

COAST WATCH

Photo by Gene Furr



Much of the land in this 1976 photo of the Cape Hatteras lighthouse has been claimed by the sea

The ocean
Is coming,
The ocean
Is coming

That, we are told, is a fact. But the habit of holding one's own is a hard one to break. Walls, boulders, bulkheads and riprap—we have thrown everything we had at the sea, and still it keeps coming.

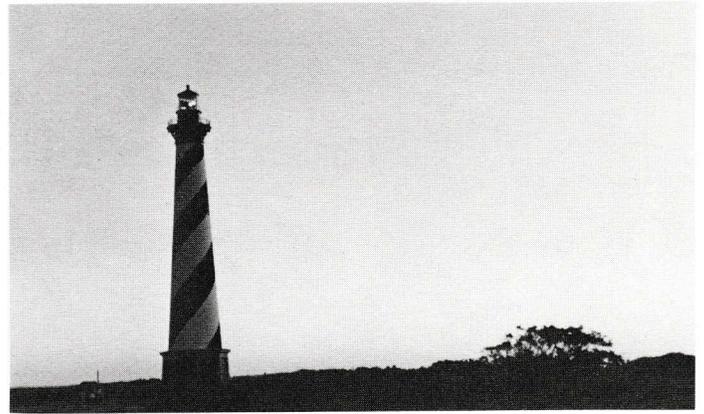
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The cry goes up—"Save the Hatteras Light!"—and thousands rally to help, while the lighthouse itself stands resolute, brave as a banner.

But while we battle the sea for inches on one hand, it steals yards on another. Houses topple, walls collapse. The sea keeps coming. State officials go about the often unpopular job of planning an orderly retreat. And the geologists are saying—to paraphrase Pogo—the enemy is us.

This month, *Coastwatch* looks at the problem of beach erosion, and what can be done about it.

Photo by Steve Wilson



What's eating at North Carolina beaches?

The word itself is a part of the problem. Erosion. Inland, it means gullied banks, silted streams and airborne topsoil. Erosion, we've been taught, is something man provokes when he disturbs the earth, and something he can stop—with walls, plants or more prudent farming.

But the sea erodes an ocean beach whether man is there or not, and geologists say that, while we might temporarily divert beach erosion from one place to another, there is nothing we can do to stop it.

As long as sea level continues to rise, our barrier island beaches will recede, and the islands themselves will "migrate" landward.

"Things out here aren't like inland areas," says Spencer Rogers, Sea Grant's coastal engineering specialist. A few hundred feet outside his office at the N. C. Marine Resources Center at Ft. Fisher, the sea is marching steadily landward.

"Geology is an active, real process out here on the beach," Rogers continues. "You can leave your lot in Raleigh on the day you're born, come back to it in seventy years, and there will be practically no change in the shape of the lot. If you have a lot on the beach that long, it's going to change dramatically. It may disappear altogether."

Most of North Carolina's 320 miles

of island beaches are backing up. Some 48 percent of the shoreline has been eroding at a rate greater than two feet each year. Eighteen percent of the coastline has been disappearing at an annual rate of more than six feet a year.

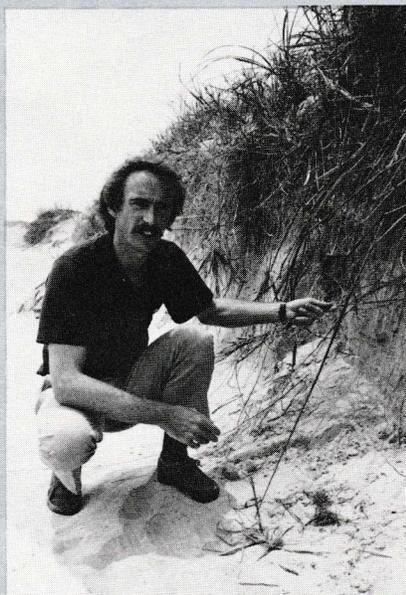
But about 54 miles of North Carolina beaches are actually gaining ground, "accreting." Some of this accretion happens when a beach collects sand lost from the opposite shore of a shifting inlet. Other beaches are accreting or eroding only very slowly because they face south, which gives them some shelter from the severe storms called northeasters, or because they are positioned in such a way that they catch sand lost from nearby capes.

This landward march is not as orderly and predictable as mere statistics make it seem. Areas such as North Rodanthe and Pea Island in Dare County, and Seagull in Currituck County, are eroding at mysteriously high rates. And, when it comes to a major storm or hurricane, no one can predict with confidence the reach of erosion.

"Geology responds to the high-energy storm events," says Stan Riggs, an East Carolina University geologist and Sea Grant researcher. "The energy expended day-to-day is not much compared to what is released in a catastrophic storm."

Riggs and Rogers explain that while the record may show a certain beach eroding two feet a year on average, a single storm might bring thirty years'

Photo by Neil Caudle



"You can leave your lot in Raleigh on the day you're born, come back to it in seventy years, and there will be practically no change in the shape of the lot. If you have a lot on the beach that long, it's going to change dramatically. It may disappear altogether."

—Spencer Rogers



Sandbag groins are used to reclaim lost beachfront

worth of erosion overnight. And, although much of the sand lost during storms returns, gradually, with calmer weather, that is no consolation to someone whose house collapsed after a storm tide swept the land right out from under it.

"One of the troubles with predicting erosion rates is that we really do have no idea how to predict what the short-term erosion is going to be like during a major storm," Riggs says. "In a major hurricane, the barrier island itself becomes the surf zone, with twenty-foot waves crashing against the buildings. You can't design anything to withstand that."

There are never very many people or machines around logging data and taking notes during a major hurricane. And, the exact interaction of waves, wind, sand and buildings is still unknown. Also, the mathematical models available for predicting short-term erosion do not take into account all of the variables.

John Fisher and Margery Overton, two North Carolina State University (NCSU) civil engineers, are doing Sea Grant research into one of those

variables—the role of dunes in short-term storm erosion. They say that predictive models have been based on the assumption that a storm would take as much sand from the dunes as it needed to offset the increased wave energy and reassert what has been called a "dynamic equilibrium."

"The old model depends on looking at the beach profile if an extreme storm took the beach to an equilibrium, on the assumption that beaches tend to erode to a stable profile, a geometric shape," Fisher says.

And Overton continues: "In the case that you have a shorter-term storm, a model like that is not going to be appropriate, because the beach won't have had time to reach that state."

Fisher and Overton are using a wave tank to simulate dune erosion and suggest ways to shape their model. They are trying to find how much sand is eroded from a dune with each "uprush" of water, so that, given the strength and number of uprushes, and the storm's duration, they may be able to predict the rate of dune loss.

"I think the motivation for this, in terms of the state's interest, is that the

FEMA guidelines (federal flood insurance) assume that if there are dunes present, then the waves will not breach them, and that therefore dunes are barriers to storm penetration," Fisher says. "But we all know that dunes are lost. Areas that look relatively safe on FEMA maps turn out to be not very safe."

Fisher and Overton say they plan to collaborate with scientists in Holland, where battling the sea is a way of life. Fisher says the Dutch are doing the most advanced work in beach processes.

"They're afraid that when that big storm comes along, most of the low-lying parts of Holland will go with it," Fisher says. "They want to be sure that they know just how stable their dunes are."

While scientists and public officials grapple with the immediate problem of how to improve the guidelines for coastal construction, most of them agree with the geologists that no computer model, building code or setback rule can guarantee a beach house safety. The forces behind beach ero-

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sion, they say, are simply greater than our means for understanding them.

Last fall the U. S. Environmental Protection Agency released the results of a study concerning the so-called greenhouse effect, created by the buildup of carbon dioxide in the upper atmosphere, and its presumed influence on sea levels. The most publicized portions of the agency's report were the worst case projections, one of which suggested that sea level could rise off the Carolinas as much as two feet by the year 2040. Such a rate would be four times or more the present rise, which has been estimated at one-third foot to one foot per century.

While such a drastic sea level rise might indeed doom the barrier islands of North Carolina, Riggs says the projections are too "iffy" to be useful now. Sea levels rise because of melting ice caps and glaciers, but also, some scientists believe, because of compaction in undersea sediments or a gradual sinking of the continental land masses.

And, while the world's ice has been melting for thousands of years, it seems to have been melting less rapidly recently. Riggs says it is possible that the world is about to experience a shift toward more glaciation and slowly lowering seas.

"The last four or five times that sea level changed, it changed about now in the cycle, toward more glaciation," Riggs says.

But "about now" in the context of world geology could mean hundreds or thousands of years. And Riggs says he makes the point not to raise any hope that the sea may stop attacking and retreat soon, but only to illustrate that the greenhouse effect is only one of a number of forces shaping the seas and coasts.

Another obstacle to understanding beach erosion is that the part of the beach we see is actually only a fraction of what is eroding. And what happens unseen under the wave may have more impact on the beaches than we have thought.

John Kraft, a geologist at the University of Delaware, has been doing Sea Grant research in Delaware's nearshore waters, and has found the beachface there eroding all the way out to 325 yards offshore, in 30 feet of water.

Kraft says that he and others had assumed that sand placed on the beaches during so-called beach nourishment projects helped restore a

gentle slope to the underwater beachface by making more sand available to the system. It was partly because of this assumption that beach nourishment has been regarded as the method of choice for beach protection (see page 5).

But when he took core samples of the sediments under water, Kraft found the sand layer surprisingly thin. Where he had expected to find several meters of sand, he found only one and one-half meters at the thickest. In some areas, old sediments had been laid bare and were eroding.

Kraft believes the slope of Delaware's beaches is getting steeper because beach managers have decided to hold a line and protect beachfront development. The rising sea, unable to advance at the top of the beach slope, advances instead nearer the foot, and the slope steepens.

Kraft says that for every meter of elevation lost on the beach berm, ten more are being lost along the length of the beachface under water. He explains that most of the sand added during beach nourishment soon disappears into "sediment sinks" far offshore, or in bays and estuaries.

"Suppose you're a beach manager, and I told you that if you replenished the beaches with three hundred and fifty thousand cubic yards of sand each year, you could keep the beaches stable forever," Kraft says. "You'd

probably spend the five dollars per cubic yard to do this—at an annual cost of more than one-point-seven-million dollars.

"But suppose I told you that ten times this amount of sediment is moving along the beaches into Delaware Bay and out on the inner shelf. You'd have to spend ten times as much—seventeen million dollars per year—to keep the beaches stable. You may want to change your mind."

Kraft says that one danger in holding a line against beach erosion is that the steeper slope of the beachface will increase the risk of property damage during storms. And, because the dry part of the beach seems, to the casual observer, to be stable, some property owners may underestimate their lots' vulnerability.

"The more you steepen the slope, the closer the average large wave comes to the beach itself, and the more damage it can do," Kraft says.

Kraft says he would expect to find the same erosion pattern on nourished shorelines in North Carolina. "I think it's happening all over," he says.

So what can be done about beach erosion? The obvious answer, to some, is, don't fight it, retreat: Build moveable houses; build far back from the sea, or don't build on barrier-island beaches at all. Perhaps the most-quoted proponent of this view is Orin Pilkey, a Duke University geologist.

Photo by Jerry Machemehl



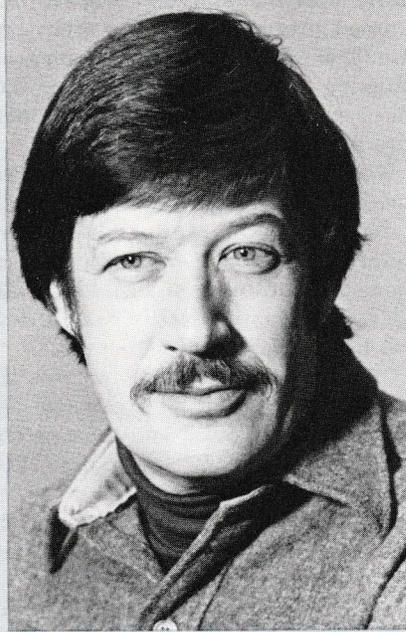
This beachfront home was undermined by a 1973 northeaster'

Pilkey proposed five "solutions" to beach erosion in *From Currituck to Calabash*, a book he wrote with his father and William Neal:

1. *Design to live with the flexible island environment. Don't fight nature with a "line of defense."*
2. *Consider all man-made structures near the shoreline temporary.*
3. *Accept as a last resort any engineering scheme for beach preservation, and then, only for metropolitan areas.*
4. *Base decisions affecting island development on the welfare of the public rather than the minority of shorefront property owners.*
5. *Let the lighthouse, beach cottage, motel, or hot dog stand fall when its time comes.*

—Neil Caudle

Photo by East Carolina News Bureau



"One of the troubles with predicting erosion rates is that we really do have no idea how to predict what the short-term erosion is going to be like during a major storm."

—Stan Riggs

Holding the line against erosion

It's called hardening the shoreline: setting up a barrier between the sea and the land. In North Carolina, most of the methods for holding the line against erosion require official permits; others are forbidden. None of these methods has escaped criticism, although one—beach nourishment—is favored for its flexibility.

Here are some of the common ways of fending off the sea:

Beach Nourishment

"Beach nourishment is the method of choice because it has fewer adverse effects, and it provides a recreational beach," says Spencer Rogers. "But it is expensive and it must be maintained. It's not a cure for an erosion problem, it's just a treatment for one."

Rogers says the success of such projects depends on reliable funding, favorable wave and weather conditions, a ready source of suitable sand, and good engineering.

Federal funds, which have in part supported beach-nourishment projects are becoming scarce, Rogers says. Some towns have established a resort

tax on rented rooms, with the revenues dedicated to beach-nourishment projects.

But Rogers says that some small beach communities may not have an economic base broad enough to adequately maintain increasingly expensive beach-nourishment projects.

Rogers also says that some communities, such as those on the Outer Banks, where powerful waves and currents keep great quantities of sand "in transport," will find their expensive sand disappearing at a greater rate than at more protected sites.

And, while some towns can replenish their beaches with sand pumped from shoaling inlets nearby, others cannot always find good sand.

Steve Benton, a geologist with the Office of Coastal Management, says that the biggest problem with beach nourishment is "where you get the material and when you put it on the beach."

Seawalls and Bulkheads

Expensive, massive and forbidden along much of North Carolina's coast,

seawalls are the hardest of devices for hardening a shoreline. Well engineered seawalls are often made of steel-reinforced concrete, and are very durable until they are undermined or flanked. They are frequently the choice when the goal is to protect a flood-prone coastal city. Seawalls cost about \$1000 a linear foot.

Bulkheads—retaining walls often made of treated wood—are less expensive (about \$200 a foot), less durable, and share the problem of seawalls: the beach seaward of the wall almost inevitably disappears. Wave energy that would normally be absorbed on the ramp-like slope of the natural beach is instead deflected, eroding sand from the base of the wall and also from adjacent property.

North Carolina regulations do not permit either structure to protect beachfront buildings begun after June 1, 1979, largely because the regulations' goal is to preserve not only property, but the beaches.

Rogers says there is also an economic reason for allowing the

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shoreline to flex enough to maintain a natural beach.

"If the beach is not there you can't begin to fill the motel rooms," he says.

Groins

Groins on the beach are usually low walls placed perpendicular to the shoreline in order to trap sand moving in longshore currents. Groins are made with a variety of materials, including sandbags, riprap, and closely spaced posts of wood or concrete, at a range of costs.

Groins rebuild the beach immediately "upstream" of the wall, but they do so at the expense of the beach downstream, because they intercept some of the sand supply. A series of groins tends to give the shoreline a severely scalloped or serrated shape. To work, groins must cross the public beach and extend well into the surf. There have been reports of strong rip currents forming along the down stream sides of groins.

Rogers says that although property owners can usually get a permit to build groins, they are not widely used on North Carolina beaches, mainly because they frequently fail during storms. But he says that well designed groins can help moderate fluctuations in the banks of an inlet.

"The reason groins can be considered for an inlet is that sand is being pushed up into shoals inside, which usually does nobody any good," Rogers explains. "The idea is to catch it before you lose it."

Fabrics and Artificial Grasses

Two man-made materials have raised some hopes in North Carolina recently because of reports of their success in building beaches or

preventing erosion. One of these is a fabric that a major oil company has claimed protects shorelines from erosion. The other is an artificial sea grass designed to be installed in the surf zone, where it may or may not help trap and collect sand.

Rogers says that the fabric is best used behind walls or bulkheads, where it can help retain sand while allowing water to move. But, while it may improve the durability of a rubble retaining wall, the fabric itself does not control beach erosion, Rogers says.

"A lot of people seem to have the understanding that you can lay this fabric on the ground and it stops erosion," Rogers says. "It's a good filter fabric, but the success or failure of this kind of system depends not on the fabric but on the very large rocks that you pile on top of it."

As for the artificial sea grass, which homeowners have begun to buy and install in some areas, Rogers suggests caution: "It's by no means a new method. It's been around several decades, and has in general proven to be ineffective in an ocean-wave environment."

Much of the optimism about the artificial seaweed arose from reports that the beach around the Cape Hatteras lighthouse was rebuilding after the material was installed in the surf there.

In September 1983, a team of scientists and engineers gathered to study erosion patterns around the lighthouse. (The team included Rogers, Steve Benton, John Fisher and Margery Overton of NCSU, Robert Dolan and Lorance Lisle of the University of Virginia, Curt Mason of the U. S. Army's Coastal Engineering Research Center at Duck, and Kent Turner of the National Park Service.)

The team reported that, while the Cape Hatteras shoreline shows "a dominant pattern of long-term ero-

sion," there have been occasional periods of accretion. The study found that beach nourishment, a newly constructed groin, and changes in wave and sediment-transport patterns have probably had the most influence on accretion at the lighthouse.

"While there has been some buildup in that area, it's also built up nearby, where the artificial vegetation could not have had any effect on the beach," Rogers says. "The accretion seems to be part of natural fluctuations in the shoreline."

Precautions

Although Rogers advised people to be careful of how they spend their money on devices to control beach erosion, he does offer some suggestions about how to protect their property and safety:

—Before you build on the beach, find out the estimated erosion rates for the lot and build on the site that affords the greatest protection. Your local CAMA permit officer can advise you.

—Build on pilings sunk deeply enough to support the house in case short-term erosion removes the dunes and some of the beach profile.

—Plan the building so that it can be moved when erosion threatens it. Many beach houses constructed on piles can be moved for a fraction of their construction costs.

—Practice dune conservation. (Sea Grant researchers Ernest Seneca and Steve Broome of NCSU have developed techniques for planting beach grasses and protecting dunes. For a free copy of their book, "Building & Stabilizing Coastal Dunes with Vegetation," write UNC Sea Grant Publications, 105 1911 Building, NCSU, Box 8605, Raleigh, NC 27695-8605. Ask for UNC-SG-82-05.

—Neil Caudle

Photo by Jim Page



A seawall is used to harden the shoreline at Atlantic Beach

Photo by Jim Page



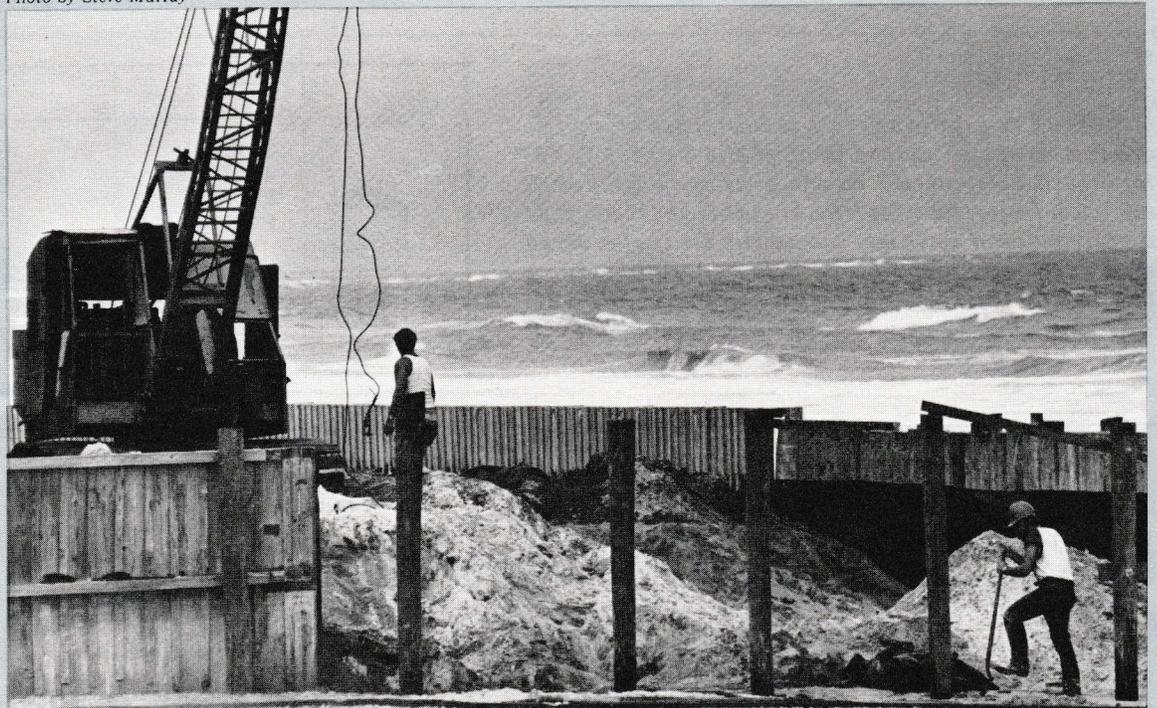
Photo by Les Thornburg



Barriers to the sea

Beach nourishment is a favorable, but expensive, way to hold the sea at bay (above). Groins and jetties, placed perpendicular to the shoreline, trap sand moving in currents along the shore (left). Bulkheads like this are no longer permitted to protect beachfront structures built after June 1, 1979 (below).

Photo by Steve Murray



Oceanfront development has its setbacks

In New Jersey, the damage is done. Waves crash at the bases of seawalls first built long ago to protect beach cottages and resorts. The sea, its energy deflected, scours sand from the walls' foundations. The rubble of failed walls lies scattered in the surf. The walls grow taller and mightier with each rebuilding. The cottages and resorts survive, but there is no beach. There is also no turning back.

But the specter of what has been called "New Jerseyization" has neither stopped nor slowed the pressure to develop North Carolina's beaches. And for better or worse, the fate of those beaches rests largely on a much-assailed and debated regulatory device called a setback.

North Carolina adopted its first ocean setback regulation in 1979, under its Coastal Area Management Act (CAMA). The Coastal Resources Commission, a board appointed to direct the state's coastal management program, adopted a rule that new beachfront development in "ocean hazard areas of environmental concern" (which include the ocean beaches) must be situated in such a way to meet several requirements. The most restrictive of these was the requirement that new buildings must be placed 60 feet landward of the vegetation line, or at a distance thirty times the long-term annual erosion rate, whichever is greater. This rule came to be known as the setback.

The setback did not please everybody. Beach developers have accused it of setting back not only the buildings, but builders and local economies as well. Some have challenged the validity of methods used to determine long-term erosion rates, on which the setback is based. And even the setback's defenders have called it a compromise that reflects the realities of state politics as much as it does the realities of beach erosion.

The controversy over oceanfront setback made headlines again last fall, when the Coastal Resources Commission

doubled the amount of beach setback for new buildings of four or more dwelling units, or of more than 5,000 square feet. After hearing from irate developers, the commission put a cap on the increase. No setback would increase by more than 105 feet.

In its public statement, the commission gave this explanation for the need for increased setbacks: "Large structures are more difficult, legally or practically, to relocate when threatened by storms or erosion." And, the statement continued, when buildings are placed too near the ocean, "there is an increased risk of loss of public beach, and an increased cost to the public due to more expensive disaster relief, flood insurance, erosion control, and the repair and replacement of public services such as water and sewer."

Dave Owens, assistant director of the state's Office of Coastal Management, says the commission weighed all the concerns and "came up with a number they felt was reasonable and practical, given the realities they were facing."

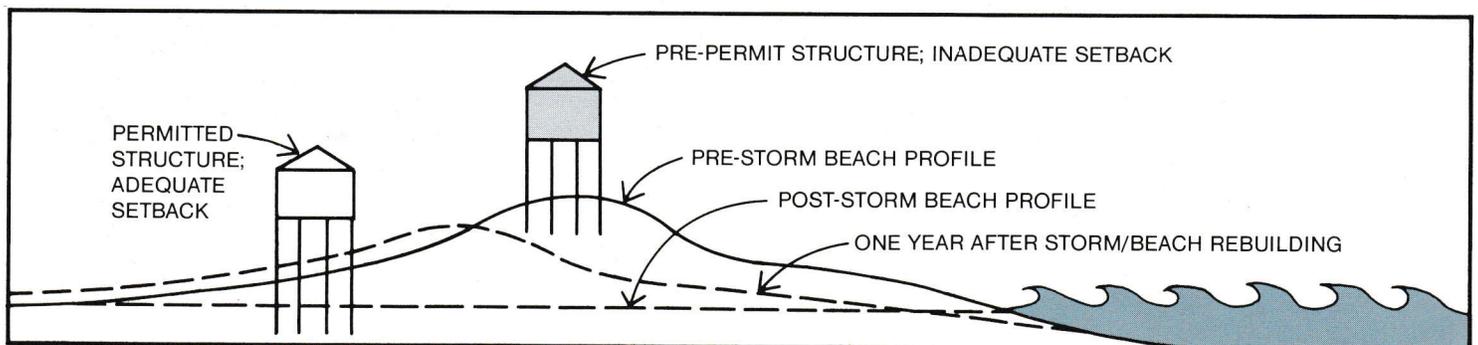
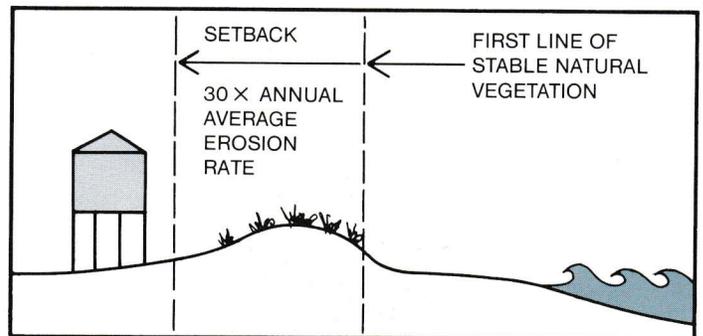
Even so, the new setback rules drew fire. Dare County's Board of Commissioners denounced the setback and, by way of protest, voted to withdraw the county from participation in the coastal management program. (The withdrawal did not make Dare County exempt from CAMA regulations. Officials say the only change will be that the minor permits program will be administered by staff from the Office of Coastal Management's field office in Elizabeth City, and not by Dare County.)

Opponents of the setback said it would stunt economic growth.

David Watson, president of the Dare County Board of Realtors, says that many hotels are built near the ocean because their patrons like it that way.

"If you set the building back several hundred feet, it may

Setback regulations require buildings along the oceanfront to be placed behind the frontal dune; landward of the crest of the primary dune; and, set back from the first line of stable vegetation at distance equal to thirty times the annual erosion rate or 60 feet, whichever is greater (right). After the storm, the house on the dune will be gone. The other has a much grater change of survival (below).





No dunes offer protection for these oceanfront homes

mean that the hotel is going to last longer," Watson says. "But it doesn't mean it's going to be better."

Watson says he believes the new setback will mean that fewer hotels will be built, that some beachfront property will be devalued, and that, as a consequence, Dare County will find its tax base too restricted to handle its tourist trade. He says that there are already too few rooms to rent in Dare County.

"It's my feeling right now that when you're running at one-hundred-percent occupancy, you need some more rooms. And with these new regulations, we're not going to get them. Our community is changing, and we are attracting more affluent visitors. People with more means demand services—nice hotels, nice facilities.

"With the limited amount of land left, I think you're going to see more big projects, fewer smaller ones," Watson says.

But the opposition from leaders in coastal communities is not unanimous even in Dare County. Don Bryan, who last fall was re-elected mayor of Nags Head, is a member of the commission and an advocate of the setback regulations.

"My view is that the Coastal Area Management Act has furnished a tool with which we can make people aware of the problem. It helps us form rules that will benefit oceanfront property owners from the standpoint of protecting the public from loss in the long run, and from the standpoint of protecting the public's interest in the beach."

Bryan says he thinks the results of the mayoral election "indicate that the citizens of Nags Head are satisfied with my stand."

Before last fall, some 500 beachfront lots were undevelopable in North Carolina at least partly because of the

setback regulations. Many of these lots simply did not have the buildable depth to accommodate the setback. Officials say the new regulations will make a smaller number of lots eligible for condominiums and other large structures, the more profitable variety of development in many areas.

But Owens says that many of these lots affected by setbacks could not be used anyway, often because of problems with sewage treatment or drainage.

"When you look at many of the developed beach communities and you see a stretch of undeveloped property, there's frequently a very good reason for that," Owens says. "The marketplace has recognized that these lots are unsuitable for development."

"Development pressure is continuing, but the supply of good land is constricted, so, over time, there's more and more pressure on these marginal lands," Owens says.

Owens points out that many developers have actually supported the setbacks. He says that, within the increased setback zone, "You can still place traditional beach cottages, duplexes, quadraplexes, swimming pools, and parking lots. You can design around it."

"I think it (the opposition to setbacks) primarily goes back to a philosophical objection people have with government telling them what they can and can't do with their property—setting some constraints," Owens says. "Because the economic impacts of this increase I don't think are all that significant."

By what authority does the state restrict the use of private property? Walter Clark, Sea Grant's coastal law specialist, says the state's authority lies partly in what has been termed its "police power," the power, he says, "to

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protect lives and property and the general welfare.”

Clark says that while the courts and the public are familiar with the legal aspects of owning private property, the public's rights to beaches are not as generally understood.

“Right now, the part of the beach now in public trust is only considered to be between mean-low and mean-high tide,” Clark says. “But it might be shown that the public has acquired an implied easement to the berm as well.”

Clark says that the public right to public land is at issue when a beach disappears in front of a seawall, or when a building encroaches on the recreational beach. The Coastal Resources Commission, he says, has decided that setbacks are the most practical way to protect all the vital interests—public and private.

Clark says that even though North Carolina's setback regulations have stood up well in court so far, there will be other challenges ahead, especially to the regulations concerning seawalls and bulkheads.

He gives as an example the case of a beachfront cottage with waves lapping at its foundations. If that cottage was built before the setback rules took effect in June 1979, the owner can often get permission to build walls between his house and the sea. But if the construction began after that time, regulations say no walls, period. Unless it is moved, that post-1979 cottage may soon be a pile of kindling on the beach. And the owner will have to clean it up.

Clark points out that few of the biggest, newest or most expensive development projects have been threatened yet, since most have built in accordance with the setbacks.

So what happens twenty or thirty years from now, when the sea is at the doorsteps of big hotels and condominiums?

“It's a very difficult proposition,” says Dave Owens. “You've got somebody sitting there with a couple-million-dollar investment, and the local government's looking at the tax revenues it's bringing in, and it's impractical to move it. Then, the commission is faced with, well, what do you want

Photo by Steve Wilson



Oceanfront building is a calculated risk

always looking for ways to improve the methods by which erosion rates are determined.

Some opponents of the state's approach to managing the shoreline have expressed a preference for methods used to control beach development in Florida. There, all new buildings permitted seaward of a “coastal control line”—a line frequently several hundred feet landward of the beach—must meet very stringent construction standards for durability and storm-resistance.

But Spencer Rogers, Sea Grant's coastal engineering specialist, says that the Florida method, while not relying on setbacks, might even be more restrictive to new construction than some people think.”

“If Florida's program were applied here, a lot of the buildings that are going in here wouldn't be,” Rogers says.

“North Carolina's program is certainly one of the most effective at addressing the hazards of coastal development,” he adds. “But even so, it's a compromise; it has to be to exist, and it has limits. It's by no means a cure to development, erosion and storm damage.”

Rogers says that too many people build immediately behind the setback line, even when they have room to spare. Rogers helped Alan Stutts and Crystos Siderelis of NCSU complete a study of setbacks and construction in several of the state's beach communities. In these towns, the study found that most new buildings were placed within 10 feet of the setback line.

Many of these structures were sited at the line for practical reason—the lots simply were not deep enough to accommodate more setback. But other buildings representing about 30 percent of the group surveyed, were sited at the setback line even though there was room to spare. In these cases, builders may have sacrificed years of erosion protection for a closer view of the sea.

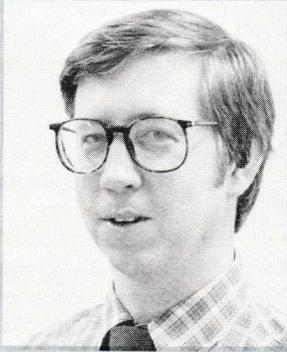
Rogers adds that the problem is compounded by the fact that the eventual homeowner is frequently not the homebuilder. Developers apply for permits, and receive Coastal Management's warnings about the property's vulnerability to erosion and storms. But very often, these warnings never reach the homeowner.

There have been several drafts of a bill that would require disclosure of such hazards to prospective buyers of coastal property. But these have all failed to gain support among legislators.

So, for now, it is “buyer beware.” And, as Rogers points out, too many buyers simply aren't aware.

—Neil Caudle

Photo by Steve Wilson



“Development pressure is continuing, but the supply of good land is restricted, so there's more and more pressure on these marginal lands.”

—Dave Owens

us to do, let it fall in the ocean? And that's a very difficult thing to put to a commission. So far, they have not granted any variances to let people put in hardening devices, but they are looking into allowing some temporary things, like sandbags.”

Owens pointed out that, while the setback is based on erosion data gathered from 30 to 40 years worth of aerial photographs, the setback calculations can not predict the future or guarantee anyone safety. He says his office is

THE BACK PAGE

"The Back Page" is an update on Sea Grant activities—on research, marine education and advisory services. It's also a good place to find out about meetings, workshops and new publications. For more information on any of the projects described, contact the Sea Grant offices in Raleigh (919/737-2454).



Bringing up the anchor of the Monitor, seashell collecting from a diver's perspective, federal and state laws on wreck diving and salvaging, diving in the Caribbean and Hawaii. You'll find out about all that and more at SEAS '84. It's the Southeast Atlantic States Diving Conference and Underwater Film Festival.

The three-day conference will be held February 24 through 26 at the Radisson Hotel in Raleigh. Jim Murray, director of Sea Grant's Marine Advisory Service, says the conference is a weekend of workshops, exhibits and films. You'll meet a panel of local and national diving experts who will tell you about everything from the shipwrecks off the North Carolina coast to underwater photography. You'll be able to take a look at all the latest in diving gear, and if you're a photographer, you can enter a photography contest.

Murray says the conference is geared toward the sports diver and those interested in the marine sciences.

The event is sponsored by UNC Sea Grant, the N.C. Marine Education and Resources Foundation, the N.C. Office of Marine Affairs, and the N.C. Wreck Divers Association.

If you register before February 10, the cost is \$15 for the workshop, \$5 for the social, \$6 for the film festival, and \$10 for the banquet, or \$36 for the entire weekend.

For more information about registration or about the photography

contest, contact Jim Murray at (919) 737-2454 or Doug Young at (919) 733-2290.



The National Estuarine Research Symposium will be held March 13 through 15 at the Marriott Hotel in Raleigh. The symposium, sponsored by Sea Grant and National Marine Fisheries Service, will explore the future research needs of our nation's estuaries.

During the symposium, prominent scientists from across the nation will tackle five subject areas: the impact of water management on estuarine productivity, the impact of sediment management on estuarine productivity, the impact of nutrients and chemicals on estuaries, the coupling of primary and secondary productivity in estuaries, and fisheries habitats.

From the papers presented and discussions held, a committee headed by UNC Sea Grant Director B.J. Copeland will develop a national strategy for estuarine research that will provide a sound scientific base for future management.

To register for the three-day symposium, send \$40 to UNC Sea Grant, 105 1911 Building, North Carolina State University, Box 8605, Raleigh, N.C. 27695-8605. Make checks payable to: UNC Sea Grant. The registration deadline is March 1.



Spencer Rogers, Sea Grant's coastal engineering specialist at Ft. Fisher, is looking for someone with property on an estuarine shoreline who can help him test a new erosion-control method.

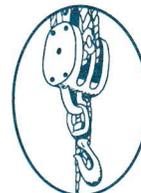
Rogers says that the device, which is designed for use on the shores of sounds or bays, combines a small wooden breakwater with protective

plantings of marsh grasses. Rogers wants to find one property owner who will be willing to pay construction costs and cooperate with the research. Rogers says the cost of the system will be half to two-thirds the cost of a bulkhead.

"Like most low-cost means of erosion control, there are no guarantees," Rogers says. "But this system may be effective in areas with up to a three-foot wave, and a bottom that drops one to two feet in the first one-hundred."

If you would like to talk with Rogers about the experiment, contact him at the Marine Resources Center at Ft. Fisher, General Delivery, Kure Beach, N. C. 28449 or call (919) 458-5498.

UNC Sea Grant has received approval for its 1984 renewal budget request. The program will be awarded \$1,175,000 in federal funds to complete the second year of its biennial program proposal.



If you would like to know more about the potential for a squid fishery, then Sea Grant has a workshop for you. Sea Grant's Southeast Marine Advisory Services, the National Marine Fisheries Service and the Gulf and South Atlantic Fisheries Development Foundation are sponsoring a squid workshop, January 26, from 6 to 10 p.m. at the Marine Resources Center in Manteo.

The workshop will begin with a social where participants can get a taste of squid and peruse squid products. At 7 p.m., a panel of experts will be assembled to discuss the potential of the fishery, location of the squid resource, quantities of squid available, harvesting methods, onboard handling procedures, processing and marketing. A question-and-answer session will follow.

The workshop is free. For more information, contact either: Jim

Continued on next page

Murray, 105 1911 Building, North Carolina State University, Box 8605, Raleigh, N.C. 27695-8605 (919-737-2454) or Wayne Wescott, Marine Resources Center, Box 699, Manteo, N.C. 27954 (919-473-3937).

Neil Caudle, UNC Sea Grant's Director of Communications, will resign his position effective March 31. Caudle, who has been with the program for over four years, is leaving to pursue a career in freelance writing.



UNC Sea Grant, the N.C. Office of Marine Affairs and the N.C. Agricultural Extension Service are sponsoring an estate-planning workshop for commercial-fishing families at the Marine Resources Center on Roanoke Island on February 9 at 7 p.m. Lawyers will be on hand to help families understand the implications of estate planning, explaining how they can save money and insure the security of their families.

The workshop will cover property ownership, wills and the effects of taxation. For more information about the workshop, contact Rhett White at the Marine Resources Center on Roanoke Island at (919) 473-3937.



The National Marine Education Association (NMEA) is offering 20 National Youth World of Water Awards to seventh- to twelfth-grade students who have won a local, state, regional, national, international or special-event science fair with a marine or aquatic research project during 1983-84. NMEA will also present five awards to undergraduate students who have completed an aquatic or marine research project during 1983-1984.

Winners will receive a plaque and an expense-paid trip to Washington, D.C., to attend Oceans '84, a prestigious oceanographic and ocean-industry convention. For more information about the awards, contact Lundie Spence at UNC Sea Grant, 105 1911 Building, North Carolina State University, Box 8605, Raleigh, N.C. 27695-8605 or call (919) 737-2454.

The UNC Sea Grant Program has a new address. We have not changed locations, but because of changes in mailing procedures at North Carolina State University our address and zip code have changed. Our new mailing address is: UNC Sea Grant College Program, 105 1911 Building, North Carolina State University, Box 8605, Raleigh, N.C. 27695-8605.

Last month we reported that Jim Bahen was experimenting with a shrimp trap. Bahen received many calls from folks wanting to purchase a trap. But hold the calls because Bahen is advising people to delay their purchases until more information about the traps is available. Regulations governing the use of the traps are unclear and the Division of Marine Fisheries (DMF) will be working with Bahen to study the traps. Later DMF will be developing a new set of regulations. Watch the Back Page for more information about the shrimp traps.

Larry Giardina, Sea Grant's marine advisory agent at Bogue Banks, left the Sea Grant Program in November to return to the west coast. Giardina, who specialized in business and marketing, had been with the program for two years.

Coastwatch is published monthly except July and December by the University of North Carolina Sea Grant College Program, 105 1911 Building, NCSU, Box 8605, Raleigh, NC 27695-8605. Vol. 11, No. 1, January, 1984. Dr. B.J. Copeland, director. Neil Caudle, editor. Kathy Hart and Nancy Davis, staff writers. Second-class postage paid at Raleigh, NC 27611.

COASTWATCH

105 1911 Building
North Carolina State University
Raleigh, NC 27650

Second-class postage paid
at Raleigh, NC 27611
(ISSN 0161-8369)

