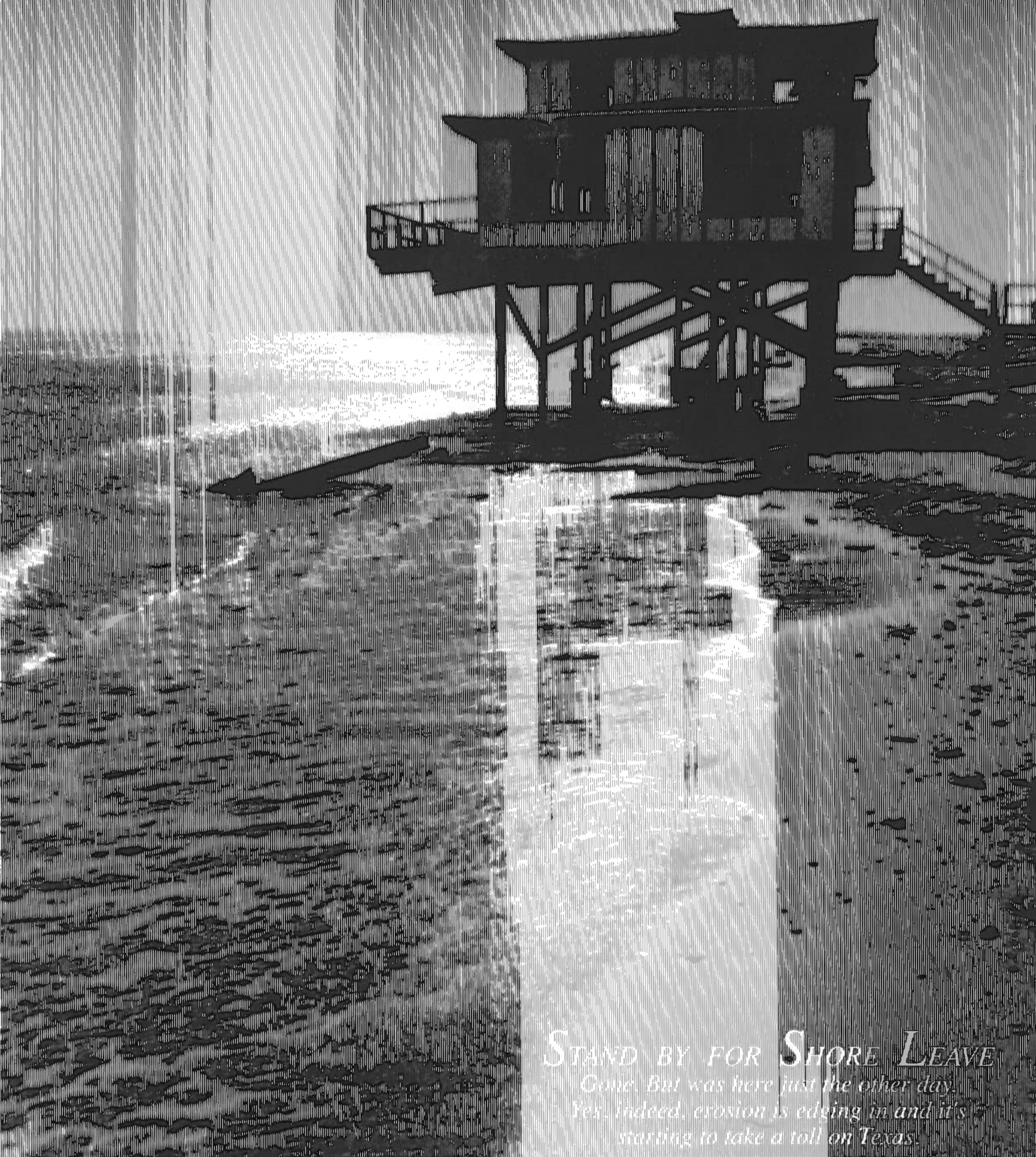


# TEXAS SHORES



*STAND BY FOR SHORE LEAVE*

*Come. But was here just the other day.  
Yes, indeed, erosion is edging in and it's  
starting to take a toll on Texas.*

# W H E R E W E S T A N D

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*When the Texas Sea Grant Program began publishing a magazine in the early 1970s, our intent was to provide our readers with news about current marine-related research, as well as a forum for discussion of events that affect the marine environment. We believed then — and we still believe — that our overriding objective of cultivating a marine-literate society would best be accomplished by making this material available to the widest possible audience free of charge.*



*Unfortunately, our belief now must contend with an economic fact of life. Texas Shores is reaching a wide audience — some 6,000 subscribers throughout the United States and in some foreign countries — and we continue to receive requests for new subscriptions weekly. But printing and postage costs have kept pace with the growing number of subscribers, at a time when funding for the Sea Grant Program is being decreased among our various funding sources.*

*We are faced with two options — discontinue the magazine or change to a paid subscription basis. After numerous discussions, we are opting for the latter alternative. Beginning in September 1988, a one-year subscription to Texas Shores will cost \$7.50. This will enable us to continue publishing four issues per year, and, hopefully, to expand both the length and content to accommodate our readers' needs more closely.*

*A subscription form is attached, and will be repeated in the Summer 1988 issue. We hope that all current subscribers will choose to continue receiving Texas Shores.*

*— Amy Broussard*

*Head of the Marine Information Service*

## TEXAS SEA GRANT

AN ORGANIZATION OF PROFESSIONALS DEDICATED  
TO THE BETTER UNDERSTANDING OF OUR MARINE ENVIRONMENT

SPRING 1988

# TEXAS SHORES

VOLUME 21, NUMBER 1



NORMAN MARTIN



NORMAN MARTIN

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NORMAN MARTIN

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CORPS OF ENGINEERS

PAGE 22

COVER PHOTOGRAPHY BY NORMAN MARTIN

**STAFF** – Dr. Tom Bright, *Texas A&M Sea Grant Director*; Mike Hightower, *Deputy Director*; Amy Broussard, *Associate Director and Head of Marine Information Service*; Norman Martin, *TEXAS SHORES Editor and Art Director*; Laura Murray, *Assistant Editor*; Mike Raulerson, *Distribution Manager*; Lona Dearthmont, *Production Assistant*; and Celia Jeter, *Printing Consultant*. **MISSION** – *Texas Shores* is published quarterly by the Sea Grant College Program at Texas A&M University in an effort to promote a better understanding of the Texas marine environment. Sea Grant is a partnership of university, government and industry focusing on marine research, education and advisory service. Nationally, Sea Grant began in 1966 with the passage of the Sea Grant Program and College Act. Patterned after the Land Grant Act of the 1860s, the Sea Grant concept is a broad-based scientific effort to better the world for all those living in and out of the sea. **HISTORY** – In 1968 Texas A&M received the distinction of being named among the nation's first six institutional award recipients. Three years later the school was designated a Sea Grant College. The university has a rich heritage of oceanography research dating back to 1949 when the program began. In addition there is an ongoing program to get marine information to the public. **SERVICE** – The effort is aided by seven county marine extension agents serving the nine coastal counties of Texas. These individuals are backed by a group of specialists in marine recreation, fisheries and business management, as well as seafood marketing and consumer education. **FUNDING** – Sea Grant is a matching funds program. The Texas A&M Sea Grant College Program itself is made possible through an institutional award from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce, and appropriations from the Texas Legislature and local governments. **Change of Address, Subscription Information or Other Questions:** *TEXAS SHORES*, Sea Grant College Program, Texas A&M University, College Station, Texas 77843. Or call 409-845-7524. Please include old label when changing mailing address. *Texas Shores* (ISSN 0747-0959), is published quarterly by the Sea Grant College Program, Texas A&M University, College Station, TX 77843. Second class postage is paid at College Station, TX. **Postmaster:** Send address changes to the Sea Grant College Program, Texas A&M University, College Station, TX 77843.

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Tour Texas' marine scene. Killer whales are in the Gulf; red tide didn't return; and TEDs are turned back by a judge.

## Deep sea secrets uncovered by Texas A&M drilling ship

Although it took the ocean's geological history millions of years to develop, much of it has been further revealed in the two years since the worldwide Ocean Drilling Program (ODP) began operations and established its headquarters at Texas A&M University.

Among other findings, ODP's researchers confirmed previous findings on the Antarctic's subtropic state, learned the Himalayas are older than believed and retrieved a record-breaking amount of sediment in the Indian Ocean. "This year was spectacular," says ODP director Dr. Philip Rabinowitz. "We fully tested the operational capability of the drillship JOIDES Resolution, and she performed magnificently."

Despite gale-force winds in the sub-Antarctic and South Atlantic, Rabinowitz says the vessel had very little time it was non-operational. ODP began in 1987 by dedicating two cruises to drilling in the Weddell Sea of the Antarctic and the South Atlantic sub-Antarctic.

The 470-foot JOIDES Resolution visited nine locations in the first part of a four-part, two-year campaign to learn how Antarctica's climate has evolved into its present environment and how its cycles of glaciation have influenced the world's climate.

Scientists on this cruise also found that the massive West Antarctica ice sheet, whose melting would affect worldwide sea levels, is more stable than previously believed. They also were able to assign dates to the cycles of glaciation and interglaciation in this region of the world. The ship drilled in the storm-tossed waters of the sub-Antarctic, where researchers obtained a 90-million-year record of the region's climate, oceanography and geology.

While researching in the Antarctic, ODP scientists were aided by the iceberg mover Maersk Master, which moved an iceberg roughly nine times the size of a football field out of the path of the JOIDES Resolution.

The ODP headquarters, located in the university's research park, houses science operations and core storage facilities for the \$30-million-a-year activity supported by the National Science Foundation and eight other countries. Texas A&M is science operator for the international project.

Core samples retrieved from the depths below the world's oceans by the JOIDES Resolution are brought to Texas A&M for analysis and study from around the world.

— Rebecca Adair



NORMAN MARTIN

## Hole in earth's ozone shield may harm ocean food chain

A veteran Antarctic researcher has announced findings indicating that the depletion of the Earth's ozone layer could threaten the world's food supply.

Professor Sayed El-Sayed of Texas A&M University says increased amounts of ultraviolet light, which a thinner ozone shield permits through to the Earth's surface, suppresses biological activity in microscopic marine plants in the Antarctic.

El-Sayed told the Associated Press that his findings, the first of their kind, confirm strong suspicions of biologists that ultraviolet light might mean trouble for fish, animal and other life in the southernmost part of the world.

On the other hand, "I never underestimate the resiliency of nature," he says.

El-Sayed says it is impossible now to say whether the plankton — microscopic single-celled organisms called "the grass of the sea" — and the organisms that feed on them might adapt to increased ultraviolet radiation, and much work remains to be done.

Plankton and the tiny shrimp-like creature called krill that feed on them are the primary food source for the whole web of life in the Antarctic, including fish, penguins and whales. A baleen whale may eat three tons a day.

"If anything happened to the krill population, the whole ecosystem probably would collapse, and you can say goodbye to the whales and the penguins and the seals and the fish," El-Sayed says. Several nations are studying plans to harvest krill, a 550-million to 770-million-ton reservoir of protein. A 10 percent annual harvest would almost equal the current world fish catch.

The ozone shield over Antarctica already thins greatly in springtime, with the depletion reaching a record 50 percent last year.

— Guy Darst

## Global atmospheric research hurt by lack of satellite data

A meteorologist who uses satellite readings to study rain on earth says that the high-technology tools that make climate change research possible have ironically become the main barriers to its advancement.

Emphasizing that such research is no longer only an academic pursuit but is a global priority, Dr. Gerald North of Texas A&M University urges the improvement and increase in numbers of computer centers and the implementation of satellite systems.

North says that progress has been hampered in computer research and satellite research.

"Presently, computer models with grid boxes about the size of Texas run tens of hours on supercomputers to simulate a standard 15-year period of atmospheric climate," says North, who heads Texas A&M's climate system research program.

"In principle, we would like to do hundreds of runs to understand the retreat of the glacier system 15,000 years ago," he says.

Although computer time remains a problem, North says, understanding climate change on that time scale is not just of academic interest, since meteorologists are now debating the location of storage sites for high-level nuclear wastes with long half-lives.

"We also need to better understand the sensitivity of climate models to the imposition of external disturbance," North says. "But here we are hampered by data limitations."

Emphasizing the necessity of satellites in such research, North pointed out that these remote platforms not only monitor such climate-related variables as outgoing and incoming radiation, but also serve as relay devices for data taken by buoys.

North, who has spent the last three years studying the measurement and monitoring from space of precipitation on the planet, says researchers have an appalling lack of knowledge of this process, especially over the tropical oceans.

"We have discovered recently that it plays a key role in the global atmospheric and oceanic circulation," he says.

"If sea surface temperatures due to El Niño phenomena give rise to changes in the pattern of convective rainfall, which in turn influence weather and climate on a global basis, we had better begin to assemble data to check our models which are already deficient in their precipitation modeling aspects," North says.

— Rebecca Adair

## Demand for red oysters not so hot along Texas coastline

A pigment similar to that in carrots caused consumers to shy away from "red" oysters this winter, although the discoloration was not harmful, says an oyster biologist at Texas A&M University at Galveston.

"Although this condition is not harmful to the oyster or to the consumer, its appeal is disconcerting," says Dr. Sammy Ray.

Such red discoloration has two primary causes, Ray says. One is a single-celled organism related to green algae that is taken in through natural filtering by the oyster, and the second is a pink yeast. Researchers at the Galveston campus say an outbreak this winter was due to the one-celled dinoflagellate.

"This discoloration is something that occurs sporadically throughout the years," Ray says. "In this case, the oystermen can either put them back in the water until they purge themselves, then reharvest, or discard them."

The abnormal color in the oysters also disappears when they are cooked, Ray explains, as the pigment is destroyed. In most cases, the oysters are sent back to the producers and discarded, he says.

The dinoflagellate produces a carotene-like pigment similar to that found in carrots. Oysters feed on the dinoflagellates, which may remain in the gut of the oyster until it is harvested.

However, when fresh, the oyster will not be red and can't be distinguished from a normal oyster. When oysters are frozen, ice crystals are formed in the cells of the oyster meat. These crystals may rupture the cells, allowing the pigment to leach out and give a red color to the liquid when thawed.

"The shucker-packer has two ways of determining whether a lot of oysters will turn red," Ray explains. "He can take a representative sample and freeze them overnight. After the sample thaws the next day, he observes the color of the liquid."

A faster means of detection is by blending the oysters with an equal volume of denatured ethyl alcohol and allowing the mix to settle for 10 minutes. An orange to reddish color in the upper layer indicates the presence of the pigment, and a yellow color indicates its absence.

Confirmation of this test may be made by adding 10 drops of a 50 percent solution of caustic soda to a teaspoon of the upper layer. A change from orange or red to yellow in about two minutes indicates destruction of the pigment and confirms its presence.

—Rebecca Adair



## Ocean drillers seek origin of huge underwater plateau

Scientists with the international Ocean Drilling Program (ODP) are hoping to confirm or refute long-held theories of the origin of the world's largest underwater plateau in the Indian Ocean where no drilling had previously taken place.

The drillship *JOIDES Resolution*, operated and staffed by Texas A&M University crew and researchers along with scientists from other nations, has begun drilling into the giant plateau through the icy waters off Antarctica.

Three possible theories on the origin and 75-million-year evolution of the Kerguelen Plateau have been debated over the years, says Dr. Philip Rabinowitz, ODP director and a Texas A&M oceanographer.

The longest-held theory contends that the plateau was sheared off the main continent of Antarctica.

A second idea holds that the plateau is a block of oceanic crust lifted up during spreading of the Southeast Indian Ridge which runs perpendicular to the Kerguelen Plateau, Rabinowitz says. A third hypothesis contends that the plateau is a product of excessive volcanic activity, perhaps related to a hot spot deep in the earth's mantle. Hot spots are punctures in the seafloor in which hot magma wells up, forming volcanoes.

Scientists on the ship plan also to drill in Prydz Bay on the eastern shore of Antarctica. The bay represents a missing piece in the puzzle of the Indian Ocean's ancient drift from the South Pole to the Asian continent.

Researchers will combine the results of research in the Prydz Bay with results of previous ODP drilling expeditions in western Antarctic waters and the North Atlantic in an effort to obtain the first complete picture of global glaciation through time.

—Rebecca Adair

## Ancient shipwreck holds key to New World manufacturing

Archaeologists have a rare chance to identify a late-1600s shipwreck by name, says a Texas A&M researcher with the Institute of Nautical Archaeology.

Hundreds of unusual artifacts, many of which appear to be manufactured goods that should be recorded on a manifest, may help identify the Caribbean wreck as one of four Spanish galleons lost almost 300 years ago, says James M. Parrent, director of the Texas A&M project.

In May of 1691, a fleet of Spanish ships set sail from the port of Cartagena, a major South American staging area for convoys, to travel to Havana and from there back to Spain.

On the straightest course to Havana lay a treacherous bank of reefs known as "The Viper," and the four ships were lost June 2, 1691, in what is now called Pedro Bank near Jamaica, says Parrent. Pedro Bank is known to have claimed victims since 1512, he says.

Excavations carried out earlier this year at Pedro Bank indicate the hulk may be that of either the *Nuestra Señora del Carmen*, the *Santa Cruz* or the *Nuestra Señora de la Concepción*, says Parrent.

Three of the four ships that foundered that day were constructed in the New World, and wood samples may provide still more clues to the hulk's identity, he says.

The wreck is definitely not that of another galleon commonly called the *Genovesa*, lost in 1730. Other efforts may be made to also pinpoint that site, explains Parrent.

From a number of coins recovered at the Pedro Bank excavation dated in the late 1680s, the scholars believe the ship may have belonged to the 1691 fleet that foundered on "the Fangs of the Viper."

Thanks to shipboard conservation techniques on the nearby mother ship, the dates on the silver "pieces of eight" were usually known within a couple of hours by the diving researchers, he says.

Like all artifacts recovered at the site, the coins and other items are the property of the Jamaican government and will be returned after they are studied and conserved by Texas A&M and INA researchers, says Parrent.

The most interesting artifacts located, however, have little monetary value but may be priceless in terms of new information about New World trades, Parrent suggests.

Archaeologists found what appear to have been goods bound for storekeepers, he says.

—Ed Walraven

# BEAUTY AND THE BEACH

*Can coastal Texans fight the good fight against erosion?  
Trust us, the tide's against them.*

Coastal geologists peering into the dark side of erosion are discovering an astonishing amount of acreage that used to be on our shores is now sitting offshore. Daily scouring of waves and pounding of storms, as well as the rise and fall of ocean levels, has changed the nation's shoreline dramatically.

Sure, the waves look meek and mild-mannered as they rumble toward the coast. But the frequently overlooked, ancient power of the sea, with its seemingly unquenchable desire to subdue the land, lies just beneath the surface.

A stunning two-thirds of the Texas shoreline experiences some erosion. And at least 100 acres of beachfront and 300 acres of bayfront are wrested away each year resulting in multi-million-dollar losses to landowners and cuts in tax rolls.

A significant cause for such losses is the lack of sand to replenish eroded areas. Prior to the advent of high-tech engineering projects, there was a free exchange of sediment as it drifted along the coast. Now the Texas shoreline is virtually compartmentalized with manmade sand traps, including six deep channels and several long jetties.

"What's happening in Texas isn't an isolated case. We have erosion occurring throughout the nation from Mississippi to New England," says Col. John Tudela, the Galveston-based district engineer of the Army Corps of Engineers.

Despite vigorous efforts, in many parts of the country huge coastal regions are vanishing.



“We have to overcome the general feeling that spending money to stop shoreline erosion is a waste of money, effort and federal dollars. If we can find a solution that makes economic sense, then we can move forward.”

Most of North Carolina's 320 miles of island beaches are receding with about 48 percent of the shoreline eroding at more than 2 feet a year, and 18 percent disappearing at more than 6 feet a year. “Geology is an active, real process out here on the beach,” says Spencer Rodgers, a North Carolina Sea Grant coastal engineering specialist.

Louisiana, long plagued by erosion, is losing more than 50 square miles a year to erosion. In Baton Rouge, Dr. Vernon Behrhorst, assistant director of the Louisiana State University Ports and Waterways Institute, believes his state is looking at massive relocations of waterways as the erosion advances. “And we're not talking about moving them just a few feet,” Behrhorst says.

In Texas, Corps officials estimate that along the 400 miles of shoreline about 60 percent is eroding, 33 percent is stable and 7 percent is advancing. Geologists determine erosion rates on such a large scale, studying information obtained from ground surveys, maps, charts and a sampling of the changes recorded by repetitive aerial photography.

“Some parts lose just a little, while other parts lose 50 feet per year,” says Dr. Bob Morton, a geologist at The University of Texas in Austin. “There are periods, such as after hurricanes, where losses are tremendous. But we tend to ignore our eroding shorelines the way Californians do earthquakes.”

Behind the numbers, though, are vintage tales of Texas coast life. One of the more macabre manifestations of shoreline erosion was the loss of a dozen graves at San Leon Cemetery during Hurricane Carla in 1961. And, after Alicia crashed down on the Galveston area like a bullet coming down a gun barrel in 1983, many coastal homeowners discovered the storm had moved the vegetation line inland hundreds of feet. As a result, some of the private property now sat on beach areas with open access by the public.

That set off a flurry of lawsuits that, in some instances, are still not settled today. The Texas Attorney General's Office barred reconstruction of many homes, fences and bulkheads. One case ran the legal gauntlet all the way to the U.S. Supreme Court before being turned back last year. All the cases were settled in favor of the state.

G.A. Jennings, chairman of the Shoreline Erosion Committee for the Texas Soil and Water Conservation Districts, says, “There's one ranch in Calhoun County that's lost 1,200 acres since 1945.” Al Luedeke, planning engineer of the Texas Department of Highways in Austin, adds, “We recognize that the beach erosion is a problem.

Anybody that's been out there recognizes it.”

The tough row to hoe is getting anyone to put up enough money to make a difference. The discord is largely traceable to a lack of perspective on the part of inland legislators in terms of what the state's coast means to the Texas economy, says State Sen. Ken Armbrister (D-Victoria).

“Believe me, when we're in the legislature fighting for money for the coast, it's extremely difficult to convince a guy in El Paso why we need this money,” Armbrister says. Even major economic projects,



Officials estimate that 60 percent of the Texas shoreline is eroding.





*There is no evidence of a long-term reversal in any of the causes of shoreline erosion. In fact, some studies suggest it may increase.*



*Critics suggest that many of the solutions offered in the past weren't solutions. They just moved the problem down the beach.*

such as the Gulf Intracoastal Waterway, receive little favor. From 1975 until this biennium, the Texas legislature had not appropriated a single dollar for acquisition of dredge material disposal areas which are used to keep the channel passable.

Armbrister says that all too often legislators representing coastal Texas are accused of pork-barrel legislation when they try to promote coast projects. "We try to raise the hew and cry that the industry along the coast has a national and even a worldwide impact," Armbrister says.

If coastal business projects can't make a legislative dent, coastal erosion projects certainly carry even less weight in Texas' momentary financial difficulty. Nevertheless, "coastal erosion is a serious issue that should be elevated at the federal level," says Ralph Rayburn, executive director of the Texas Shrimp Association in Austin.

Texas Land Commissioner Garry Mauro isn't fazed by the lack of land-bound enthusiasm. "We have to overcome the general feeling that spending money to stop shoreline erosion is a waste of money, effort and federal dollars. If we can find a solution that makes economic sense, then we can move forward."

All too frequently, he says, many of the solutions offered in the past weren't solutions. "They just moved the problem down the beach. Now is the time to take a measured approach. We can do something about the erosion. It's not necessarily inevitable."

Well, a positive attitude might help. But the outlook for stopping erosion isn't good. "Rates of erosion can only increase," says Jeffrey Paine, a geologist with The University of Texas Bureau of Economic Geology. "The effects of decreased sediment supplied by the Trinity River, relative sea-level rise, and frequent, intense storms are nearly insurmountable despite widespread shoreline protection."

Indeed, researchers suggest that there is no evidence of a long-term reversal in any of the causes of shoreline erosion. In fact, some studies have demonstrated that magnitudes and rates of shoreline recession will increase if worldwide sea-level rise maintains or exceeds a pace comparable to that in past decades.

"Erosion is going to continue," says Berdon Lawrence, president of Hollywood Marine, a Houston-based barge and tow company. "It's nature's process." In some cases, such as Galveston Island, there are compounding factors that are speeding the pace of erosion. Relative sea-level changes in the Galveston Bay area occur due to land subsidence, in addition to global sea-level trends. This is due to groundwater

withdrawal and regional compactional subsidence.

Coastal experts believe most unprotected shorelines in the Galveston Bay system will continue to retreat landward as a result of natural conditions that began before the 1800s—conditions which have been enhanced since then by human activities.

The opportunity for coastal erosion in Texas is rather large. The Army Corps estimates that there are about 2,500 miles of tidal shoreline in Texas. About 85 percent of it is along the bays, estuaries and other interior waters of the state. The Gulf shoreline itself accounts for a mere 15 percent—some 375 miles—of the total.

The Corps says approximately 82 percent of the total shoreline is privately owned, 16 percent is federally owned and 2 percent is publicly owned by state, counties and cities. Meanwhile, slightly more than 8 percent of the tidal shoreline is either privately developed or is privately owned recreational shoreline. That 8 percent of the shoreline is concentrated in three areas: Galveston Bay area, Corpus Christi Bay area and the Matagorda Bay area.

Reaping the brunt of the erosion whirlwind straight off, though, is the Galveston Bay system. Despite the widespread use of shoreline protection measures, which began in some areas before 1930, some 78 percent of the shorelines within the Galveston Bay system retreated between the early 1850s and the early 1980s.

During this period, bay shorelines moved an average of 2.2 feet per year landward, causing the loss of about 12.5 square miles of land. Although the prevailing direction of shoreline movement remained the same through this time, there is the worrisome fact that the rate of shoreline retreat, coupled with effects of land subsidence, increased from an average rate of 1.8 feet per year before 1930 to 2.4 feet per year after 1930. And as shoreline positions change, there's a real threat that public and private investments may be jeopardized and property damaged or destroyed.

Shorelines move in response to a hierarchy of natural phenomena, including tides, storms, sediment supply, and relative sea-level changes. "Durations of these phenomena range from less than a day to several thousand years," Paine says.

Meanwhile, farther down the coast, a Texas A&M University study of Matagorda Bay indicates that 523 acres of agricultural, residential and industrial land worth \$5.5 million, vanished between 1970 and 1985. Dr. John Herbich, a Texas A&M [ PLEASE TURN TO PAGE 26 ]

# MUDDY WATERS

*Sargent Beach is without question the most severe erosion problem on the Texas coast.*

STORY AND PHOTOGRAPHY BY NORMAN MARTIN

LEANING BACK IN A POOFY, OVER-STUFFED LAWN CHAIR, BILL Templeton glumly sits on the deck of his beach house, waiting for the sea to call. Like most residents of Sargent Beach, he knows the Gulf of Mexico's low, pounding waves are coming all too soon.

Today erosion rates at Sargent are more than 100 feet a year. In the past two decades most of a small subdivision that used to front the Gulf has been left hundreds of feet offshore by the eroding beach line.

Anger often heats the air as Sargent Beach residents lament the loss of their land values. "Lots on the Sargent Beach tax rolls are \$250 a piece," Templeton says. "On Matagorda beach, 18 miles down the coast, those same 50- by 150-foot lots are \$10,000."

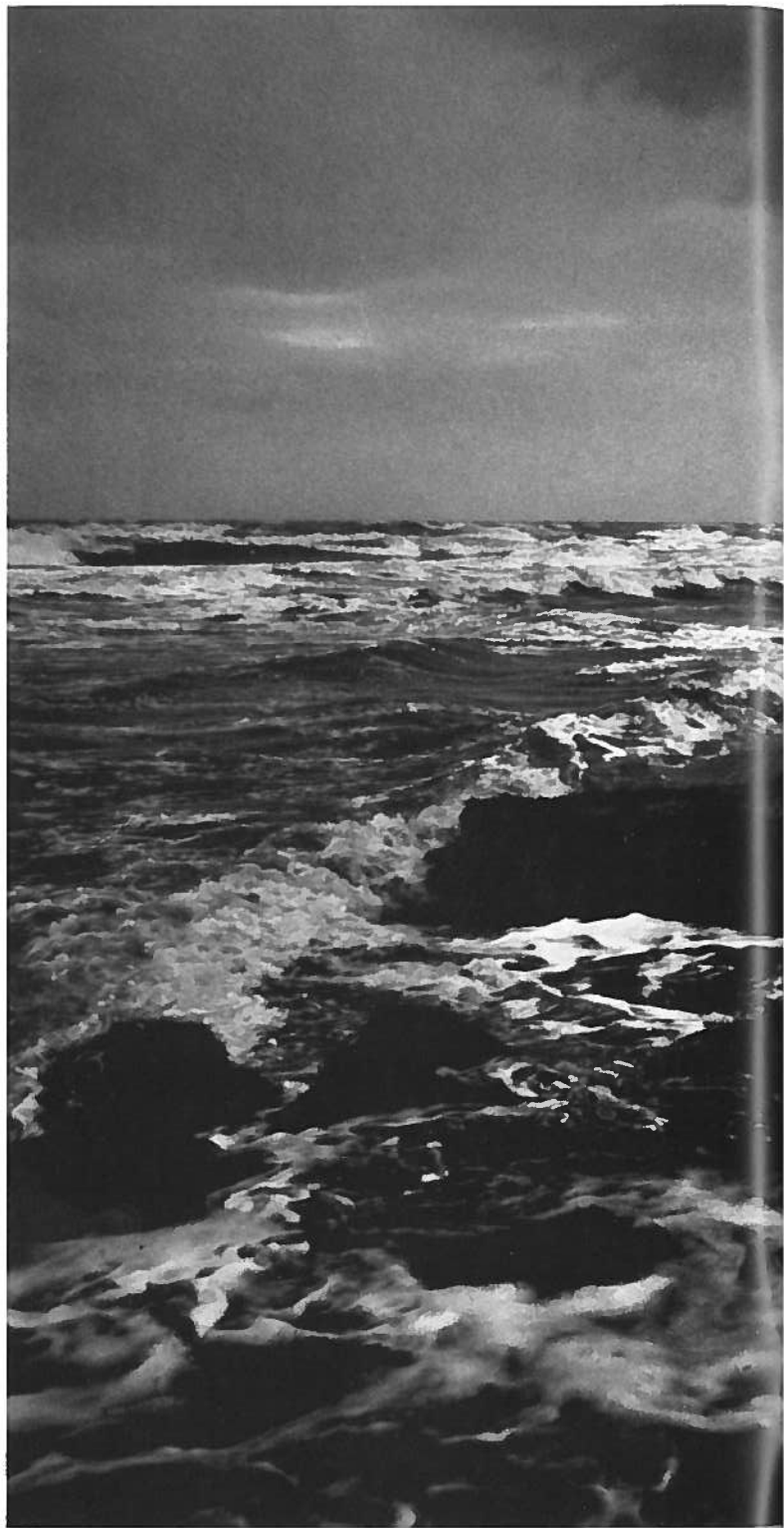
It galls Templeton that apparently there's nothing to stop the water from continuing to shear piece after tiny piece of the beach away. "We can't sell and we can't get any help," he says, bitterly.

Since moving to Sargent Beach, Templeton has seen the length of a football field vanish in front of his home. And, coastal geologists say the pace of erosion is increasing, so much so that the state's main coastal waterway is now endangered.

"It is without question the most severe erosion problem on the Texas coast," says Bill Wooley, a Galveston-based planning chief with the U.S. Army Corps of Engineers.

Just 30 years ago Sargent had a broad beach and a seemingly bright future. Row after row of beach homes dotted the shores. But the foundation that most homes were built on was not sand, but mud from an ancient river delta. And that mud means the end of Sargent Beach.

When a sandy beach is eroding, part of that sand eventually feeds other downdrift beaches. When mud erodes, most of that volume is a true net loss. Between 1852 and 1987, Sargent lost more than 2,000 feet



Sargent beach residents have seen the power of the Gulf up close and personal. The "Chinese House," as locals call it, has moved from the back of subdivision in 1971 (left) to the water's edge in 1988

(above). Just 30 years ago Sargent had a broad beach and a seemingly bright future. But there is a problem with the area's foundation. It is primarily mud from an ancient river delta and that mud is quickly moving offshore.



*Welcome to Sargent Beach.*

*Better take a good look, though.  
This ten-mile stretch of the Texas  
coast is headed for the last round-up  
at an astonishing pace.*

to erosion, as millions of cubic yards of mud have been carried seaward by tidal currents.

Accelerated erosion levels, caused by the daily scouring action of waves, have brought the encroaching sea to the doorstep of the Gulf Intracoastal Waterway. Marine experts say this process, more so than the loss of beach homes, is of paramount importance to Texans.

Through sheer historical coincidence, the canal is located in its closest position to the Gulf shoreline in the same area where the erosion rates are highest. The exact moment they will fuse isn't known. Geologists and marine specialists say a variety of elements must be factored. Still, "by 2003, if things go as they have in the past, we should not even have a beach isolating the canal," says Texas Sea Grant Marine Agent Willie Younger. "The locals shoot for a date around 1995."

More than 60 million tons of cargo make their way annually along all or a part of the Gulf Intracoastal Waterway that stretches in the Texas portion from Sabine Pass in East Texas to Brownsville at the southern tip of the state. "There may very well be an impact far beyond this area," says Capt. Austin Yegar of the National Oceanographic and Atmospheric Administration in Washington. A key factor in Sargent's predicament is simply the magnitude of the problem in terms of length of coastline at risk – about 10 miles.

By no means is this the first warning researchers have heralded concerning Sargent Beach. "This problem on the beach has been studied to death," says U.S. Rep. Mac Sweeney of Wharton. Wooley, the Corps' planning chief, adds, "Matagorda County has experienced problems along the Gulf shoreline as far back as records are available." In 1973, a Texas A&M University study by William Seelig indicated the beach had eroded at an increasing rate since at least 1930. "Sargent Beach will continue to erode with a minimum shoreline retreat of 30 feet per year, if the present factors remain in effect," Seelig said. They did. It did.

The big question is who, if anyone, will fix the problem? But determining who can or will fix the problem is the equivalent of a financial version of Abbott and Costello's "Who's on First" skit. Nevertheless, the upshot is all parties – federal, state and local – will have to ante up, and in these hard times that prospect is not popular. While the state may support the plan, Al Luedeke, planning engineer for the Texas Department of Highways in Austin, says the Corps is responsible for keeping the waterway open. "That is who we're going to rely on for survey and reconnaissance and, ultimately, for a solution to the problem."

Col. John Tudela, head of the Corp's district headquarters in Galveston, says, "I'm sympathetic to the problems at Sargent Beach. Our responsibility is to keep the waterway open. We've done it in the past and will do it in the future." Getting on track may well be difficult, though.

The Sargent area has an unusual feature that is the foundation of its present woes. Several thousand years ago, large volumes of sediment poured out of the massive forerunners of today's Brazos and Colorado rivers. The Sargent area is, in general, the result of the meeting of those two main river systems.

In short, unlike other parts of the Texas coast, the base for the beach is not sand. It's mud – river mud. Because it's mud, the Sargent area has been retreating for several thousand years.

Several physical factors make Sargent a prime earthmover. The area has an irregular shoreline of principally exposed mud. Nature abhors these types of irregularities. It always wants to smooth things out.

The composition of the mud is only 10 to 15 percent sand, so there is little remaining sand to replenish the beach. The Sargent area's only principal source of sediment is the Brazos River, which lies to the northeast. Waves and currents tend to transport the sediment to the southwest. But scientists know from sediment sampling programs, beach conditions and a general lack of sand offshore, the Brazos isn't contributing all that much today. Indeed, the little sand that's available to the beach more often than not ends up on land behind the beach, rather



**A**ccelerated erosion levels, caused by the daily scouring action of waves, have brought the encroaching sea to the

than on the beach itself.

While erosion has been eating away the shore for millennia, marine researchers say the process has been accelerating the past 50 years. Previous studies suggest that between the mid-1800s and 1930 there was a balance between the areas that were eroding and the areas that were stable or advancing. But more recently there has been a shift toward the side of erosion. The rate jumped from 10 feet in 1930 to 20 feet in 1970. In the next decade levels red lined at 40 feet a year and between 1981 and 1985, the loss was some 60 feet a year.

Meanwhile, coastal legislators say they have trouble getting their land-bound peers aboard a plan to aid Sargent and the waterway. State Sen. Tom Uher (D-Bay City) says, "Those of us who live on the coast know the importance of this water system to our economy. But money



doorstep of the Gulf Intracoastal Waterway. Still there is some construction on the beach (top, left) and life goes on pretty much as it always has in this coastal

community (center, top and middle). But time is running out. Signs of erosion, like the exposed footing (top, right), are a reminder of the pace of erosion. The problems of Sargent

Beach are being addressed by several state and federal agencies, including Bill Templeton of the Sargent Chamber of Commerce (bottom, right), State Senator Tom Uher

(center, bottom), U.S. Rep. Mac Sweeney (bottom, center), Col. John Tudela (bottom, left) and Texas Land Commissioner Garry Mauro (bottom, far left).

appropriated to the Intracoastal Waterway is simply not looked on as a priority item."

In the last two legislative sessions the Texas General Land Office has requested \$190,000 for pilot erosion control projects in the Sargent Beach area. They were not funded. About the only money the Land Office was able to provide was \$10,000 from a specially created fund called a "damage fund" in which individuals are fined for damaging state lands in the process of petroleum drilling.

The Land Office also chipped in another \$10,000 to the Gulf Coast Erosion Control Committee of the Soil and Water Conservation Districts for six pilot projects. "We intend to take the results of those pilot projects back through the appropriations process and try to get it fully funded," says Texas Land Commissioner Garry Mauro.

The scope of Sargent Beach's problem isn't likely to be solved by \$10,000, though. Big money and extensive expertise will have to come from somewhere, and all participants give the nod to the Corps. But they can't act on their own.

All Corps activities originate as the result of efforts of local congressmen or senators who introduce resolutions before Civil Works Committees. This first phase consists of a preliminary evaluation, at federal cost, by the Corps to provide an early look at the engineering problems and possible solutions. The second phase includes a cost-shared study that serves as basic information for use of Congress for authorization. Ultimately, construction is funded by Congress.

"Until the process is changed, we must work within the existing laws and regulations," Col. Tudela says. It is a process that can take decades,

despite new efforts to reduce project construction timetables. So, without funding, the Corps can only monitor the situation and offer technical assistance.

Some would prefer the Corps to move a little faster. The preferred option by individuals who want immediate action is the “special appropriation” legislative route. That translates, in bureaucratic terms, to five to eight years. Essentially the method circumvents the regular congressional process, which may take as long as 10 to 15 years. In this method, a special appropriation would immediately go to the appropriations committee where it must be established as a genuine emergency.

Criteria include a pressing and compelling call to action. But congressional observers point out that congressmen on the appropriations committee come from a broad range of backgrounds and diverse parts of the country, and they must agree that this situation is indeed a national emergency requiring immediate action. The process is, of necessity, arduous because it is designed to slow pork-barrel legislation tendencies.

“The chances of success of that route are about one in fifty,” says Rep. Sweeney. And in every case where that route has been successful, it requires that the Corps come forward and agree that this is indeed an emergency and agree it requires emergency action. That prospect is not likely, Sweeney says.

“The Corps has projects across the nation and they do not want to get up front on any one project since it sets a bad precedent. That’s not to say it hasn’t been done, or that it can’t be done,” Sweeney says.

Then there’s the traditional, and much-maligned, Corps study approach. This is usually judged on a long time scale with a minimum of about 14 years until something is actually done on the ground.

“The tried and true method is the study,” Sweeney says. “It’s the traditional way of doing business. It’s also a very lengthy process.

“When the Corps says they are going to go forth and solve this problem, people are starting to recognize that might mean 20 years later,” Sweeney says. New legislation and the new Assistant Secretary of the Army have directed the Corps of Engineers to streamline and expedite the time it takes to do their projects.

Corps’ Planning Chief Wooley believes the “study” method is the mechanism where federal assistance can ultimately be provided. The first phase of the study referred to as the reconnaissance phase is at federal expense and would be completed in 12 to 18 months.

Should the study conclude that there is a likelihood of a project economic feasibility, then an agreement between the federal government and a local sponsoring agency to share the cost of the feasibility studies equally would have to be accomplished. Cost-sharing is also involved in design, construction, and maintenance. The outcome of such a study is difficult to predict as a number of alternatives, both structural and non-structural, will be considered during the study.

One unlikely alternative is local erosion control. In short, the tiny Sargent Chamber of Commerce and the roughly 1,000 local residents would bear the cost of private construction. Private projects have been done, but these projects are generally frowned upon by the government.

Another rather ominous aspect from a development perspective is the possibility that the Sargent Beach area will be included in the Coastal Barrier Resources System, which precludes the use of federal funds for projects such as Sargent Beach. The law would prohibit any new activities such as beach restoration or rerouting the canal. It would, however, allow for maintenance activities associated with the waterway, including dredging.

There would be no additional activity of any kind to help prevent further erosion. Essentially, the Coastal Barriers Act mandates that nature take its course. That would mean the erosion would take its course without any interference by individuals or government agencies.

There are several possibilities when it comes to the actual construction. One is beach replenishment – actually building structures to stop or slow the erosion. “We know there’s not that much material in the system, and coastal structures, in part, depend on sediment supply. You



Few plants are available to hold the beach in place (top). Re-routing the waterway is a possibility,

says Dr. Robert Morton (bottom, left). But it is an expensive option, says Al Luedeke (bottom, right) of the state highway department.

must deal with them together,” says Dr. Robert Morton, a geologist at The University of Texas at Austin.

“You could go out there and put in a seawall, and put additional sediment seaward of the structure in an attempt to hold the shoreline in its present position. But that project ends somewhere. And where it stops there will be additional erosional problems,” Morton says.

Another method is beach nourishment. Traditionally the Corps has favored this technique because it is less expensive and easier to do. But the approach requires a ready supply of sand.

One long-term solution is re-routing the waterway. Re-routing the intracoastal canal simply shoves the problem off into the future, Morton says. “But that isn’t necessarily bad.” The distance between the Gulf shoreline and a re-routed Intracoastal [ PLEASE TURN TO PAGE 27 ]

# THE UNKINDEST CUT

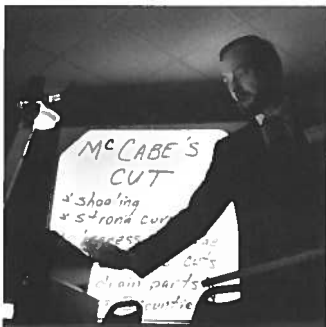
*A ripping current pried apart McCabe's Cut. Now it's time to close the wound.*

**M**cCabe's Cut on the upper portion of East Matagorda Bay is a classic case of good intentions gone awry; a bizarre combination of factors and the unimagined powers of coastal erosion have coupled in this tiny coastal community to create a monstrous navigation problem.

The 100-foot-wide channel 100 miles southwest of Houston separates the Gulf Intracoastal Waterway and the open waters of the Gulf of Mexico by less than 200 yards. The cut's ripping current has been known to suck barge tows directly out into the open water.

Understand that before 1983, McCabe's Cut, which is named for a local marina owner, didn't exist. From a small breach, the restless Gulf waters have pried apart the opening and gouged away thousands of cubic yards of beach.

When officials of Matagorda County Drainage District No. 1 decided to place a small channel from the mouth of flood-prone but hardly raging Caney Creek to the Gulf, few could have foreseen the erosion predicament they were literally digging for themselves. Originally, the channel called for the rather petite dimensions of 40 feet wide and 3 feet deep. Currently, McCabe's Cut is 100 feet wide, 20 feet deep and it's continuing to grow.



Willie Younger says the cut is only 300 feet west of a swing bridge.

Willie Younger, a Matagorda County-based Texas A&M University Sea Grant marine agent, says the impact of this massive earth moving is exacerbated by its location, which is only 300 feet west of a swing bridge that spans the Gulf Intracoastal Waterway and divides the Texas mainland with a thin strip of the Texas coast.

Younger says, "The bridge's pilings have been hit and shrimp boats have been damaged by barges trying to go through there." State highway department officials report three damage incidents to the fender and bridge system have occurred since completion of the cut and claims are near \$75,000.

A combination of swift currents and the sediment build-up make it difficult for barge tows to navigate past the cut and through the swing bridge opening. There has been damage to the bridge by tows because of these conditions, and extended delays waiting for the tide to change.

Strong tidal currents are involved. These currents strike eastbound tows from a 90-degree angle at a critical time when the operator is making his approach to enter the bridge. "We've had an eastbound 500-foot, two-barge tow heading from Corpus to Houston swept from the waterway into the Gulf because of the tide flowing out of McCabe's Cut," says Jack Binion, vice president of Hollywood Marine, a Houston-based barge and tow company. "It's a dangerous situation."

Although the cut is enlarging, incoming currents from the Gulf are



The current has been known to suck barge tows directly out into open water.

depositing sediment in the Gulf waterway just south of the entrance to McCabe's Cut. Prior to 1983, the last dredging of the waterway in this reach occurred in 1964, Army Corps records indicate. Dredging frequency was about 18 years apart.

Since McCabe's Cut opened, the area has required dredging twice, first in March 1986, removing 120,000 cubic yards, and in June 1987, when 30,000 cubic yards of material were again removed.

"The shoaling rate (in the waterway) attributed to McCabe's Cut is now 41,000 cubic yards per year," says George Rothen, construction-operations chief for the Army Corps in Galveston. "We have another dredging contract scheduled this year and anticipate future requirements at 6- to 9-month intervals."

Meanwhile, the situation has pitted two perfectly commendable needs – safe navigation of the canal versus the need to drain parts of three counties as a flood control measure. The purpose of the cut was to provide an outlet for floodwaters from Caney Creek and other streams discharging into East Matagorda Bay.

"It's just like filling up a jug," says George Deshotels, a member of the Matagorda County Commissioners' Court. Only so much water can go into East Matagorda Bay. Once that saturation point is reached, the water becomes a flood without a drainage cut to the Gulf of Mexico.

"In 1979 we had a small tropical depression pass through here and



George Deshotels says filling the cut could begin this summer.

a 12-mile area flooded down there by the cut. It stayed that way for two weeks," Younger says. Several homes and businesses have been underwater on more than one occasion in the McCabe's Cut area. Part of the reason for today's problems is the result of yet another productive flood control effort up the creek proper. In the past

few years great effort has gone into improving Caney Creek's drainage. This was accomplished by clearing much of the brush that had been choking the waterway. That was fine upstream, but down at the cut it's a different story.

Prior to creation of McCabe's Cut [ PLEASE TURN TO PAGE 27 ]

# FINE LINE

THE TIME HAS COME TO PUT IT ALL ON THE LINE.  
AND ON TEXAS BEACHES, IT'S THE VEGETATION  
LINE THAT RULES. IF THERE'S ANY DOUBT, JUST ASK THE  
ATTORNEY GENERAL, THE SUPREME COURT OR MR. MATCHA.

OPEN SEASON ON THE OPEN BEACHES ACT IS OVER. With the final two court cases being settled in the state's favor in April, Gulf beachfront property owners now know if they fight the line, the line will win. And on a Texas beach the boundary line is the vegetation line.

In short, if your beach bungalow is behind the line and a hurricane happens to pound that line backward behind the house, then buddy, your abode is now open to public access.

The reason: Since 1959, the Texas Open Beaches Act has allowed all those who hear the call of the sea plenty of elbow-room once they get down to the water. No matter how big and bright the beach house, the beach itself is open to the public as the prairies are to mesquite, jack rabbits and oil drillers.

Even so, some homeowners along the beaches of the Texas coast have long desired to turn the tide on the state's controversial Open Beaches Act. But efforts to stop the act are now dead in the water.

After being clobbered by Hurricane Alicia in 1983, many beach homeowners wanted to fix damaged property. But the state attorney general's office halted repairs and reconstruction of storm-altered vegetation lines. The state says the law is clear. The public has a right to use all beach areas between the mean low tide line and the natural vegetation line.



*The 1959 Open Beaches Act recognizes the public's right to use the beach even though it may be privately owned.*



## TEXAS OPEN BEACHES ACT

- The public has a right to use all beach areas between the mean low tide line and the natural vegetation line.
- No one may erect barriers to prevent the public from using those beach areas.
- No one may post signs saying the public is prohibited from using those beach areas.
- Municipal and county governments that receive state beach-cleaning funds by application are responsible for cleaning and maintaining the beaches within their borders.

The act recognizes the public's right to use the beach even though it may be privately owned. The only prerequisite is that there must be proof that the public has indeed used a specific beach area over a period of time, and thereby acquired a longstanding right for continued use, if attempts are made to curtail public access. To encourage local government to maintain these open beaches, the state finances 50 percent of the cost of cleaning beach areas fronting the Gulf of Mexico.

Dr. Robert Ditton, a Texas A&M University coastal recreation expert, points out that effectively only about 36 percent, or 79 miles of the total 215 miles of beach on the Texas barrier islands, are affected by the Open Beaches Act. The remaining 136 miles are included within National Seashore or state park boundaries, or are on Matagorda and St. Jose islands and are not accessible to the public.

What happens if your land increases rather than erodes? The

general rule of law is that accretion, the land that results from natural causes, becomes the property of the landowner, says Ronald Kaiser, an environmental lawyer and professor in Texas A&M's Department of Recreation and Parks.

"If we have an area along the Gulf that is naturally accreted, the landowner gains," he says. The key word, though, is "natural." While the rules in Texas are somewhat unclear, the general consensus is that land created artificially is still state property.

Coastal property owners first started mulling over ways to blunt the open beach law after Hurricane Alicia roared onto the Texas coast in August 1983. Alicia's pounding winds and tides eroded the shoreline and shifted the vegetation line along west Galveston Island, overnight placing private property on what the state considers public beaches. [ PLEASE TURN TO PAGE 28 ]

BY NORMAN MARTIN

# CHUTE, IT'S NOTHING

## BUT A LITTLE SMOOTH CORDGRASS

Erosion devours thousands  
of feet of land each year despite  
the best attempts of coastal experts  
to control their crumbling bayfront  
using everything from parachutes  
to Christmas trees.

BOB NAILON GIVES HIS PARACHUTE STRAP A SHARP tug. There is no explosion of reinforced nylon above. The brilliant yellow chute merely straightens between the two poles on which it is tied and continues its rather unorthodox duty as a three-foot high sentinel against the relentless, low-lapping waves of East Galveston Bay.

Standing in two feet of water and mud, Nailon's boots sink into the ooze as he finishes tying off his jury-rigged coastal erosion barrier. Before him are two 700-foot rows of old Air Force parachutes. "Before we got these, virtually 100 percent of our grass was wiped out by strong tides," he says. And, make no doubt about it, cordgrass is important to the Anahuac-based Texas A&M University Sea Grant marine agent. More than 3,000 feet of cordgrass have been planted just offshore in an effort to buffer the bay's clay banks since 1986. The parachutes protect dense patches of transplanted cordgrass by absorbing the force of the waves until they take hold. "A thick stand of grass is the key to this whole thing," Nailon says.



STORY AND PHOTOGRAPHY BY NORMAN MARTIN



**E**ach acre of marsh habitat produces up to \$80,000 worth of sport and commercial fishing in direct and indirect expenditures. It's the nursery where it all begins.



These are troubled times for the Texas coast and there is good cause for such unconventional erosion abatement methodology. Erosion devours thousands of feet of land each year despite the best attempts of coastal experts to control their crumbling coast using everything from Christmas trees to parachutes.

But nowhere is the loss of wetlands greater than in Galveston Bay. Continuous wave action whipped up by prevailing southeasterly winds annually takes a four-foot bite out of the northern shore of East Galveston Bay. In some areas the loss is as much as 12 feet a year. "The shoreline is disappearing," says Eddie Seidensticker, district conservationist for the U.S. Soil Conservation Service in Chambers County. More than 45 acres of Chambers County disappear into East Galveston and Trinity bays every year at a rate of 0.5 acres per mile each year.

Texas bayshores are vastly different from the far more popular beach areas. Bay soils are primarily clay, while the beaches are dominated by sand. Of the two, erosion abatement procedures are generally considered much more complicated on Texas

beaches due to current patterns, dune development, vegetation growth and legal property questions concerning the state's Open Beaches Act. Most of the state's bayshore is privately owned.

Still, more than land is lost when coastal erosion occurs. When the owners of the Delhomme Hunting Club inherited the Trinity Bay site in 1984, they thought they had received more than 1,400 acres. But a 1985 survey indicated almost 400 acres had fallen into the bay since the previous survey a half century before. At an appraised value of \$250 an acre, the new owners had lost almost \$100,000 worth of prime hunting and ranching land. They weren't the only ones missing something. The previous owner had paid taxes for years on land that no longer existed. And the county lost a source of revenue when the acreage was dropped from the tax rolls.

With bayshore erosion, the fishing industry also loses because some of the state's most productive estuaries are being destroyed in the erosion process. "Each acre of marsh habitat produces up to \$80,000 worth of sport and commercial fishing in direct and indirect expenditures. It's the nursery where it all begins," Nailon says. Sediment washing into bays can cloud the water and block sunlight to shallow waters. Vital microscopic organisms that form the basis of the estuarine food chain are not produced and fisheries resources suffer. Moreover, when the bay front erodes, the usual result is a mud flat—a sterile desert with no vegetation and few organisms because the water is typically turbid.

Ronald Kaiser, an environmental lawyer and professor in Texas A&M University's Department of Recreation and Parks, says some 95 percent of all the shell- and finfish in the Gulf of Mexico depend on estuaries for at least one part of their life cycle. "The fish are dependent on the fine balance of fresh and salt water in estuaries," Kaiser says. "If it is destroyed, then much of the commercial and recreational fishing industries are destroyed as well."

Sure, coastal bay erosion symbolizes a huge fisheries problem. But it also represents a few bright spots. At the base of Galveston Bay's north jetty, shifting erosion patterns have created a major wintering and staging ground for shore birds. Sands and silts that used to make up Galveston's beaches have been swept along by currents to form a massive deposition tidal flat known as the Bolivar Flats. "The largest population of piping plovers, which is an endangered species on the upper Texas coast, winters at that spot," says Ted Eubanks, president of the Houston Audubon Society.

Bayshore erosion is certainly not limited to Galveston Bay or Texas for that matter. Other areas of the Texas coast also have a long history of bayshore erosion. Landowners in Calhoun County, for example, have been concerned about erosion on the shores of San Antonio and Matagorda bays for years. A University of Texas study of the Matagorda Bay area indicates that between 1856–1957 some 5,000 acres of wetlands disappeared. Dr. Joe McGowen pointed out that

More than 3,000 feet of cordgrass (below) have been planted just offshore in an effort to buffer Galveston Bay's clay banks since 1986. The parachutes protect dense patches of transplanted cordgrass by absorbing the force of the waves until they take hold. "A thick stand of grass is the key to this whole thing," says Marine Agent Bob Nailon (above).



human activities directly contributed to reduction of the marsh area. Among the leading causes, he says, were construction of dams across marshes and tidal creeks and piling of dredge spoil in marshes adjacent to dredge channels and boat basins.

And along a broad expanse of southern Louisiana, between the Atchafalaya and Mississippi rivers, a million acres of wetlands have disappeared since 1900. "Vast amounts of marshland are disappearing," says Dr. Vernon Behrhorst of Louisiana State University's Ports and Waterways Institute. "We're losing 50 to 60 square miles a year to erosion," Some marine scientists believe that annual rate could double by 1995.

The loss of the Louisiana's marshes affects more than just local residents. The area provides almost 30 percent of the nation's fish harvest and 40 percent of the fur catch. Also, it is a winter habitat for some two-thirds of the migratory birds in the Mississippi flyway.

Saltmarshes on the Gulf coast are dominated by tall emergent grasses. Needlerushes or reeds commonly cover the highest, landward margins, while saltmarsh cordgrasses—*Spartina*—are found closer to the bay. These coastal wetlands are among the most productive of any habitat on earth. They provide much of the food that fuels the entire estuarine ecosystem. The marsh grasses are not pastures for grazing marine life. Very little of the plant is actually consumed



in the saltmarsh. Rather, marine scientists say, the plant leaves are shed annually into estuarine waters, where they break up into smaller pieces known as detritus. These fragments are heavily colonized by microorganisms which are the base of vast food webs that eventually lead upward to shrimp, crab and fish.

Several new transplanted grasses (left) from around the nation are being tested at an experimental nursery.

A big question is, what can be done now to slow the pace of bayshore erosion? The growing damage to bayfront property has generated a host of makeshift solutions to erosion. Ranchers have tried everything from tractor tires to slabs of concrete to stop land from eroding into the bay. Nothing has worked for long. Waves tunnel around the artificial barriers and continue toward shore, creating small bluffs. Bulkheads can be used in some places, but they usually are far too expensive for widespread use, especially since these rural coastal lands aren't valued at much more than \$250 an acre.

Currently, cordgrass has the advantage of being a natural barrier, as well as holding the promise of being much cheaper. Transplanting grass has been tried in Texas before. In 1957, the Soil Conservation Service planted 1,000 feet of *Spartina alterniflora* in the tidal zone in Chambers County. It thrived without fertilization or special care. One report indicated the vegetation reduced erosion and allowed deposition of almost a foot of new sediment in 12 years.

Some three decades later, Seidensticker and Nailon are once again experimenting with revegetation of the Chambers County shoreline with smooth cordgrass. They believe the grass can significantly slow the erosion of inland bays, even though three years are needed to produce a marsh grass area thick enough to make a healthy stand against the waves. Funding for the four marsh rejuvenation experiments is provided by the Texas A&M University Sea Grant Program, the Brown Foundation and the Moody Foundation.

Basically, the smooth cordgrass acts as a shock ab-

Ranchers have tried everything from tires (below, right) to slabs of concrete to stop land from eroding into the bay. After trying Christmas trees (below, center), the researchers began stringing strips of surplus cargo parachutes (below, left) to form a 4-foot-high fence in front of their cordgrass.



sorber when waves crash against the shore. The tall, thin-leafed grass thrives in salty, shallow waters near the shore. The long leaves diffuse the force of the waves while at the same time filtering out sediment. But the researchers say the grass doesn't grow in certain areas. Among the criteria for successful erosion control using grass are relatively low shoreline bluff conditions and shallow bottom immediately next to the bank with a fairly long slope. In addition, it will grow only on land between high and low tide marks.

Texas bayshores are vastly different from the far more popular beach areas. Bay soils are primarily clay, (below) while the beaches are dominated by sand.



Getting the grass up was no easy feat. The initial problem with transplanting the grass was that waves knocked the plants over before they got a foothold. The cordgrass is hand-transplanted using a metal rod to bore a six-inch hole. The 10-week-old grass shoots are then placed in the hole and covered. In order to slow the wave action, the two men tried tying a line of discarded Christmas trees between the open bay and the newly planted grass. The Christmas trees had the advantage of being cost-free, but they were labor-intensive and offered only seasonal availability.

Next they tried plastic snow fence from Colorado. The snow fence worked about the same as the double row of trees, but was a lot more expensive. Construction of the snow fence ran about \$7 a foot. The Christmas trees were about \$8 a foot. Finally, from out of the blue came a new idea – parachutes. The researchers began stringing strips of surplus cargo parachutes to form a 4-foot-high fence in front of their cordgrass. The surplus parachutes, from the Texas Surplus Property Agency, were staked out in two rows on about 500 feet of the O.C. Jackson ranch on Lake Stevenson and about 700 feet of the Ralph Leggett ranch on the north shore of East Galveston Bay. Although waves flow through the barrier, the force was diminished. Currently, 60 percent of the plants have survived with the aid of the parachutes. “It cost us about \$6 per foot to do the job, which is a lot cheaper than building a \$75- to \$80-per-foot bulkhead,” Seidensticker says. Another advantage of the parachute material is that it's more durable than previous materials and may even be reusable.

“We still have a ways to go to prove ourselves,” Seidensticker says. “The next step is to remove the parachute barrier and let the grass stand up to wave conditions on its own.”

Meanwhile, the researchers are developing an alternate transplant site and nursery testing area for native Texas

Recovering lost habitat expands the food basket for the bay systems (right). Fishery species nurtured by the marsh include brown and white shrimp, blue crabs, redfish, speckled trout, bait fish and, indirectly, oysters.





More than 45 acres of Chambers County disappear into East Galveston and Trinity bays every year at a rate of 0.5 acres per mile (left).

cordgrasses as well as grasses from around the nation using two former shrimp ponds on the Leggett Ranch. Water levels, which simulate the movement of tides, can be regulated on the two-acre ponds using water pumped in from nearby Robinson Bayou. Seidensticker and Nailon estimate that 50 percent of the primarily rangeland coastline on East Galveston Bay can be treated for erosion by planting smooth cordgrass. However, continued trial-and-error planting studies are needed to determine optimum methods for establishing the vegetation.

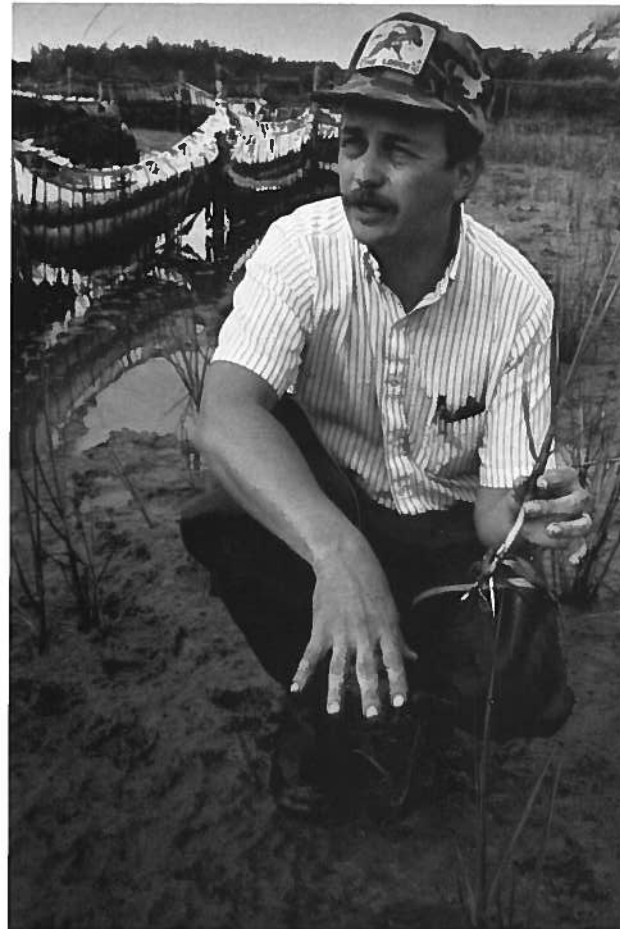
A University of Texas study on coastal erosion estimates that the average rate of wetland loss on the northern shore of Galveston Island increased from 0.8 feet a year between 1852 and 1930 to 2.1 feet a year between 1930 and 1982. The University of Texas researchers predict that extensive losses of marshland will occur along this shoreline, as well as along West Bay and Galveston Bay shorelines near Texas City, if subsidence continues. The Galveston Bay system includes four major bays - Trinity Bay, Galveston Bay, West Bay, and East Bay.

Interest in bayshore erosion is on the rise. Dan Yanta of the Port Lavaca Soil Conservation Service office says that about four years ago, Calhoun County officials helped organize the Gulf Coast Shoreline Erosion Committee, a group of Soil and Water Conservation District officials from coastal Texas. And on the state government front, the Texas Legislature in 1984 created an interim committee on coastline rehabilitation headed by State Sen. Chet Brooks, D-Pasadena. Although the committee focused on the beaches, Yanta hopes it will lead to funding for more study of bayshore erosion and for some pilot projects to control it.

Still, educating the public on the importance of replanting the vegetation is difficult. Seidensticker says, "People don't realize the value of the marsh areas we're trying to create."

Recovering lost habitat expands the food basket for the bay systems. Fishery species nurtured by the marsh include brown and white shrimp, blue crabs, redfish, speckled trout, bait fish and, indirectly, oysters. The growth of a species is limited by the habitat available.

"The shoreline is disappearing," says Eddie Seidensticker, district conservationist for the U.S. Soil Conservation Service (below).



# CURB SERVICE

THE SEAWALL IS PART OF THE SCENE NOW, JUST A GIANT CURB ALONG THE ROADSIDE OF THE GULF. IT'S TIME SOMEBODY PLUGGED GALVESTON'S BIG BEACH BARRIER.

ON A HOT SUMMER DAY thousands of beachgoers skitter across Galveston's Seawall Boulevard on their way to flop on the sand and take in the beauty of nature. Rarely do these greasy suntanners consider the massive hurricane barrier underfoot.

The seawall is part of the scene now, just a giant curb along the roadside of the Gulf of Mexico. Yet when weather warning signs abound, the wall is there to protect this all too vulnerable coast community 50 miles south of Houston.

"We do take it for granted," says Lee Zapp Jr., a Galveston real estate and insurance executive. But, he says, the seawall makes a difference in gaining new development since many prospective out-of-state buyers seeking substantial pieces of property don't even consider building outside the seawall.

Seawalls are terribly elaborate affairs. This 17-foot-high, 10-mile-long wall was completed over a period of 61 years. In that time it's been blasted by a series of killer storms, innumerable waves and once even a four-masted schooner that sailed over the wall at the height of a hurricane, dragging two anchors.

It cost more than \$14 million



*Galveston's 17-foot-high, 10-mile-long wall was completed over a period of 61 years. When the wall went in place there was a veritable sea of sand in front of the barrier.*

to build. If the same seawall were built today, the sum would be closer to a mind-boggling \$14 million a mile, says the U.S. Army Corps of Engineers.

Another point long forgotten by today's beach crowd is that when the seawall went in place there was a veritable sea of sand in front of the barrier. An Army Corps report indicates the beach extended for 300 feet in places on the Gulf side of the huge concrete wall. There are few remaining signs of that sandy vista today.

If this were a movie, the scene would demand a flashback: a much younger

Galveston, standing on the threshold of economic good times in the mid-19th century. In those early days the city's financial and marine trade was protected from hurricane tides by sand dunes along the Gulf front. Rapid development as a resort mecca, so reminiscent of today's booming tourist-based economy, led to removal of the sand dunes along the beach front for fill and to permit easy beach access.

But in 1900 Galveston's good fortune turned to abject failure. The 38,000 residents of the city were directly in the path of a screaming swirl of wind and

rain on September 8 with nothing to protect them. The result was the single worst natural disaster in U.S. history. The fury of the full-blown hurricane sent beach water levels more than 15 feet above normal. Damage was estimated at \$25 million, but more importantly, 6,000 died.

In 1902 the Galveston City Commission and Galveston's County Commissioners Court appointed a board of engineers headed by Brig. Gen. Henry Robert, former chief of the Army Corps of Engineers. The cost, paid entirely by Galveston County, was \$1.6 million.

Materials that went into that





CORPS OF ENGINEERS



NORMAN MARTIN

*Galveston's groins went into place in 1936. They help protect the seawall from erosion.*



NORMAN MARTIN

*If the same seawall were built today, the cost would be more than \$14 million a mile.*

first section included 5,200 rail cars of crushed granite, 1,800 rail cars of sand, 1,000 rail cars of cement, 1,600 rail cars of pilings, 3,007 rail cars of riprap and six rail cars of steel rods.

While the county's seawall was being constructed, Congress authorized construction of a similar 4,935-foot seawall between 39th Street and 53rd Street, along the front of the Fort Crockett Military Reservation. Construction by the U.S. Army Corps of Engineers started in December 1904 and was completed by October 1905, at a cost of \$295,000. Ed White, a Galveston-based spokesman

for the Army Corps, says that ten years later the seawall was subjected to its first major test. In 1915 a major hurricane produced a tide 15 feet above mean low water and wave crests were estimated to have topped 21 feet.

"They hit the wall for more than 19 hours. But the wall held and it's held ever since," White says. Twelve people were killed and property damage was limited to \$4.5 million.

But the hurricane's large waves killed the city's beach. Prior to the storm, there was a beach, 300 feet wide in places, along the Gulf side of the wall.

After the storm had passed nothing of the beach remained.

Still, the seawall itself was largely undamaged. Several chips of concrete were knocked out when a four-masted schooner was carried over the wall, dragging two anchors at the height of the storm. Unfortunately, the anchors chose a rather inconvenient time to hold. Both held on the bottom of the seawall and the ship was smashed to bits on top of the seawall.

Marine scientists later discovered that most of the sand from the beach lay in a bar several hundred feet offshore. Some of the sand did eventually move landward, but the beach never reformed to its original dimensions.

Another extension of the seawall was completed in 1921, connecting 6th Street and the federal Fort San Jacinto Reservation, near Galveston's south jetty.

The final extension was a drawn-out process. The Korean War held up federal funding, so Galveston completed the first mile, from 61st Street west, themselves for \$2.6 million, finishing in 1953. Construction of the federal government's portion of the seawall resumed in 1958 and ended in 1962. The cost for the two-mile section was \$5.6 million.

"In terms of economic development, the seawall definitely helps," a Galveston Chamber of Commerce official says.

"There's no doubt, if it wasn't so expensive, I'm sure it would be extended." The seawall itself was only part of the plan to protect the city.

The engineers also raised the level of the land behind the seawall, using 700,000 tons of

fill per mile. The sand fill behind the seawall ranges from 150 to 200 feet at the base, sloping upward to an elevation of 18 to 21 feet.

Another renowned feature of Galveston's shoreline protection scheme are the city's rock walkways, technically called groins, which periodically protrude out into the Gulf. The groins, located between 12th Street and 59th Street, were added to the waterfront in 1936, following a beach erosion survey that indicated this method was the best method to protect the seawall.

Construction on the 13 metal and timber groins, each 500 feet long and 1,500 feet apart, was finished in 1939. These were replaced between 1968 and 1970 with the rock groins currently in place.

Seawalls, while expensive, are not entirely a thing of the past. The 4,600 residents of Palacios, 107 miles southwest of Houston are paying more than \$1 million a year to repair their old five-foot high seawall.

George "Billy" Harrison, a rancher and former Matagorda County commissioner, says the first wall was erected in the 1930s to halt the oncoming waters here at the headwaters of Matagorda Bay, and for decades it did an adequate job. But in the 1970s the wall began to show signs of age.

So, in 1984 the small coastal community reinstated their Palacios Seawall Commission and sought approval for the state to fix their crumbling seawall.

In 1985 the Texas legislature approved the measure and since then the city has placed reinforced concrete footings behind the old 1.75-mile seawall and raised its elevation by two feet.

—Norman Martin

# ADVISOR



LAURA RODEN

A rare sighting of a pod of 15 killer whales in the Gulf of Mexico was made by Capt. Dick Deason and Laura Roden on September 27, 1987, 55 miles northeast of Port Isabel.

## Headstarted redfish fingerlings getting big boost from power plant

A project to assess the feasibility of overwintering red drum fingerlings in heated water from an electrical generating plant is being called a success.

In an agreement between Texas A&M University and the Gulf States Utilities Company, red drum fry were placed in a pond at the Sabine Power Station at Bridge City.

"We have done all we anticipated and more," says Tom Linton, the project coordinator and a Marine Advisory Service fisheries specialist.

This year was scheduled to be the "learning year," the time to work out the kinks in the pond culture project. Next winter was to be the "production year," when the one-inch fingerlings placed in the pond in the fall would actually grow to the four- to six-inch growout size.

The latest set of fingerlings, provided by Redfish Unlimited of Palacios, are doing very well, Linton says. If they continue growing as expected through the spring, these "headstarted" red drum will be ready for growout ponds, making this not only the learning year, but the production one as well.

The prospects for survival weren't always this optimistic

though, Linton says. The first two stockings of red drum all died. Tilapia were used to test the waters, rather than continuing to stock with the expensive redfish. Several adjustments were made to the water temperature and the inflow and outflow of the water. It made a big difference in the survival rate of the tilapia, Linton says. So they tried again with a stocking of red drum on March 17. This batch gives every indication that it will survive, Linton says.

The primary enemy of young red drum in pond culture is cold weather. By utilizing the heated water being emitted from the GSU plant, Linton and his associate, Windfield Granger, were able to create a water habitat that is 25°F warmer than a typical outdoor unheated pond in winter, Linton says.

The set-up at the plant allowed them to control the temperature within 1°F-2°F and to control salinity, as well.

Linton believes utilizing the heated water from generating plants in future projects is feasible, as there is often land near power stations that is not being used.

He figures if these companies are willing to lease the land for cattle grazing, then they might be willing to lease the land to a fish farming enterprise by providing a series of ponds with warm water pumped through them. ■

— Rhonda Snider

## Specialist breaks rock shrimp package problems

Rock shrimp are hard to sell for two reasons. First, their tough, lobster-like shell makes them hard to peel, and therefore too difficult to prepare for cooking. The second problem is they cook differently than the popular Gulf shrimp, causing frustration for the average seafood cook experimenting with rock shrimp.

Mickey Costella of Broadway Seafood solved the first dilemma by providing consumers with a new market form of the tasty shrimp. His Port Lavaca seafood operation recently began producing individually quick-frozen rock shrimp that are peeled and deveined and packaged in one-pound bags.

He had to request help on the second problem, however. "A little bit of education," was what was needed, he says. Costella asked Annette Reddell Hegen, Texas Sea Grant seafood consumer education specialist, to provide recipes for the packages of shrimp.

Hegen says special instructions for rock shrimp were needed because they cook in about half the time of regular shrimp, and therefore must be closely monitored to avoid overcooking. Similar to lobster, Hegen says, the rock shrimp are sweet tasting and have a firm texture.

The primary method of cooking in the past has been to butterfly the shrimp and broil them like lobster. But there are many preparation alternatives for rock shrimp, she says. Costella had his packages printed with three of Hegen's recipes: rock shrimp scampi, rock shrimp salad and sauteed rock shrimp.

He says the recipes will definitely increase sales of the frozen rock shrimp, as people will be more likely to try cooking

the shrimp if they are given preparation ideas and details for cooking. Thus far, people have responded well to the recipes on the packages, Costella says.

Costella says distributors and buyers have been so impressed with his product and packaging idea that he has hopes of getting the new rock shrimp idea in major grocery store chains soon. ■

— Rhonda Snider



Coral polyps

## UPDATE Coral bleaching at Flower Gardens remains normal

The incidence of bleaching of corals at the Flower Gardens Coral Banks in the northwestern Gulf of Mexico appears to have been no greater than would be normally expected, say researchers at Texas A&M University.

But mass bleaching of corals has been observed at many reefs in the Atlantic and Caribbean, alarming scientists who are not sure what has caused the phenomenon. Bleaching occurs when the coral tissue expels large numbers of zooxanthellae, the single-celled organisms that normally give coral its color.

Last fall, scientists at the Flower Gardens observed a *Montastrea annularis* coral head that was nearly 20 percent bleached. "Word of this observation may have gotten out before confirmation of bleaching elsewhere on the reef," says Dr. Thomas J. Bright, a Texas A&M oceanographer and director of the Sea Grant College Program. "It may have prompted the assumption by others that

zooxanthellae expulsion on these reefs was similar in extent to that reported from other Western Atlantic coral reefs.”

Since that observation, Bright and Texas A&M oceanographer Steve Gittings have gathered reports from others who have visited the reef. Gary Rinn, a dive boat operator who took several trips to the Flower Gardens last summer, noticed no bleached corals. Another diver, Jeff Stone, also saw no evidence of obvious bleaching on the reef in September.

Gittings reports that on a research voyage in November, he observed only minor coral bleaching at the East Flower Garden Bank. Most recently, Dick Shaul of Continental Associates, Inc., surveyed the reef in February and found it free of bleaching. ■

—Lona Dearmont



*Ptychodiscus brevis*

## UPDATE Red tide bloom fails to return, but teams still monitor Gulf

Marine scientists continue to monitor Gulf waters closely for the presence of a killer red tide that wiped out millions of fish in 1986. So far, there are no signs of a return engagement.

Red tide, a massive bloom of microscopic single-celled organisms called dinoflagellates, killed more than 22 million fish before it receded in January 1987. Masses of dead fish blanketed the beaches, sending a foul odor into the air and driving people away for weeks.

Today researchers continue to study the life cycle of dinoflagel-

lates for clues to the formation of red tides. Texas' latest red tide was due to the specific dinoflagellate named *Ptychodiscus brevis*.

Scientists still don't know what prompts the red tide organism to bloom in such heavy concentrations that it makes seawater appear brownish-red. But they do know that the organism, in the form of cysts, lays dormant at the ocean bottom, waiting to be triggered to life by some unknown combination of factors.

Last fall, coastal residents marked the one-year anniversary of the red tide that bloomed in the Gulf from Galveston to halfway down the coast of Mexico.

Water salinity and temperature, and upwellings of water from the ocean bottom, may be important factors in the appearance of a red tide. Red tide outbreaks occur so infrequently in Texas — the last major event was in 1935 — that researchers must contend with limited data.

The Texas Department of Health now routinely monitors Gulf waters and Texas bays for red tide by tracking high salinity counts.

The aim is to try to catch a possible outbreak of the organism in its early stage. Scientists hope to gain clues to the factors creating red tide and health officials want to test shellfish as early as possible in case shellfish harvesting must be banned. Shellfish absorb the red tide toxins and can pose a health threat to humans who eat them.

Nevertheless, the most severe impact of red tide on humans appears to be economic. City officials in towns along the Texas coast reported substantial drops in the fishing and tourism industry.

In Texas, menhaden and mullet apparently were the primary victims of red tide. ■

—Lona Dearmont



Young sea turtle

## UPDATE Mandatory use of turtle excluders blocked by court

Regulations requiring shrimp fishermen to use turtle excluder devices (TEDs) in their nets went into effect March 1, but a Louisiana federal district court judge on April 12 ordered the suspension of the regulations' enforcement until shrimpers can make their case against the TEDs rules.

The rules, authorized by the federal Endangered Species Act, require all shrimp boats fishing in the Gulf of Mexico within 15 miles of the shoreline to have an excluder on each net in the water.

Government officials and environmental groups say the TEDs will save thousands of endangered sea turtles.

National Marine Fisheries Service officials say the turtle excluder device prevents sea turtles from being caught and drowned in shrimpers' nets. The Center for Environmental Education claims that shrimping kills 50,000 sea turtles annually in the south Atlantic and Gulf of Mexico.

But an organization of shrimp fishermen filed suit in Louisiana federal court claiming the regulations pose a financial burden on shrimpers they can ill afford. They object to the use of excluders because of reports that the devices not only exclude turtles but part of their catch. Shrimpers say their losses could run as high as \$20,000 in one day's fishing if an excluder completely malfunctioned.

The Concerned Shrimpers of America's class action was originally dismissed, but Judge Patick Carr granted the shrimpers an injunction against the mandatory use of TEDs until the shrimpers' appeal could be resolved. Meanwhile, environmental leaders taking the side of the federal government called for an immediate boycott of all shrimp and shrimp products originating from Texas and Louisiana.

They oppose the suspension of TEDs use and have called for the total enforcement of the regulations to save sea turtles from slow death in shrimp nets. Use of TEDs is voluntary while the regulations are suspended. ■

—Lona Dearmont

## Mercury poisoning cited in closing of Lavaca Bay

For the first time ever, the Texas Department of Health closed a portion of Texas waters to fishing for finfish and crab due to the risk of mercury poisoning.

Effective April 21, the health department closed part of Lavaca Bay after officials measured levels of mercury in fish that exceeded the federal Food and Drug Administration's accepted level of 1 part per million. Seafood with mercury levels above 1 part per million are deemed unsafe for human consumption. Health department officials say it is difficult to predict how long the closure will last. Regular monitoring will continue until mercury traces in finfish and crabs subside to acceptable levels.

The Aquatic Life Law, passed by the Texas legislature in 1985, authorizes the Texas Department of Health to close contaminated waters to fishing for all types of marine life. The recent closing is the first time the department has exercised its new authority. ■

—Lona Dearmont

# BEAUTY AND THE BEACH

[ CONTINUED FROM PAGE 6 ] ocean engineer, believes the causes are linked to a combination of wind-generated currents, storm surges and the very fine sediments that make up Matagorda Bay.

Now there is evidence that erosion isn't just occurring on the beach itself. Dr. John Kraft, a geologist at the University of Delaware and a Sea Grant research scientist, says coastal residents may be seeing only a fraction of what is eroding.

In his examination of Delaware's nearshore waters, Kraft discovered that the beachface was eroding 325 yards offshore in 30 feet of water. Previously, many coastal specialists assumed sand placed on the beaches during beach nourishment projects helped restore a gentle slope to the underwater beachface by making more sand available to the system.

In Texas most shore erosion is due to the action of waves removing sediment from the shore. The two most important factors in the landward movement of the Texas coast are the overwash of water and sediments and the formation of inlets. Storms cause both phenomena. During severe storms, like the occasional hurricane that roars ashore, the beach

and nearby dunes are topped by high water and waves.

All this wind and wave energy has to act against something, and in Texas that material is the fine sand typically found on Gulf beaches, and the silt or clay usually found on bayshores. In some limited areas, other materials receiving the brunt of nature's power include oyster shell or gravel. Dominant winds along the Texas coast come in two varieties. One is persistent southerly or southeasterly winds from March through November. And, two, are the periods of strong north winds from December through February. Apparently, erosion strongly depends on the exposure of the shore to these dominant winds.

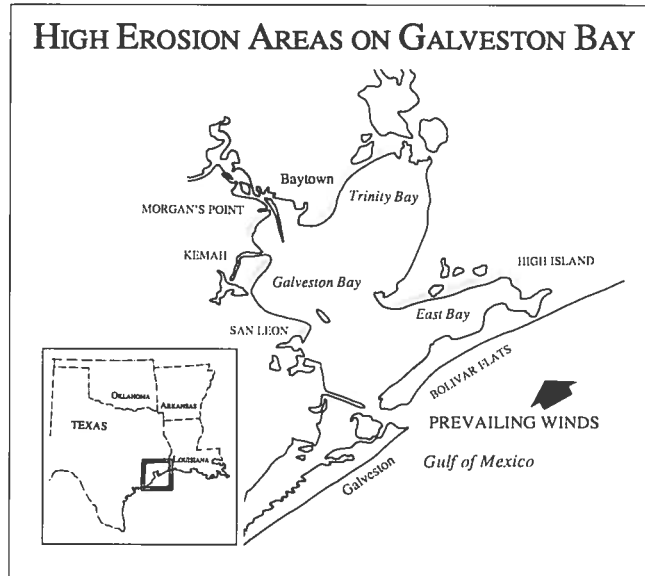
Texas has three principal points where the shoreline, both through recent geological and historical time, has been continuously eroding. Those areas are between Sabine Pass and Bolivar peninsula, the central coast near the Brazos River, and on South Padre Island. All three areas have similar geologic conditions.

On Padre Island, the long- and medium-term annual erosion rates average 8.25 feet and 9.24 feet respectively, largely because of daily wave action, says Dr. John Giardino, a Texas A&M geomorphologist.

But erosion rates soar with the onslaught of

a major hurricane. Giardino and his research team discovered that Hurricane Allen's 1980 trek inland ripped away 12.2 feet in just 48 hours. However, he says, following these spectacular changes, normal conditions reversed the general order of change and repaired the damage. "Then they resumed their persistent, but less spectacular, processes of coastal modification," Giardino says.

Matagorda Bay has a long history of ero-



sion. In his report on the Matagorda Bay area, Dr. Joe McGowen, a geologist formerly with The University of Texas Bureau of Economic Geology, indicated that in a 100-year period of historical monitoring between 1856 and 1957, some 8,450 acres of land were lost by natural erosion of Gulf and bay shorelines. During the same period, only 615 acres of land were gained through natural accretion, the creation of new land. McGowen found that Gulf shorelines had experienced the greatest amount of erosion.

But it is Galveston Bay's erosion that many state and local officials fret over the most. Almost three-fourths of the state's coastal population live in the surrounding counties. In addition, it is the largest of Texas' seven major estuarine systems, providing nursery and spawning grounds for some 30 percent of the total fishing products harvested from the Texas coast.

For Galveston Bay, the Trinity River is a main source of sediment, although other sources include the San Jacinto River in upper Galveston Bay and numerous smaller creeks and streams. Lower rates of sediments have been rolling down river, though. Intense reservoir construction within the Trinity River basin is usually blamed for the downstream sediment decrease.

Galveston Bay's modern erosion history dates back to the turn of the century. In 1935, the Corps published a shoreline erosion study indicating that retreat of the west shore averaged 75 feet between 1915 and 1934. Meanwhile, several longtime residents reported 600 feet of erosion between 1900 and 1934 and the loss of entire city blocks during their lifetimes.

A national shoreline erosion study published by the Corps in 1971 included the entire Galveston Bay system. The study revealed that western Trinity Bay, eastern Trinity Bay near Double Bayou, northern East Bay, the shores of Lake Anahuac, and much of western Galveston Bay between April Fool Point and Morgan's Point were either "critically" or "non-critically"

eroding, depending on the rate of shoreline retreat and property value.

In 1983, the Corps published another study of erosion along Galveston County bay and Gulf shorelines. Observations made during the study and statements from residents suggested that the long-term erosion rate near San Leon increased from about 4 feet per year between 1850 and 1933 to about 5 feet per year since 1933.

In a recent report, University of Texas geologists add that most of the shoreline within the Galveston Bay system retreated between the early 1850s and 1930. The primary reason was wave action, weathering and eventual failure of many ancient Pleistocene bluffs, as well as

the relative loss of ground elevation due to minor sea-level rise and compaction of the thick sedimentary section underlying the coastal plain.

Still, two areas actually did win the erosion battle and moved forward. They were the Trinity delta and the southwestern tip of Bolivar Peninsula.

Currently, the Corps is proposing initiation of a congressionally authorized Matagorda County Shore Erosion Study, and recently completed a study of Galveston County erosion problems.

"We periodically monitor the shoreline conditions, but without specific congressional authorization we have no means to attempt to reduce it," says Col. Tudela, Corps district engineer.

Meanwhile, there are cosmic questions to consider. Some marine scientists believe global changes in climate since the last glacial stage have indirectly affected positions of bay shorelines. But overall, climate is generally considered by coastal geologists as the least important contributor to historical shoreline changes.

"It isn't just because of human activity that the beach is eroding along the Texas coast. That erosion began a long time ago," says University of Texas geologist Morton. ■

# SARGENT BEACH

[ CONTINUED FROM PAGE 12 ] Waterway is about 7,000 feet. "Even with the highest rates of erosion, that's still about 100 years from now. If we shove it off that far into the future and the waterway becomes threatened again, then it isn't this stretch at Sargent Beach that is at risk. It would be the entire stretch from Port O'Conner to Galveston Island."

Texas Department of Highways' Luedeke says, "Relocation is going to be a very expensive operation, if that's what is decided." The non-federal sponsor, of course, is responsible for purchasing any right-of-way that's involved in a relocation effort. There is some expensive right-of-way involved.

The real kicker is that federal rules require the non-federal sponsor, in this case the state, to share on a fifty-fifty basis any capital improvement associated with a relocation, such as widening or building new locks, dams and structures on the canal.

"If it costs \$20 million to move the waterway away from this problem, that's \$10 million dollars to the state of Texas, plus the right of way," Luedeke says. "We have no way now of knowing how much money that is." Luedeke points out that money has to come from the state's general fund. It cannot come from the state highway fund, since that money cannot be used for general state purposes.

"Texas has a real funding problem. That's one of the aspects that we must keep in mind when discussing moving it as an option," Luedeke says.

The highway department got the job of policing the waterway in 1975 when the state legislature passed the Texas Coastal Waterway Act. This act authorized the State of Texas to act as the local non-federal sponsor of the Gulf Intracoastal Waterway in Texas and designated the department to act as the agency for the state in fulfilling the responsibilities of the non-federal sponsor.

Meanwhile, the Corps is attempting to analyze the Sargent area in other ways. For instance, section 216 of the 1970 Flood Control Act provides the authority to reanalyze completed projects where conditions have changed during the project's life.

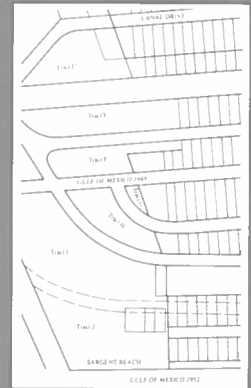
"We've requested funds to evaluate specific needs along the waterway, especially in the Sargent area," Wooley says. "This study will re-examine at the entire waterway in light of today's conditions and that which can be expected in the foreseeable future."

The type of equipment now using the waterway is significantly different from that used in the 1940s. Barges are bigger, towboats more powerful and tow configurations have changed. All the while the waterway's dimensions and curves have remained essentially the same.

State officials estimate some 20 percent of the Texas gross state product is linked to this narrow stretch of water. And more than 145,000 jobs are involved when the major industries affected by the waterway



Accelerated erosion levels, caused by the daily scouring action of waves, have brought the encroaching sea to the doorstep of the Gulf Intracoastal Waterway (above). Many homes have already moved offshore, as this 1950s subdivision design indicates (right).



are considered. Water transportation alone in Texas employs some 22,000 people.

By far, barges are the most economical way to move chemicals, a prime product of the Texas coast. Chris Castoro, a marine transportation officer for Hoescht-Celanese Group, says, "That's the way we move it and that's the way we'd like to continue to move it. That's why this isn't a local issue, it's a national issue."

The waterway not only links Texas deepwater ports, but connects the state's crucial oil and petrochemical industrial complex to midwestern markets. Besides massive amounts of crude petroleum and residual fuel oil, other shipments seen daily on the waterway include basic chemicals, gasoline and distillate fuel oil.

"Once that beach is lost at Sargent, it's gone forever," says Sea Grant's marine agent Younger, who has watched the steady march of the sea for the past 10 years. "It's not a short-lived phenomenon. It's something we're going to have to live with from now on." ■

## McCABE'S CUT

[ CONTINUED FROM PAGE 13 ] there was no outlet to the Gulf. Brown Cedar Cut, which is much farther down the bay, is open only during storms or when the water level is significantly high in the bay.

Last December the Army Corps notified the drainage district that the cut had exceeded its permitted dimensions and was impacting a federal project, the Gulf Intracoastal Waterway. "The drainage district was requested to provide a plan to bring the cut back in compliance with permitted dimensions," says Rothen with the Army Corps.

"That cut is accelerating erosion and setting up conditions to create an accident," adds Capt. Robert Mason, a U.S. Coast Guard marine safety officer in Galveston. If a major pollution case were to occur at the cut, he says, the Coast Guard would in all likelihood move against the barge operator under the guidelines of the Water Pollution Control Act.

"The barge operator is going to go against somebody locally to help cover his costs. And that's going to be somebody who helped dig that drainage ditch," Mason says. "Something needs to be done before somebody bangs into the bridge and we've got oil or chemicals all over the place."

Needless to say the drainage district offi-

cial is racing to find an alternate drainage site farther down in the Matagorda Bay system. The hold-up is gaining the consent of a variety of local, state and federal agencies, including the County Commissioners Court, drainage district officers, Army Corps representatives, and state and federal wildlife and fisheries personnel.

The drainage district has already produced a preliminary plan that includes a new opening to the Gulf across the extreme eastern end of East Matagorda Bay and connects with the intra-coastal waterway. The location would be between McCabe's Cut and Brown Cedar Cut. If the new opening is permitted, McCabe's Cut would then be closed. Tentatively, construction is scheduled to begin this summer. ■

# FINE LINE

SLOWLY BUT SURELY  
THE BEACH HAS GIVEN  
WAY TO THE SEA

[CONTINUED FROM PAGE 14] Dr. Robert Morton, a geologist with The University of Texas Bureau of Economic Geology, says Alicia caused substantial landward retreat of both the shoreline and the vegetation line. "Retreat of the vegetation line ranged from 20 to 145 feet and averaged about 80 feet," Morton says. On Galveston's West Beach alone, Alicia eroded more than 2 million cubic yards of sand.

But equally troubling was that some two years after the hurricane, recovery of the vegetation line was insignificant. It's clear, Morton says, this was largely due to the depth of beach erosion exceeding root depth, effectively eliminating plants from some previously vegetated areas.

Basing its case on a strict interpretation of the Open Beaches Act, the attorney general's office succeeded in prohibiting many beach homeowners from building or rebuilding homes, bulkheads or retaining walls. Attorney General Jim Mattox filed 15 civil lawsuits against owners of hurricane-damaged beach property, while more than 100 property owners in return sued the state challenging the validity of the Open Beaches Act.

Despite getting so much flak, Linda Secord of the attorney general's environmental protection division says the state won on all fronts. "We achieved our goal; we asked the courts to look at the statute and tell us what they meant. Now, hopefully, people will comply."

Nevertheless, many beach homeowners believe their rights as property owners were washed out with the tide by the Open Beaches Act. They've been critical of the attorney general's hard-nosed approach in the handling of the beach cases. John Arrington, a West Galveston Beach homeowner sued by the state for rebuilding his retaining wall, told the Houston Chronicle, "What good is it to own title on property if the public can gather underneath my house and have a picnic?"

Federal relief may soon arrive for some beach homeowners. In February, President Reagan signed a new law assisting homeowners faced with losing their homes to coastal erosion. The law gives participants in the Federal Flood Insurance Program two previously unavailable options in dealing with clear threats to their homes. For structures that could not be saved, it allows the opportunity to level them at a safe time. And for those houses that are sound now, there is the opportunity to move them away from the threatened area.

Insured homeowners following the first path would be eligible to receive up to 110

percent of the insured value of their homes, the additional 10 percent to cover tearing the house down. Those wishing to move their homes would have to relocate them beyond the 30-year erosion setback line – or 60-year line for multi-family dwellings – and would then be eligible for up to 40 percent of the insured value to assist with moving costs. "The max insured value is \$185,000," says Sue Waldron, a spokesman for the U.S. Committee on Merchant Marine and Fisheries.

"Prior to these changes homeowners had no options," says U.S. Rep. Walter Jones, D-NC. "It was either lose it or lose it." For many, the insurance program saves money by paying out a maximum of 40 percent on a home that otherwise would be a total loss.

Meanwhile, the homeowner gains some certainty by either moving or leveling his house as the situation dictates. And communities benefit by the encouragement of responsible development away from fragile shorelines, Jones says.

The National Flood Insurance Program is administered by the Federal Emergency Management Agency, which is expected to draft regulations to implement the new rules in the near future. A Federal Emergency Management Agency official in Washington emphasized that official regulations are not complete concerning this new legislation and could offer no timetable for when they would be ready. He suggested the homeowners affected by coastal erosion should contact FEMA with specific questions.

Still, some guidelines are known. For instance, the insured home may be moved if it is determined that it is in imminent danger of collapse. And, the rules apply to potential losses to homes that are not currently damaged. Also, the bill contains a two-year sunset provision added by the Senate, which means the policy must be in effect by June 1 of this year and a claim must be filed by September 30, 1989.

**L**egislative and legal battles seem to go hand in hand with coastal erosion issues. Last year, beachfront owners in Galveston and Brazoria counties unsuccessfully sought legislation to allow a four-year moratorium before beach property is confiscated after a storm. Again, under the Open Beaches Act, the sandy shore between the ocean and the vegetation line is protected as a public beach. Property owners believed the moratorium would allow the vegetation line time to return to its pre-storm position.

But the Texas attorney general's office and state geology experts disagreed. They countered that coastal vegetation lines might gradually shift back toward the sea as the beach replenishes itself but will never return to their pre-storm location. "It has not and it will not return," Morton says.

Morton believes movement of these coastal

boundaries on Galveston Island and elsewhere clearly demonstrates that the line of continuous vegetation is neither stable nor permanent. In short, long-term movement of the vegetation line is similar to long-term movement of the shoreline.

Historically, vegetation-line retreat along Galveston's West Beach has ranged from Hurricane Carla at 315 feet; Allen, 95 feet; and Alicia, 145 feet. Carla caused an average vegetation-line retreat of 164 feet, or more than twice that caused by Alicia's 78 feet and almost five times that caused by Allen's 34 feet.

**R**esearchers say many factors affect the degree and rate of beach and vegetation-line recovery, including time, storm damage, subsequent storms, shoreline stability, climatic variations and human alteration of the natural processes. Coastal experts point out that where sand is abundant and shorelines are stable, the beach and vegetation line will eventually recover to their pre-storm positions.

But where sand supply is deficient and shorelines are undergoing long-term erosion, the beach and vegetation line will not entirely recover. "Indeed, on highly erosional coasts, the vegetation line may remain in its most landward position until the next erosional event causes further landward retreat," Morton says. In addition, wet and dry cycles alter the vegetative cover. But their influence on the Gulf shoreline is generally negligible.

Among the factors that have the greatest effect is the human variable. It is in this realm that the battle for the beach can get a bit weird. Take the most celebrated of the beach lawsuits – a case where Robert Matcha fought the line and the line won. Matcha and his wife Anne sought compensation from the state for confiscating their \$100,000 beach property in Galveston.

When the Houston couple built their home on a 60-by-120-foot lot in the Sea Isle subdivision on West Beach, the structure was behind the vegetation line as required by state law. And they maintained that Alicia's assault caused the vegetation line in front of their dwellings to suffer a temporary setback.

After the storm, Matcha began to build dunes as barriers and planted them with grass before the attorney general obtained an injunction stopping the "artificial manipulating" of the natural vegetation line.

The suit went through several courts, ultimately ending with the U.S. Supreme Court's refusal last year to consider an appeal by Matcha.

"Our job is not to preserve private property but to protect the public beach," says Assistant Attorney General Ken Cross, the state lawyer handling the beach lawsuits. "We didn't create this problem. This is a harsh situation not because of what we've done but because of Mother Nature." ■

# P R E S S

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