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A Line in the Sand
Nourishing South Carolina's Beaches

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Folly Beach's 1993 nourishment project is a success story, lasting years longer than its design expectations. But erosion hotspots, like this one in front of a seawall, remain a problem for beachgoers. PHOTO/WADE SPEES



PROCEED TO BOARDWALK. *Increasingly, only the wealthy or those willing to rent their homes part of the year can afford to own single-family houses on many South Carolina beachfronts.* PHOTO/WADE SPEES

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LOST AT SEA. Edisto Beach Mayor Burley Lyons stands near the remains of a seawall that once protected Helen M. James' home, destroyed two years ago by a winter storm. PHOTO/WADE SPEES

A Line in the Sand

Nourishing South Carolina's Beaches

Many beach communities want to stop erosion in its tracks. How long can they hold back the sea's advance?

By John H. Tibbetts

Burley Lyons, mayor of Edisto Beach (pop. 641), says he'll make a stand against erosion and a rising sea, despite having seen large chunks of his town's oceanfront disappear underwater. "I know you can't fight Mother Nature," he says. "But I'm going to fight it as long as I'm here."

Sections of Edisto Beach's shoreline have eroded with alarming speed, as much as 40 feet in a single year. Two years ago, a beachfront cottage was severely damaged during a nor'easter. The storm surge knocked down the seawall, undermined the house's pilings, and cracked the structure in half, leaving the oceanfront portion drooping into the sea.

Helen M. James, the cottage's owner, later had it torn down. The house was too expensive to repair, although it had been in her family since the 1930s, and she spent every summer there.

James' now-empty lot is just a sliver of land between the sea and Palmetto Boulevard, the state highway. High tides routinely wash up to the lot's sandy crest, and spring tides pour across to the highway. Yet James says she plans to build a new seawall and house there. "My architect told me that if we move the house and seawall back (from the oceanfront), it would be all right. I think it will be fairly safe. If I worried too much, I wouldn't rebuild."

High tide floods pilings beneath numerous cottages along an eight-block stretch of the town's northeastern shoreline. Now Mayor Lyons wants the South Carolina legislature to help fund a multi-million dollar beach nourishment project for an adjacent state park that could protect these properties from erosion.

In its bond request package for the 2004 fiscal year, the state Parks, Recreation and Tourism agency will ask the legislature for \$4 million to nourish Edisto Island State



Neighbor versus neighbor

All nourishment projects should be locally funded, some experts say, because those who benefit most should pay for replenishment. Local responsibility would have the added benefit of eliminating funding controversies over beach nourishment.

But even locally funded projects can cause hard feelings over money.

Some residents of private communities are battling over who should pay for beach nourishment to bulk up eroding shorelines. Because private communities lack public beach access, they can't get federal or state money for nourishment. Landowners must pay the entire bill.

At DeBordieu, a private community in Georgetown County, a seawall guarding eight homes from severe erosion needs repair, and the retreating beach must be nourished if those homes are to be saved.

Meanwhile, most of DeBordieu's shoreline is healthy and wide. Yet all property owners of DeBordieu had to help support a \$2 million nourishment project in the winter of 1998.

All property owners were given a "special assessment" on a sliding scale that made beachfront dwellers pay the highest rates. But those who owned property on the wide beach section had to pay rates as high as those on the eroded area.

"That everybody here pays for nourishment irritates me," says Paul Huray, who with his wife owns two condominiums at DeBordieu located on a wide section of beach. "I studied the area before I bought, and now (the landowners on the eroded area) want me to pay for their mistake." For the 1998 project, Huray paid \$10,000 in the special assessment for two pieces of property.

In October 2003, the DeBordieu Colony Community Association requested a permit for a nourishment project to rebuild the beach again, drawing sand from the entrance to North Inlet.

Park. Such a project would also help supply sand for the town's beach, which is immediately south of the park.

Sand along Edisto Beach moves north to south with downdrift currents, as it does along most of the South Carolina coast. If the town also ponied up \$2

million to nourish its shoreline, the combination of state- and locally-funded projects could save many Edisto Island beachfront homes from future storm damage, says geologist Bill Eiser of the S.C. Office of Ocean and Coastal Resource Management (OCRM).

The state, however, has been mired in a multi-year budget crisis. "It's hard to say if the state will have that kind of money, considering the budget demands for courts, prisons, and education," says Chris Brooks, OCRM deputy commissioner. "It's going to be a real long shot." But Brooks is a strong supporter of nourishment as an investment in the state's beaches for tourism and economic development.

Edisto Beach is a typical oceanfront community in only one respect. People constructed homes on the shoreline with an expectation that the land would not disappear.

Rie Rone, James' daughter, recalls Edisto Beach when she was a girl. "I can remember in the late '50s walking down a boardwalk across the dune to reach the beach." Now the boardwalk is gone, the dune is gone, the house is gone, and the beach itself is gone at high tide.

James, who lives most of the year in Sumter, hopes that a potential nourishment project would widen Edisto Beach and protect her home. "A lot of us old-timers," she says, "really value the place."

Many beach communities have similarly turned to nourishment to hold back severe erosion and rising sea level. Projects have mined sand from pits on land and trucked it to the eroded beach;

Steve Moore

"If you look at the tourism industry and the money it brings in, it makes sense economically to nourish beaches."

or dredged sand from offshore or a nearby tidal inlet and pumped it onto shore.

Studies show that artificially widening a beach can reduce damages from storm surges and waves during hurricanes and nor'easters. Nourishment projects also compensate those

communities where federal navigation projects, such as harbor jetties, have robbed sand from downdrift beaches.

But critics argue that nourishment is often short-term, expensive, and wasteful, drawing development to vulnerable locations.

Who pays for beach nourishment? Taxpayers in places like Greenville and Spartanburg and Omaha and Kansas City have helped fund the vast majority of nourishment projects. Who benefits? Beachfront property owners and beachgoers clearly benefit. Beyond that, there is plenty of debate.

South Carolina planners point out that wide sandy beaches are the central attraction of the state's coastal tourism, which draws billions in revenue each year, and supports local businesses that employ thousands. "If you look at the tourism industry and the money it brings in, it makes sense economically to nourish beaches," says Steve Moore, OCRM director of planning.

If tourism declined, so would the enormous tax stream from visitor spending at local, state, and federal levels. This loss would particularly hurt county and state budgets, and taxpayers would have to make up the difference.

Not true, says Orrin Pilkey, a geologist and director of the Duke University Program for the Study of Developed Shorelines. "If you just let the shoreline (recede), the beach will always be there." That is, the beach would retreat naturally. "It would be very good for tourists.



LAST STAND. A high tide rushes under an Edisto Beach cottage. If the town of Edisto Beach fails to secure state or federal funding for beach nourishment projects, many homes like this one could be wiped out by a future storm. Local officials argue that they need more aid for beach nourishment to protect shorefront investments, which are the backbone of the coastal tourism industry. PHOTO/WADE SPEES

Some houses might fall in, but the beaches would remain.”

During the 1980s and 1990s, South Carolina’s beaches were nourished at an average cost of almost \$3 million a year from all sources, says Brooks. Localities or private communities paid the entire bill in a few instances. The federal government, through the U.S. Army Corps of Engineers, supported most projects with matching funds provided by the state and localities.

Brooks argues that beach tourism and coastal growth have been the only positive areas in South Carolina’s economy over the past several years, and “healthy beaches are a key to this success.” Through nourishment, he says, “We are protecting our most important economic asset.”

During the 1990s, total state expenditures for nourishment projects were \$25.5 million. Yet South Carolina has not funded any projects for the past three fiscal years. And while federal funding for nourishment nationwide has risen from \$79 million in 1995 to \$135 million in 2002, desperate oceanfront communities are fiercely competing for those funds.

After nearly 20 years of nourishment projects, the state’s beaches “reached a peak in 1999 in what we call ‘healthy beaches’ based on the amount of sand in the (oceanfront) profile,” says Brooks. The percentage of “healthy beaches” has declined slightly over the past three years, largely because state funding has diminished, he says.

Pilkey, however, dissents. An artificially plumped-up beach is not a “healthy” shoreline, he argues. In his view, a healthy beach is one that can migrate naturally.

In any case, several developed South Carolina beaches still have localized hotspots of severe erosion: Garden City, DeBordieu Island, Daufuskie Island, Hilton Head Island, Folly Beach, Sullivans Island, and Isle of Palms.

Edisto Beach has one of the worst erosion problems in the state. Sand that used to reach the town and the park becomes naturally trapped north of Edisto Island.

The irony is that nearly all Edisto Beach cottages at risk were constructed after the S.C. Highway Department nourished that shoreline during the 1950s and built groins to hold the material in place. The highway department reportedly used mud and crushed oyster shells from inland pits to fill in the shore. The heavy oyster gravel made the coastline stable for decades, and dozens of homes were built there. But no one would use this material for beaches today because it’s too coarse.

Now the town of Edisto Beach hopes that the state legislature will fund a nourishment project that could provide some storm protection for dozens of homes drawn to that location because of another nourishment project decades ago.

Edisto Beach’s dramatic erosion is unusual; beaches distant from tidal inlets rarely retreat at 40 feet in a

single year. But its retreating shoreline could foreshadow the long-term fate of many beaches in eastern North America.

Nourishment alone will not stop an inexorable rise of the sea. Over the past 80 years, sea level has risen 10 inches at Charleston, measured by a NOAA monitoring station located in the harbor. Even a tiny rise in sea level can threaten huge numbers of coastal properties. “It doesn’t take much of a sea level rise to flood a great deal of land,” says James T. Morris, marine biologist at the University of South Carolina.

As a rule of thumb, a one-foot rise in sea level translates into 100 feet of shoreline retreat, all other factors being equal, according to Stephen P. Leatherman, director of the International Hurricane Research Center & Laboratory for Coastal Research at Florida International University in Miami.

Some coastlines are also sinking due to natural factors such as compaction of sediments, shifting

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GROWING TREND. A change in housing types in oceanfront communities has raised the stakes for those who want to protect more costly investments. Some communities with higher-value real estate and vigorous tourism economies have used their leverage to gain nourishment protection. PHOTO/WADE SPEES

geological faults, and intensive pumping of groundwater and fossil fuels. These factors frequently cause far swifter shoreline erosion than does sea level rise.

Some South Carolina beaches are retreating slowly, while others are accreting—that is, building out. Accretion and erosion occur naturally along the entire coast. In most places, change is invisible. In other places, it is dramatic and volatile. A stretch of beach near a tidal inlet can migrate inland hundreds of feet over a few years, then accrete a similar distance over a few years, and then retreat once more. A house with hundreds of feet of beachfront one summer can have seawater washing underneath it the next.

Most South Carolina beaches are relatively stable over the short term. But the long-term trend is toward higher seas and eroding shorelines.

Sea level rise will probably accelerate in the next hundred years, the great majority of climate scien-

tists agree. The Earth's average surface temperature is expected to warm more rapidly in coming decades, primarily due to a combination of natural warming and increasing greenhouse gases from manmade pollutants.

As ocean water warms, it expands, pushing the sea higher up shorelines. Ice caps, ice fields, and mountain glaciers will likely continue melting, providing increased freshwater to oceans.

Even the most skeptical climate scientists acknowledge that the next century's rate of warming will be more than double the past century's. Worldwide sea level, therefore, is expected to rise by about 19 inches on average by 2100, according to the World Water Council, an international water agency.

Some communities could see dramatic shoreline changes long before that. As sea level rises, large storms will increasingly cause erosion and greater damages to structures along the oceanfront. But shoreline retreat won't be uniform. There probably will be

even more severe extremes of erosion in some areas, while other areas will hold relatively firm, says Paul Gayes, a marine scientist at Coastal Carolina University.

"The beach is not responding uniformly to sea level rise now," he says. "Some areas are going to be more heavily stressed, and the ones on the brink now are probably the ones that will be most vulnerable in the future."

BEACHFRONT SUBSIDIES

Tourists swarm to sandy beaches around the world, dipping into the sea from California to Hawaii to Australia to southern Europe and North America from New York to Texas. The seashore is still the world's favorite getaway spot. An ocean view, hot sand at your feet—that's the modern paradise fantasy for vacation or retirement.

Advertisers employ beaches as sexy backdrops, as the ultimate exotic venue for escape and freedom.



American popular culture celebrates youthful hormonal excitement at the ocean's edge. Think of the Beach Boys and *Where the Boys Are*, bikinis and muscle beach and spring break and "California Dreamin'."

Millions upon millions want to stay—for a brief idyll or for the rest of their lives—close to the sea. That's one reason why many oceanfront properties are among the most expensive vacation real-estate investments.

Only a few generations ago, sensible people built modest shacks on southern oceanfronts, because homes there were likely to get damaged or knocked down by big storms.

But since the 1950s, southern beaches have become densely built with high-rise hotels and condo

complexes, plus expensive second homes and vacation rentals that resemble mini-castles jacked up on pilings. Low-key beach communities continue to be transformed into crowded, bustling tourism centers.

Consumer demand for vacations and retirement homes drive this explosive growth. But government subsidies have also encouraged costlier oceanfront development. Federally subsidized flood insurance is "an incredibly large subsidy" for all coastal property owners, says Robert F. Becker, director of Clemson University's Strom Thurmond Institute. "But in some beachfront locations, the most important subsidy could be beach nourishment."

A recent study by the NOAA Coastal Services Center found cost information on 242 of 333 nourish-

ment projects completed since 1950, funded by federal, state, county, local, and private sources. Cost information is difficult to locate on the other 91 projects, which were small or have exclusively state or local funding.

About \$2.5 billion (in current dollars) was poured into beach nourishment from 1950 to 2002, the study showed. Since the 1950s, nourishment funding has risen sharply every decade, with the exception of the 1980s when it dipped slightly. During the decade of the 1960s, it cost taxpayers about \$95 million (current dollars) to replenish beaches. In the decade of the 1990s, nourishment projects cost \$835 million.

"Through beach nourishment, the government is subsidizing development in these dangerous places," says Pilkey.

Oceanfront housing density has increased soon after sand has been



ON THE EDGE. Sandbags have been placed in front of JoAnn Schultz's home on Folly Beach in an effort to protect it from erosion. In the 1980s, portions of this lot were probably submerged under seawater due to erosion. Then a 1993 nourishment project substantially widened this section of the Folly beachfront, and the original property owner built a house there. Schultz purchased the house, but now she is trying to sell it. This is an example of how a nourishment project apparently encouraged development in a hazardous location, critics say. Meanwhile, Schultz is asking the town of Folly Beach for a variance to build a vertical seawall to protect her property. "Renourishment is too far (in the future) to help me," Schultz says. "I want to get a seawall and sell the house at a reduced price. I will never go close to the coast again. I've learned my lesson."

PHOTO/WADE SPEES

poured onto some beaches, Pilkey adds. In several communities in North Carolina (Atlantic Beach, Carolina Beach, Nags Head, and Kill Devil Hills) and South Carolina (Garden City and Folly Beach), numerous single-family homes have been torn down and replaced by multi-family apartment buildings and condominiums within several years after nourishment projects were completed, Pilkey says.

Along with federal flood insurance, beach nourishment draws more intensive development to the seashore, most experts agree. And because many millions of dollars worth of sand has been pumped on beaches, more valuable structures are at risk from large storms. Taxpayers in the future will be asked to pay for replenishment projects to protect those buildings, says Pilkey.

Oceanfront property owners are the greatest beneficiaries of nourishment. "We have seen property values along the beach rise dramatically and fairly quickly after nourishment projects," says Andy Coburn, associate director of the Program for the Study of Developed Shorelines.

Since a federal/state project was completed on Folly Beach in

1993, for example, the value of beachfront lots has risen dramatically. Oceanfront lots that sold for \$150,000 a decade ago now sell for as much as \$850,000.

But even back-island properties have benefited. Lots a few blocks inland that cost \$30,000 in the mid-1990s now can be sold for \$200,000.

"Look at the property values at Folly Beach, and you can see a tremendous change through the whole island since renourishment," says Tim Kana, president of CS&E, a coastal engineering firm in Columbia, who argues that since beach-town dwellers benefit most, they should pay a lion's share of nourishment costs.

It's difficult to say whether nourishment is the most important driving force behind skyrocketing property values on Folly Beach. But no one likes a severely eroded beach.

HOLDING BACK THE SEA

Before World War II, most U.S. beaches were undeveloped or lightly developed. Beaches moved naturally inland when the sea drowned the shore. Property owners lost their houses or moved them.

But starting in New Jersey in the 1960s, beachfront property owners began installing erosion-

control structures to protect their investments, and landowners in other states quickly followed suit, armoring the shoreline with seawalls, bulkheads, and similar hard structures.

The problem with seawalls is that they allow waves to scour away sand and prevent beaches from naturally migrating inland. As a result, the beachfront disappears underwater.

By the 1980s, many South Carolina landowners would have lost their homes to storms and erosion if they hadn't built new seawalls and repaired old ones. But the public lost access to the dry beach in some areas. So coastal regulators discussed how to balance the public's right to enjoy the oceanfront against the need of private landowners to protect their property.

Policymakers debated whether to create a policy of retreat. The idea was that new buildings would be significantly set back from the ocean, and construction of new seawalls and repair of old ones would be prohibited.

In 1988, South Carolina was one of the first states to attempt an orderly retreat from the sea, when the S.C. General Assembly passed the Beachfront Management Act. The 1988 law established a narrow no-construction zone immediately behind the front beach dune, though farther landward from this "dead zone" people could build a home. But the "dead zone" rule, intended to set structures substantially back from the sea, did not last long.

In 1986, developer David H. Lucas purchased two oceanfront lots on the Isle of Palms for \$975,000. However, any structure built there would be in the no-construction zone under the 1988 law. Because he was prohibited from building on his lots, Lucas argued that the 1988 law had illegally “taken” his shorefront lots. The state of South Carolina had rendered his property worthless, he said.

Lucas pointed to the Takings Clause of the Fifth Amendment, which says, “[N]or shall private property be taken for public use without just compensation.” Lucas took the state to court, demanding compensation for his losses.

Lucas won in the U.S. Supreme Court in 1992, and a year later received a settlement of \$1.55 million from the state, including the transfer of the two disputed lots to the state, which later sold them.

Yet even before *Lucas v. S.C. Coastal Council* was decided, the South Carolina legislature again revised the beachfront management law. This time, the legislature got rid of the “dead zone” restrictions, making it possible for some landowners to develop their oceanfront property if they have special permits.

Did the *Lucas* decision and the state law’s revision eviscerate South Carolina’s capacity to retreat from the ocean? No, says Brooks. “We’re continually making decisions on beachfront development. We’re moving structures back as far landward as we can on the lot and downsizing them.” But many coastal parcels are shallow, lacking room to move back, Brooks acknowledges.

“It’s politically and economically difficult to back off of a highly developed coastline,” says Moore.

“People don’t want to give up that front row of houses.”

As part of its beachfront law, South Carolina still prohibits new seawalls; none has been constructed since 1988. An existing seawall cannot be rebuilt if two-thirds of it has been destroyed by a storm. (By 2005, the threshold falls to 50 percent.)

The principle behind the seawall provisions is simple. As storms destroy older seawalls, beaches naturally migrate inland. Beach migration eventually undermines oceanfront homes, which collapse or have to be abandoned.

Over the past decade, apparently just one South Carolina oceanfront building has lost its seawall. That one belonged to Helen M. James. Now she can probably rebuild the seawall because of a shortcoming in state law, coastal regulators say.



SAND TRAPS. Decades ago, groins—hard structures perpendicular to the shoreline—like these at Folly Beach were built in an effort to control erosion. Later, groins fell out of favor because they can starve sand from downdrift beaches. Now, under South Carolina regulations based on a recent state law, new groins can be constructed and existing groins can be reconstructed only in concert with an ongoing nourishment effort that meets special criteria. PHOTO/WADE SPEES

It is a little-known fact that landward sections of many South Carolina beachfront lots are outside of state authority in regard to seawalls.

Where you can build on the beachfront depends on several factors. First, you need to find the baseline, which is an invisible line running along the ridge of the front beach dune. If a seawall has replaced the dune, or the dune is gone, then the baseline is where the dune would have been.

Once the baseline is established, a second invisible line of jurisdiction—the setback line—is drawn. The setback line is usually defined by the local erosion rate. That is, the setback line is generally a projection of where the baseline will probably be in 40 years if erosion continues at the current pace along a particular beachfront. If a beach is eroding at a rate of one foot per year, then the setback line is 40 feet landward of the baseline. If a beachfront is stable or expanding seaward, then the setback line still has to be located a minimum of 20 feet landward of the baseline.

The setback line is important to understand for several reasons. Seaward of this line, property owners can build homes limited to 5,000 square feet of space. They cannot build large commercial structures. Moreover, they cannot build seawalls, bulkheads, revetments and other erosion-control structures parallel to the shoreline.

One problem is that the setback line sometimes does not reflect the dynamic reality of a beach. For instance, Edisto Beach's long-term erosion rate, measured over decades, is actually quite slow—only a half-foot per year. But its short-term erosion rate in many areas is explosive—40 feet in a single year. As a result, the setback line at Edisto Beach is located in some frequently flooded areas.

Another weakness of state law is that the setback line marks the landward limit of the state's jurisdiction.

If a beachfront lot is deep enough and a property owner has high ground to build a home and seawall more than 20 feet inland from the baseline, then in some cases he can build those structures in the lot's landward area, if a locality will allow it. And most localities do.

In other words, many property owners who have lost seawalls can simply retreat from the state's jurisdiction and rebuild them under local authority.

"There are many places where people can drop back and build a house and squeeze in a seawall outside of our jurisdiction," says Eiser. This was a shortcoming of the original law, he says. "Every oceanfront lot should have been in our jurisdiction."

As a result, Helen M. James can probably build a new home and seawall on a disappearing beach. "I don't think we would refuse a request to build a seawall," says Laurie Sanders, zoning and building code administrator for the town of Edisto Beach. "The town has no rule to stop a seawall."

With such limits on their jurisdiction and authority, South Carolina coastal managers strongly support nourishment as a practical method to protect beaches. But this is a choice, most experts agree, that may have a limited time horizon. In a not-so-distant future, sea levels could rise so high and storm damage could become so expensive that nourishment would be ineffective or impractical in certain locations. "Some places are getting to the end of this temporary solution," says Gayes.

No one really knows when it will become impractical for many beaches to nourish, Eiser says. "By periodically nourishing you can hold off that imperceptible sea rise that occurs over decades." Still, you can't hold it off forever, he says.



Costs and benefits

The town of Edisto Beach eventually hopes to gain a 50-year U.S. Army Corps of Engineers nourishment maintenance project funded by Congress.

If Congress agrees, the federal government would pay 60 percent of the cost of periodically pumping sand onto the seashore for half a century; state government and localities would share the rest of the bill.

Before Congress can authorize one of these projects, a study must prove that the economic benefits of wider beaches for storm protection outweigh the long-term cost of pumping sand onto the beach and monitoring the project.

First, the Corps of Engineers studies the value of beachfront property that would be damaged in a storm under current eroded conditions. Then the agency compares the value of property that would be damaged if the beach were replenished, creating a buffer from a storm surge. If replenishment would save, say, \$300 million worth of beachfront property, and the long-term cost of the project is considerably less, then a community can argue to Congress that the project should be funded.

In other words, the Corps of Engineers has to illustrate that a town has enough oceanfront property to warrant a multi-million-dollar sand replenishment project.

Would Edisto Beach, with its front row of modest cottages, qualify?

"Some communities don't have enough oceanfront development to justify federal nourishment projects," says Andy Coburn, associate director of Duke University Program for the Study of Developed Shorelines.

But Joe Jones, chief of planning for the Corps of Engineers Charleston District, says, "We have just as many projects in (low-density) communities as (high-density) communities. We are prone to have more projects in single-family beachfront communities" than those with high rises.

WHO PAYS?

In 1996, the Clinton administration sought to phase out federal backing for nourishment. The George W. Bush administration has wanted the same thing. Both administrations called for states and localities to bear an increasing share of shore replenishment costs.

Yet it didn't work. Over the past seven years, coastal states and communities have lobbied successfully for additional nourishment funds for major projects from Congress. Since 1996, Congress has funded at least six new 50-year beach maintenance projects around the country, says Howard Marlowe, a lobbyist for American Shore and Beach Association, an influential organization representing many shoreline communities. Federal taxpayers fork over 60 percent of a project's cost, while states and localities pay 40 percent.

"We have not been stopped on any project," says Marlowe. "There are more federal projects coming down the pipeline in more areas of the country than ever before. We've gotten everything we've asked for."

Current annual funding for 50-year federal beach replenishments, says Marlowe, is at least twice that of the pre-1996 era.

Yet there remains a huge hunger for sand. "If you doubled the federal appropriation for nourishment, you wouldn't satisfy the demand for it out there," says Kana. "So local communities have to take the lead because they have the most to gain from these projects."

Many beach towns argue they are too poor or too small to pay several million dollars for an effective project. Besides, they

support tourism, a cash cow for county, state, and federal budgets. Therefore, towns should receive county, state, and federal help in paying for beach replenishment. State and federal government should fund nourishment just as they do construction of highways and bridges that support the tourism industry, local officials say.

"Two-thirds of South Carolina's tourism industry's revenues come from the coastal area," Mayor Lyons points out. "Yet the state has not put aside funds for nourishment to protect that investment."

Beach towns, however, have discovered that erosion can move faster than Congress or state legislatures.

Robert G. Dean

"There are many, many beaches that do not have the economic base for nourishment."

Communities must spend six to ten years on planning, feasibility studies, and lobbying before gaining congressional approval for a 50-year federal nourishment project. That's why some erosion-prone

towns, desperate for sand, have given up on Congress and funded their own projects through accommodations taxes, special property tax assessments, neighborhood fees, and other local measures.

Edisto Beach has set up a committee to study "avenues for creative financing" to pay for nourishment on its own, says Mayor Lyons. The town has saved funds from its accommodations tax, but it could not alone pay \$4 million to \$6 million for a useful project, he says. Edisto Beach lacks the property tax base or intensive tourism business to service that level of debt.

Edisto Beach is not unique in this regard. "There are many, many beaches that do not have the economic base for nourishment," says Robert G. Dean, a coastal

engineer at the University of Florida.

On the East Coast, modest cottage communities are an endangered species. Property taxes on beachfront land have skyrocketed. The cost of hazard insurance continues to go up. Only the wealthy or those who can draw lofty rental prices can afford to pay high costs of owning beach property in many places. Beachfronts have been gentrified, and many smaller cottages have been replaced by more valuable investments.

Now some communities like Edisto Beach find themselves in a dilemma: they are too small to pay for their own projects but unable to capture enough state and federal funds for nourishment. "South Carolina has a diversity of beaches," says Brooks. "It has the glitz of Myrtle Beach and Hilton Head, and it has unique family beaches like Edisto, Folly, and Pawleys Island. A lot of people search out that kind of beach, and it would be a shame to lose it."

Edisto Beach faces special circumstances because of its exceptionally high erosion rate. But eventually, most beaches along the East and Gulf coasts will migrate inland too far, too fast for nourishment to save buildings from damaging storms. This migration could take numerous decades in many locations, while a few beaches might face this dilemma in a matter of years, says Gayes.

To preserve South Carolina's beaches over the long-term, oceanfront landowners will probably have to retreat from rising ocean waves. But, politically and economically, that seems unlikely over the short term. So, for now, nourishment is the only practical answer. Many coastal geologists, however, say that we are only postponing an inevitable retreat, and the longer we wait to pull back, the more costly and painful it will be. 🍷

The Hunt for Sand

Where will we find the sand to nourish beaches over the next several decades? And how much more will it cost?

In South Carolina, sand resources for nourishment projects are surprisingly scarce and not uniformly distributed, says Paul Gayes, a marine scientist at Coastal Carolina University. Sand for nourishment has to be a certain size. Moreover, transporting sand is so expensive that some sand deposits only a few miles offshore can be cost-prohibitive to pump onto the shoreline.

When nourishment sand is placed on the beach, it tends to become redistributed and dispersed, making it difficult to recycle. "So we'll need to find more resources over time," Gayes says. Future sand resources will probably be more numerous but smaller and farther from the areas to be nourished. All these factors will result in increased costs for future nourishment.

South Carolina has only recently begun mapping the location of sand resources along the coastline.

In 1994, the S.C. Sea Grant Consortium, in partnership with and with funding provided by the U.S. Geological Survey, began the Coastal Erosion Study. The ultimate goal is to establish a "sand budget" for the coastline.

Phase I, completed in 1999, focused on a surveillance of the mid-section of coastal South Carolina. This research, coastal managers say, has already provided useful information about the degree to which some South Carolina beaches are eroding and where some potential nourishment deposits of sand are located. Scientists are also studying offshore and nearshore geology, historical movement of the shoreline, and sediment volume and transport rates.

Researchers are compiling this information into an Internet-based GIS database that will be available to resource managers, beachfront communities, consultants, educators, and others.

Phase II, begun in 2000, has expanded the research to include initial studies of remaining portions of the South Carolina coast, as well as preliminary work on northern Georgia coast. Using geophysical surveys, repeated beach profiles, and innovative technologies such as high-resolution sonar imagery, the study's researchers are searching for locations that have beach-quality sand. For more information, visit the Phase II Web site at <http://camelot.coastal.edu/>

To their surprise, scientists have discovered a giant shoal just a few kilometers offshore parallel to the Grand



HIDE AND SEEK. South Carolina is starved for beach-quality sand. "We're having to go farther and farther offshore to find nourishment sand," says Paul Gayes, a marine scientist at Coastal Carolina University, shown standing on Waites Island in Horry County. "But transportation is where your biggest expenses are." This combination of scarcity and transportation costs will make nourishment bills higher in the future. PHOTO/WADE SPEES

Strand shoreline. This massive shoal, which likely comprises beach-quality sand, could be a remnant of an ancient river channels that flowed north to south roughly as the Waccamaw River does today.

Scientists are studying processes that could be transporting significant volumes of sand from Grand Strand beachfront to this shoal, thereby increasing shoreline erosion. If dredged appropriately, however, the shoal might provide a renewable source of sand for nourishment projects.

Researchers on the project represent Coastal Carolina University, College of Charleston, Clemson University, University of South Carolina, Skidaway Institute of Oceanography, Georgia Southern University, Scripps Institute of Oceanography, and State University of West Georgia. ♡

EBBS & FLOWS

**ASLO/TOS 2004
Ocean Research
Conference**
Honolulu, Hawaii
February 15-20, 2004

This inaugural meeting, co-sponsored by the American Society of Limnology and Oceanography and The Oceanography Society, will allow an open exchange of ocean-research issues. The conference will provide a forum for researchers to highlight recent advances in ocean research. For more information, contact Helen Schneider Lemay at (800) 929-ASLO or business@aslo.org

**Spring 2004 SCMEA
Conference**
Palm Key Resort, Ridgeland,
South Carolina
March 19-21, 2004

Educators are gathering for "Marsh Madness" with keynote speaker, Dr. Chris Marsh <http://www.lowcountryinstitute.org>, at the annual South Carolina Marine Educators Association (SCMEA) Conference. The conference will be held at the beautiful Palm Key Resort <http://www.palmkey.com>. For information contact Elaine McClure at ebmcc@sc.rr.com or visit the SCMEA Web site at <http://oceanica.cofc.edu/scmea/index.html#conference> for information updates.

**7th International
Conference on Shellfish
Restoration**
Charleston, South Carolina, USA
November 17-20, 2004

The 7th International Conference on Shellfish Restoration (ICSR 2004) will provide an opportunity for government officials, resource managers, and users to discuss approaches to restore coastal ecosystems through habitat quality assessment and restoration; stock enhancement, management, restoration; and habitat remediation through watershed management.

To request more information, contact Elaine Knight at Elaine.Knight@scseagrant.org.

Public Comment Sought on S.C. Sea Grant Consortium

The S.C. Sea Grant Consortium will be evaluated by a national Program Assessment Team, appointed by the Director of the National Sea Grant College Program, on June 14-17, 2004. As part of this evaluation process, the National Sea Grant College Program is inviting comments from the public on any aspect of the Consortium or its work by May 14, 2004. Written comments should be sent to: Mr. Jonathan Eigen, NSGO Program Officer, National Sea Grant College Program, NOAA R/SG, 1315 East-West Highway, Silver Spring, MD 20910.

SUBSCRIPTIONS ARE FREE UPON REQUEST BY CONTACTING: ANNETTE.DUNMEYER@SCSEAGRANT.ORG



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