks for my grandchildren."

Engelhard is a low spot in Hyde, a 600-square-mile county with an average ele-

vation of 3 feet above sea level, about the rise predicted in the next 86 years by the state science panel. Fewer than 25 miles to the west, unincorporated Swan Quarter — the county seat, population about 325 — nestles on its eponymous bay. Debbie Cahoon, the county soil and conservation officer, works in a second-floor office of the courthouse, itself elevated against flooding. The 7-year-old brick building overlooks one of the region's most dramatic countermeasures: For nearly 18 miles, a system of 6.7-foot-high seawalls and earthen dikes protects Swan Quarter and 7,000 acres of farms. It cost about \$14 million in local and Federal Emergency Management Agency money.

Her family tills about 1,000 acres of wheat, cotton, soybeans and other crops. "We're one of the smaller ones here," she says. "We were out looking the other day at land that had salt on it from the last flooding. It wasn't growing anything." Like many houses here, where longtime residents record hurricanes by water stains on walls, hers was recently elevated about 7 feet, at a cost of about \$30,000. "It's a hard way to get a view," she says, laughing. About 25 homes have been raised under a \$500,000 FEMA grant, County Manager Bill Rich says, and they're not alone. Such houses are common along much of the coast, such as in the Carteret County community of Merri-mon, home of 57,000-acre Open Grounds, the largest farm east of the Mississippi (*cover story, September 2011*). Most of it is less than 2 feet above sea level.

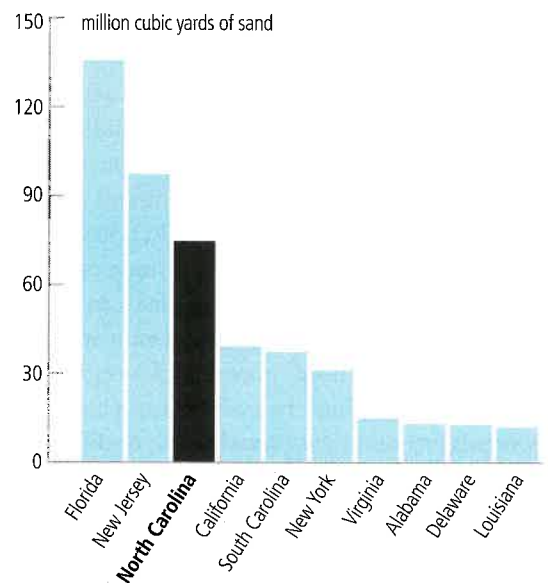
Planning for a rising sea or stronger storms generated by climate change is a growing, multimillion-dollar industry on the coast. In Engelhard, a \$1 million medical clinic built eight years ago sits on a raised earthen platform that's barely noticeable until pointed out by its designer, Ben Cahoon, who lives in North Nags Head. "In a hundred years," he quips, "I'll be living on a little island — a very valuable, remote little island." His Nags Head firm, Cahoon & Kasten Architects PC, designs commercial and residential buildings. "The only response to water is to avoid it, either by building on pilings or columns or building it up with fill dirt. That's well and good, but what happens to the infrastructure around the buildings?" Plus, he adds, coastal communities rely on drinking water from under-

ground aquifers that are being infiltrated by salt water.

Nags Head, like many places, has responded to the threat by requiring the bottom floor of new construction be at least a foot higher than water in the worst flood in a century would be expected to reach. About half of the state's 112 coastal communities require a 2- or 3-foot minimum. Such measures, intended mostly to preserve homes and businesses, attract little controversy because they apply only to new construction. What really rattles the deniers are potential increases in storm-

## True grit

Since 1990, the U.S. has spent \$7 billion to renourish beaches. North Carolina has added more sand than all but two states.



Source: Western Carolina University

related insurance premiums, which could jump thousands of dollars in a single year. But environmentalists say this subsidized insurance encourages owners and developers to build where they shouldn't. "The vast majority of this property on the oceanfront isn't primary homes," Western Carolina's Young says. "It's investment property. If they weren't getting good returns on their investments, they wouldn't be doing it. As long as they're subsidized, why the hell should they care about sea-level rise?"

In 1969, the General Assembly established the Coastal Property Insurance Pool, a non-profit that now provides wind insurance for about 236,000 policyholders. It paid out more than \$136 million in losses to 17,677 claims when Hurricane Irene hit in 2011, averaging

about \$7,500 per claim. Its purpose is to ensure all coastal properties can get coverage, General Manager Gina Schwitzgebel says. Policyholders pay above-market rates, enabling the pool to operate without state funding. NC-20's Thompson argues that homeowners on the coast pay more than their fair share. Citing statistics that show the coast is less prone to devastating storms than popularly perceived, he notes that homeowners there pay triple what people in the Piedmont do. For a \$150,000 home, he says, coverage costs about \$480 a year in Charlotte but \$1,526 on the mainland side of Carteret County — on the beach, it would carry an annual premium of more than \$2,400.

Federal flood insurance is a more controversial subject that divides politicians of both parties. The federal plan has paid nearly \$1 billion on more than 75,000 flood claims in North Carolina over the last four decades, averaging about \$13,000 per claim. Subsidized by taxpayers, the program is about \$24 billion in debt after massive Superstorm Sandy payouts, most in the Northeast. Another federal program, the Robert T. Stafford Disaster Relief and Emergency Assistance Act, pays for flood damage to public buildings, roads and other property and dictates that the destroyed infrastructure be rebuilt in the same place. Because of those backstops, ratings agencies don't factor sea-level rise in its ratings of local governments, even the most exposed cities and counties, according to David Jacobson, a spokesman at Moody's Investors Service Inc. in New York. "The federal government comes in, so they don't pay for damages and losses out of their own pockets."

Efforts to rein in the federal programs stalled this year when House Republicans blocked implementation of the Biggert-Waters Act in Congress. It would have based premiums for coastal flood insurance on the actuarial risk a home or business faces. "We know of several examples where policies were a couple thousand dollars a year but, under Biggert-Waters, would have gone up to \$11,000 or \$12,000," says Tyler Newman, government affairs director of the Wilmington-based Business Alliance for a Sound Economy, which represents builders and Realtors. It's worse than that, says Rogers of North Carolina Sea Grant. "People deny it, but we've seen actual

[FEMA] estimates of houses in the [most-hazardous areas] that would have cost \$53,000 a year."

Though he opposes onerous regulations on development, the state's top appointed official on coastal issues thinks federal subsidies for insurance are excessive. "I believe if I'm crazy enough to buy something on the ocean, a person in Wisconsin should not have to pay for it," says Frank Gorham III, a Figure Eight Island resident appointed by McCrory in 2013 to chair the Coastal Resources Commission. "On the other side of the coin, if I'm receiving no funds from the federal government, I should be able to do what I want." A former owner of an oil and gas company whose wife, Ramsay, was a state senator and GOP chairwoman in New Mexico, he moved in 2009 to North Carolina, where he has owned a house on the coast since 1998.

His mission, he says, is to calm the storm over sea-level rise. "Unfortunately, the commission has been the victim of politics. The science panel got blasted unfairly. One second after I came on board, it became the most political issue I've ever seen. You were absolutely against any sea-level rise, or you thought that the world was going to end. There was no willingness for people to talk, no willingness for people to say there was some middle ground." It's a different tone than taken by Rep. McElraft, who opposes any state action to address sea-level issues.

"Scientists think in hundreds or thousands of years," says Robert Thompson, an East Carolina political-science professor. "It's hard to get politicians to think beyond the next election. The deniers have a deep suspicion of science and think this is all just something cooked up by people trying to perpetuate a fraud." An update of the science panel's 2010 report will be sent to the General Assembly by March 2016, following another year of review by experts and the public. A few miles across Bogue Sound from McElraft's office, Todd Miller, who has spent his life on these waters, steers his boat to a dock. The seashore is tiny and fragile, he knows, compared with the vast, mighty ocean beyond. Miller favors bending with its changes, living with its moods. He shuts off the engine, and the sea breezes surrender. There's a crash of thunder as the storm arrives. ■