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**Where's  
The Beach?**





**M**any owners of oceanfront condominiums and single-family homes have watched their beaches disappear in recent years and beaches, or the lack of them, provide owners with some of their biggest concerns.

The fear of a hurricane, the steady erosion of many beaches and the possibility that nothing will be done until the buildings are undermined and crumbling has become all too real in the past few years.

In Galveston, Texas, many of the beachfront bungalows and homes were simply allowed to fall into the sea.

In Palm Beach, Florida, a whole sec-

vacation area — are eroding at an alarming rate.

The country of Spain has also had to renourish several beaches due to continuing erosion problems, Campbell said.

Closer to home, in New Jersey, a joint federal-state project calls for the construction of a beach 100 feet wide and 12 miles long running from Asbury Park to Sandy Hook — which was becoming a lot less sandy due to serious beach erosion.

And in Florida, the wealthy town of Palm Beach, which is essentially built on a long barrier reef, could more aptly be called "Palm Beachless" since erosion has washed away most of the beach. In many places the ocean floods right up to the foot of the sea wall at high tide. During even mild storms, waves crash over the wall and flood the coastal road beyond.

In Louisiana, channels cut to facilitate barge passage have led to the erosion of coastal wetlands and flooding is now a major concern during storms.

And on both the east and west coasts of America, condominiums, single-family homes and other buildings which were once hundreds of feet from the water are now literally falling into the ocean during high tides or stormy weather.

The oceans are rising at a rate of perhaps a foot every hundred years (studies differ on whether this will continue), and beaches all over the world are washing out to sea; but the main cause of coastal erosion is not the rising water, but man — that interminable meddler.

### **Inlets: the worst enemy of a beach**

When Ponce de Leon first gazed on Florida's sandy shores there were only nine inlets in the entire state. Most of them were shallow, meandering, sandy estuaries and only a few, such as the mouth of the St. Johns River, were navigable by large ships.

Now there are 36 navigable inlets in Florida, most of them cut and dredged by mankind to obtain better passage for pleasure craft and commercial shipping.

The same is true of coastlines throughout the world. Constantly seeking better passage for cargo and pleasure vessels, governments and private companies have dredged inlets and built sea walls in any area where nature lacked the foresight to provide access.

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# **Where's The Beach?**

*Beach Erosion is taking it's toll*

*by Ken Cruickshank*

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tion of the beach road was allowed to wash out and had to be replaced at tremendous expense.

According to one study, 75 percent of all Americans live within an hour's drive of a beach. America has had a lasting love affair with its beaches for many years.

And we are not the only ones who love our beaches — nor are we the only ones having problems.

According to Tom Campbell of Coastal Planning & Engineering, Inc., in Boca Raton, Florida, a group of Russians from the Soviet National Academy of Science visited Boca Raton recently to study the renourishment project recently completed at Red Reef Park.

The Russian scientists were studying beach renourishment — the process of dredging sand from offshore and depositing it on the beach — because, they said, beaches along the Crimean Peninsula on the Black Sea coast — a prime Russian

The trouble with all these artificial inlets is that they interrupt the natural flow of sand along the coast — the so-called “littoral drift” which gently replenishes beaches by dropping sand off as the water drifts along the coast.

Man has interfered with the sand system, of which the beach is a part, much the same as he has interfered with the ozone layer — and the consequences of our meddling will be a burden on future generations.

When man dredges a navigation channel he usually builds a jetty — a solid dam built perpendicular to the beach which is purposely constructed to divert the natural flow of drifting sand and direct it hundreds of feet offshore. The jetty prevents sand from filling up the inlet and cuts down on the amount of maintenance dredging needed in the inlet.

But since the littoral drift cannot reach the other side of the inlet and since the sand that would naturally replenish the beach is now deposited offshore, the beaches beyond the inlet are starved of sand — sand which will never return to the shore naturally.

The interruption of the littoral drift has consequences far “downstream” from the jetty or inlet. In Florida, one of the most studied areas, it is estimated that 80 per cent of the serious beach erosion on the east coast is caused by the fact that sand is blocked and diverted offshore by 22 inlets. Some 217 miles of Florida beachfront are now in a state of critical erosion, according to the experts.

### The sand system

We have all stood on a beach on a windy day and felt a stinging sensation as fine particles of sand struck our legs. That sand is part of a system which moves (or rotates) sand from the ocean to the beach and to the dunes and back. It is a sensitive system and the balance shifts back and forth with varying wind and storm conditions.

This is the system we have interrupted — and we have destroyed the balance in the process.

Every sand grain that is hitting your legs would otherwise drift down the beach until stopped by some obstruction — say a plant such as a sea oat. Seashore plants act as a “sand fence” in much the way artificial “snow fences” are installed up north to catch drifting snow. One plant can catch an incredible amount of sand in this way. This is the way sand dunes are built up — and dunes, with a beach, are the best, and most natural, protection for upland areas.

If the blowing sand should go into the water, it normally would remain part of the system. Storms would wash sand off the beach, but the littoral drift would gently replace it in calmer weather. Unfortunately, when jetties and inlets come into the picture, sand that should be washing back up on the beach to be trapped by vegetation and form dunes is simply diverted out to sea and will never again be deposited on the beach or a dune.

Eventually, when pounding surf washes away the beach and begins to gnaw away the dunes, the primary line of defense for beachfront properties and buildings is breached.

And once a jetty has been built to protect an inlet, the erosion process begins almost immediately. Sand and beaches “downstream” disappear at an alarming rate.

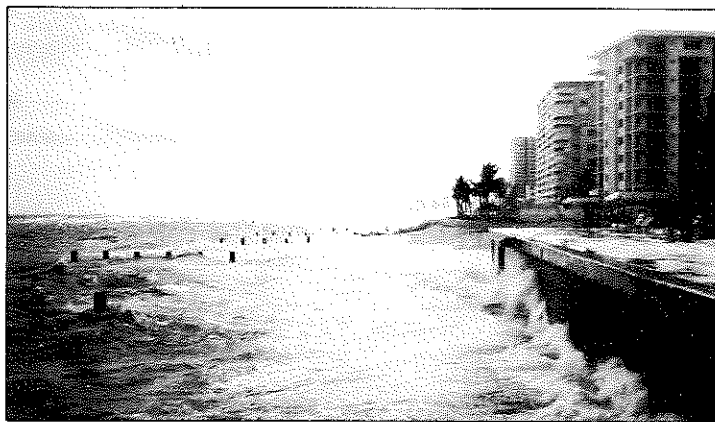
### A futile victory

As an example, Captiva Island on Florida's West Coast recently underwent some renovation. The work included the building of a large jetty. Shortly after that, the residents of neighboring Sanibel Island noticed that their beach was rapidly disappearing. They blamed the Captiva jetty.

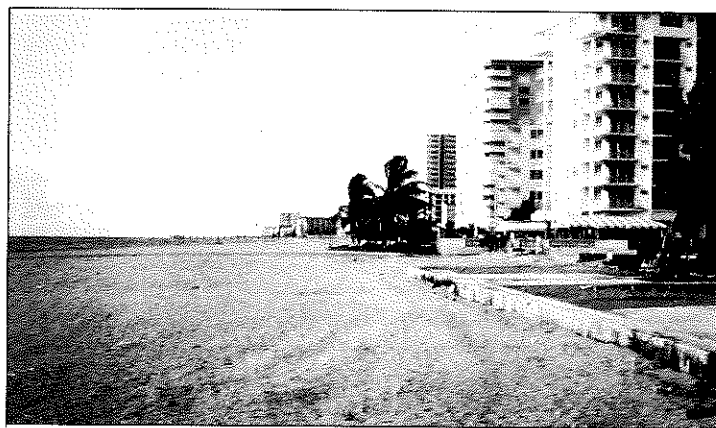
The people on Captiva disagreed, saying the jetty couldn't be part of the problem.

The issue will likely be fought out in the courts, but even if Captiva wins, it may prove a futile victory: the beach is eroding so fast on Sanibel that it is threatening to wash away a beachfront road — and that road is the only means of overland access to Captiva Island.

Officials all over the world are naturally concerned about beach erosion, partly because a lack of beaches leads to serious



Pompano Beach Florida before beach renourishment



Pompano Beach Florida after beach renourishment

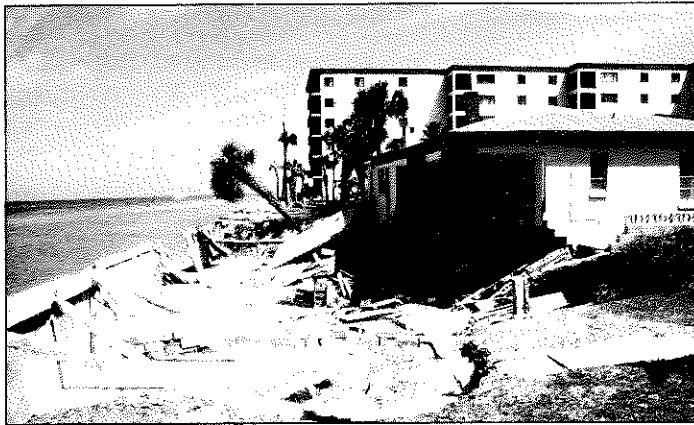
flooding during storms and threatens shoreline property, but also because beaches are a valuable natural asset, especially in warmer climates.

### Beaches: a financial asset

In Florida alone, it is estimated that beaches generate \$4.6 billion in sales due to tourism and recreation. Beaches also generate 180,000 jobs in Florida and pump \$164 million in taxes into the state's economy each year, not to mention that more than 75 percent of Florida's income is contributed by only 50 percent of its counties — the ones with beaches.

Beaches, in other words, are that state's biggest money-making asset yet up until now Florida has spent only one percent of the money made by those beaches to put them in working order.

The same is true along the entire 12,000 miles of United States coastline and concerns are mounting. Americans like their beaches and so choose to live near them — yet those beaches are disappearing. So what's to be done?



Storm damage to beachfront properties in Pinellas County Florida

### Quick Fixes

Beach erosion is a subject which, for some reason, attracts instant opinions from self-styled "experts." Ask anybody who lives near a beach what should be done and he or she will have an answer — a fact which makes it harder to base solutions on solid information, rather than opinion.

A lot of people don't want to be taxed to fix the beach. No matter how vital it may be to the region's economy, it is perceived as the problem of those "fat cats" who own beachfront property. Also local citizens are concerned about increased tourism. No matter how they may feel about tourists, statistics show that tourism is one of the "cleanest" industries available and a most efficient method of funneling hard cash into a local economy.

So attempts are made to fix the beach problems "on the cheap."

Various quick fixes have been tried to trap and funnel sand to eroding beaches. Engineers and inventors have made claims for fuzzy nets that lie on the ocean floor; artificial seaweed; specially designed underwater catchment systems made of metal or concrete and all sorts of other devices.

The problem with all these devices is that (a) they seldom work as well as advertised and (b) they are, for the most part, simply stealing sand from some other part of the beach "downstream."

"The trouble with all those artificial offshore gadgets is that they don't create sand — and that's what you need," said Erik Olson of Olson Associates, Inc., of Jacksonville, Florida, a firm specializing in beach renourishment. "Even if you get some improvement you are just robbing Peter to pay Paul. Navigation projects have taken tens of millions of tons of sand off the beach and unless you put sand back into the system it just gets worse. The problem is simple. It's sand starvation."

### Renourishment the answer?

Yes, it is the only proven solution which replaces sand which could never again rejoin the natural system without man's help.

In manager's terms, the initial renourishment of a beach could be termed a "remedial repair." If the cause of the beach erosion is ongoing (such as a jetty), then renourishment should be established as a "maintenance program" until (and if) an effective "preventive maintenance program" is instituted. Such as the installation of a sand transfer station capable of piping all the sand being lost to an inlet and jetty system across the inlet to join the littoral drift once more. We cannot allow beach erosion (and renourishment) to go on the books as "deferred maintenance."

We all have a responsibility to support beach renourishment, it is needed, for several reasons:

1. Loss of beachfront property (and perhaps even life) is imminent.
2. Loss of beaches has an immediate impact on the economy of any area that relies on them for recreation.
3. The quality life is compromised for a large segment of the public, since they can no longer use the beach for recreation and enjoyment.
4. The loss of sand from the beaches destroys a stable environmental habitat which supports much plant and animal life. An example would be sea turtles, which need beaches to dig nests where they lay their eggs.

Once you renourish a beach, the primary expense is over. It then becomes more cost effective to maintain your beach through smaller, maintenance-type renourishment projects every few years.

In New Jersey, the problem of beach erosion has been recognized since the 1950s, when beach renourishment was first recommended. But bickering over the effectiveness of the method and between state and local governments over expenses delayed any action until recently when things became so critical that areas of the state had no beach, just a sea wall being undermined by pounding surf.

So officials stopped bickering and started to do something — years later and at much more expense.

The New Jersey experience illustrates one of the prime problems with beach renourishment — getting everybody together to say they want renourishment and getting the state and various municipalities to agree to ante up their share.

Yet: "Renourishment is the only solution that gives you a recreational amenity back," says Olson. "It's cost effective."

More and more states are beginning to agree with that logic, but public pressure is often needed to bring local officials and dissident public opinion around to beach renourishment. Some environmental groups are dead set against it, claiming damage to marine life and to areas of rock which have been exposed due to erosion and have become a new type of habitat.

"Basically they're trying to protect green slime on the rocks," said one disgusted renourishment supporter.

Others argue that the habitat was not there until man-made erosion created it. Besides, they say, during the renourishment,

rocks can be piled offshore to create the same sort of environment, thus getting the best of both worlds.

"These inlets have been stealing sand from the system for 100 years on the average and that sand needs to be restored," said Campbell. "Even if we were to fix all the inlets, we'd still have a lot of sand that needs to be restored. We need to restore the beaches and then address the inlet problem to reduce future needs for renourishing beaches."

### Safe Renourishment

In Florida, the possibility of reef and environmental damage during dredging seems a more valid concern, but proponents of renourishment argue that reefs can be protected in two ways: (1) the judicious selection of a "borrow" site for the sand to be pumped back on the beach and (2) efficient management of the work so that there are no foul-ups on the part of the contractor.

"Unfortunately, a lot of the sand suitable for renourishment in a place like Palm Beach County (Florida) is between the reef lines so you have to use tight parameters for dredging," said Olson. "You can't just design the project and walk away it after the contract is signed. You have to be there to make sure it is carried out correctly. It's not an insurmountable problem; it just takes good design and good control. You are working in an environmentally sensitive area and the ocean is very difficult to work in — it's a rough environment."

Campbell agreed. "But if the project is properly monitored, you can avoid a lot of the ecological problems," he said. "If the project is designed properly they can be directly addressed."

The turbidity created by dredging, claim other engineers, is no more than that created by any rough sea of six- to eight-foot waves — a fairly common occurrence.

"The trick," according to Dr. Robert G. Dean of the University of Florida's Department of Coastal and Oceanographic Engineering, "is to make sure that no more than five percent — at the most ten percent — of the material being deposited on the beach is silts and clays."

Ideally, he said, one would like to locate a material that is the same as that on the beach, but it is not always possible.

A member of the Florida Task Force for Beach Management Funding, he said both the state and renourishment advocates are aware of ecological problems with renourishment, but that there are also ecological benefits. Beaches are habitats, too, and one study showed a heavy increase in turtle nesting on a renourished beach.

Besides, he said, beach renourishment is the only program that has been proven to work. The best protection for land is the beach itself. Sea walls and other man-made structures may protect vulnerable buildings for a while, but they only increase beach erosion and may, themselves, become undermined.

### What can you do?

Revetments and seawalls do not get the long-term job done. The only thing that will protect beachfront property is a wide beach and a big healthy dune system behind it. Renourishment is the only way to recover a severely eroded beach. But there are some things you can do to protect what beach you have. How?

#### 1. Protect vegetation.

Remember those stinging legs? Well vegetation can trap sand and build a dune quicker than you would believe. One way to get vegetation is to run a sprinkler. A regular supply of moisture will attract plants very quickly (you can also plant some sea oats or sea grape or whatever your local ecologist recommends). When you get vegetation, you will get sand build-up and, eventually, a dune.

#### 2. Support renourishment.

Beach renourishment is the only proven solution for a case of severe erosion. Try to forget the controversies and feeble solutions and encourage your local government and state to get together and supply funds for beach renourishment (which are usually matched or exceeded by federal funds).

### Finally: legal action.

Florida has become the first state to tell towns with inlets that they must replenish any sand captured by the "upstream" side of the inlet (Section 161.161, Florida Statutes). As a result, sand transfer stations have been placed at many inlets to pipe sand from the area where it collects and move it across the inlet to continue the littoral drift of sand while still preventing the inlets from filling up with sand.

Unfortunately, even the best transfer stations only return a fraction of the sand trapped or diverted by the jetties so other methods of renourishment must be used — and communities or even states may be forced into using those methods since more and more legal challenges to the problem of inlets are being mounted.

In a landmark decision, for instance, a circuit judge in Florida ruled that the South Lake Worth Inlet District must pay the cost of placing one million cubic yards of sand to restore 2.5 miles of beach at the town of Ocean Ridge, immediately south of the Lake Worth inlet. The judge also ordered the district to increase its current sand transferring system to help maintain the shoreline created by the restoration program.

The ruling could have legal implications for every "improved" navigation inlet in the state and perhaps around the nation. Other states are watching closely and the South Carolina Legislature has copied and enacted, word for word, Florida's law mandating sand pumping across inlets.

In the state of California, the beach situation is not so critical partly because material dredged from harbors was placed on the beaches instead of being dumped at sea.

"They were wise," said Dr. Dean. "Very much so."

In Florida, unfortunately, a law mandating the cheapest method of sand disposal saved money in the short run, but may cost millions in the long run, since it led to the Army Corps of Engineers taking tons of dredged sand from the inlets out to sea and dumping it far off shore.

"They are starting to decrease that practice a bit," said Dr. Dean, "but in my view they are still putting too much sand in deep water. They are worlds better than they used to be, but they could still improve."

The Florida Task Force for Beach Management Funding recommended that the state spend at least \$20 million on restora-

tion and renourishment of beaches as well as the \$15 million a year currently allocated. The task force also recommended that the state spend at least \$50 million a year for the next ten years for beach acquisition to guarantee sufficient public access and cut back development — which often hastens erosion.

Unfortunately, times are tight. The legislature came up with only half a loaf, authorizing at least \$30 million for beach acquisition, but delaying the \$35 million request for repair and maintenance. It will continue the old policy of appropriating money for beach maintenance out of general revenue funds.

Yet even at the \$15 million funding level of last year, \$50 million in renourishment money was generated — or will be when the state's money is matched with local and federal funds.

Those who have a vested interest in maintaining good beaches have been putting increased pressure on state and local legislators to come up with solutions. If the various factions involved (towns, counties, special interest groups and the like) can keep jurisdictional squabbling to a minimum, much may be done.

Otherwise, persons owning property on or near a beach may find themselves echoing the classic doubts of a man who bought oceanfront property before finding out that a hurricane had devastated the area some years previous, ripping away much of the beach, many of the oceanfront houses and an entire section of road — and that the same thing or worse could happen again at any time.

This article was reprinted courtesy of **Coastal Planning & Engineering, Inc. (CPE)**. CPE is a Florida based coastal engineering firm serving clients throughout the coastal United States and the Caribbean. They specialize in beach restoration and erosion control designs, navigation and coastal inlets. (see below)

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