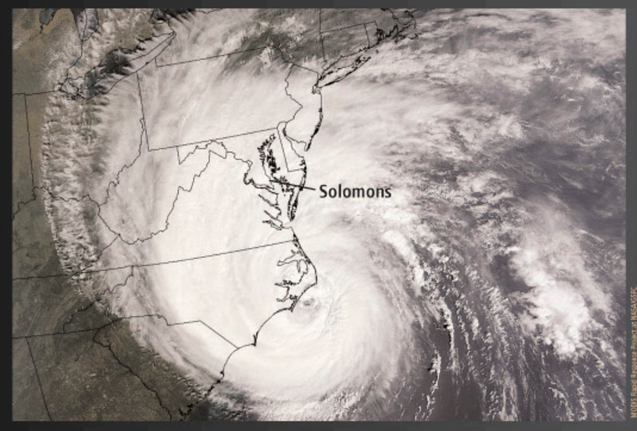
On Thursday, September 18, 2003

# Hurricane Isabel,

## a massive Category-2 storm, slammed into the east coast.




With its eye located just south of the Chesapeake Bay, Isabel's high winds and tidal surge caused widespread flooding, property damage and power outages from North Carolina to New York.

Downgraded to a tropical storm by the time it hit the Chesapeake, Isabel's winds nevertheless drove water and waves up the Bay, inundating roads, homes and businesses. The impact of the storm caught everyone—even many experts—by surprise.

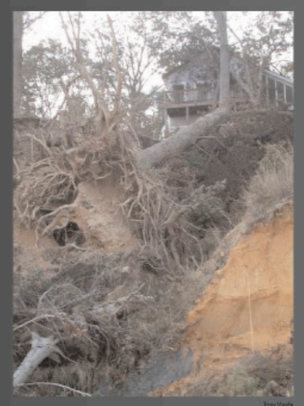
Why did Isabel cause more damage than the typical tropical storm? Rising sea levels may be partly to blame. In the Chesapeake Bay, the rate of sea level rise is nearly twice the global average. If this continues, the region—already prone to coastal hazards, especially flooding and erosion—may become even more vulnerable to storms like Isabel.

Hurricanes, tropical storms, nor'easters, floods and storm surges are natural events. They become disasters only when people, property and resources are put at risk.

If Isabel left devastation in its wake, the storm also taught us valuable lessons about how to prepare for these events—and where and how to build along the coast. In addition, Hurricane Isabel reminded us that our rapidly changing shores and waters demand that we act now to be ready for what risks the future might bring.


Deck of Phyllis Bonfield's home, Calvert Cliffs

# SOUTHERN MARYLAND EROSION




House on the edge, Calvert Cliffs


Sand washed up by waves, Piney Point


Waves before the storm, Long Beach

## Eyewitness

**Phyllis Bonfield, Marketing Communications Consultant, Lusby**


"We've never had experience on cliffs before—we moved here from Pennsylvania. And we had no idea there was a problem when we bought this house. We knew that there could be *some* erosion. Well, in 4 years we've lost 25 feet! Now, that's not like slicing cake: The cliffside falls in clumps—root balls and so forth.

**"You're either subject to erosion if you're high or flooding if you're low. You do what you can to work with it."**

Calvert Cliffs are one-third clay and two-thirds sand. There is no rock. We've got toe erosion at the base, so at this point the drop—the degree of angle to the bay—is 80 degrees. A safe angle is about 45 degrees so storm water that collects at the top of the cliff will drain off. If there is no place for the water to go, the top gets too heavy for the bottom to support and it's going to fall.

And that's how the slides started. We had four slides between June 2003 and February 2004. The sinkhole at the edge of the cliff happened in July 2004. It just collapsed—20 feet down and 25 feet across. Isabel weakened the cliffs and a lot of trees went down. You've got a ripple effect because of that and I think more landslides have happened as a result of the hurricane.

There are about 93 houses on a 2.5-mile stretch of shoreline here. They are endangered to varying degrees—but we are the most dramatically endangered. We probably have a year to two years before we'll have to vacate the property. We cannot sell this house at this point so we'll do everything we can to save it.

We've looked at other property—and it's very disappointing. Look at what we have, look at what we see here. That's hard to beat. Once you've lived on the Bay, you don't want to live anyplace else."

**"Everybody is infatuated with the water, but they don't know what they're getting into."**

— Tony Vajda, Retired engineer, Lusby


## Eyewitness

**Jeff DiMeglio, Stone carver and amateur fossil hunter**
**Alexandria, VA**

"Hurricanes are what fossil hunters wait for. The day after Isabel, we decided to go to a favorite spot on the St. Mary's River. When we got there the beach was completely changed. There was so much accumulated sediment that when we landed the boat on the beach and stepped out, we were instantly up to our knees where usually it's hard-packed sand. And the place was covered with unusual seashells.

**"Paleontologists love erosion because we get a chance to see the fossils that are preserved in those cliffs."**

— Dr. Stephen J. Godfrey
Curator of Paleontology, Calvert Marine Museum


Paleontologists quarrying fossil whale skull wrapped in a field jacket, or cast

The downed pine trees had been completely swept off the beach and along with those came about six feet of the ledge. All the loose sediments had been swept away and there was this six-foot shelf of solid fossils.

I was looking along this exposed clay layer at the base of the cliff and I see these two little pieces of jawbone sticking out. I brushed away the loose sand and there's more and there's more. We sloshed away the sediment with water and were able to uncover about 30 inches of the skull and two lower jaws of an eight-million-year-old baleen whale." [on display at Calvert Marine Museum]

**Erosion is changing the face of the Chesapeake Bay's coastline. Beaches and bluffs, marshlands and cliffs, low-lying islands—all are losing ground at an increasing rate, a direct effect of rising sea level. In Maryland alone, shoreline erosion claims about 260 acres each year.**

Courtesy MD Sea Grant and Alexandra Hanlon

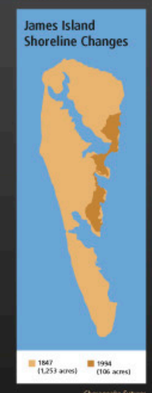
Local fishing club stages a reunion on last remnant of Sharps Island, c. 1950.

**Unlike the rocky New England coast, which can withstand battering by ongoing wave action and storm surges, the Chesapeake's more vulnerable shoreline consists of soft clays and loose silts and sands. Exposed areas are especially susceptible to erosive forces.**

**As the shoreline is worn away, tons of sediment and nutrients wash into the Bay's tidal waters, smothering oysters and sea grasses and clouding the water. Though a natural process, sedimentation at accelerated rates damages vital habitat for Bay life.**

**Shoreline erosion is not just about land loss: Waves and storms also build up the land by carrying sand and other sediments inland from beaches and nearshore waters. This redistribution of sediments is called *accretion*.**

**The rate of erosion or accretion varies from place to place depending on natural conditions such as soil composition, vegetation, exposure, prevailing winds, and elevation and slope of the shore. Human activities also affect erosion rates—especially land use and shoreline reinforcement (bulkheads, walls, jetties and other barrier-type structures). The wrong shoreline protection approach can loosen sediments and disrupt drainage patterns, causing more erosion.**




**Shoreline erosion is one of the most serious problems facing the Chesapeake. While short-term evidence appears in the sudden, dramatic changes caused by periodic storms, scientists also monitor small, gradual changes to predict long-term erosion rates as sea level rises.**

**Experts continue to develop erosion management methods to better protect homes, roads and other structures, as well as sensitive coastal ecosystems and the people who live there. While putting these programs into practice may be expensive, doing nothing will ultimately cost much more.**

Financial assistance provided by the Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management, National Oceanic and Atmospheric Administration (NOAA). A production of the Maryland Coastal Zone Management Program, Department of Natural Resources pursuant to NOAA Award No. NA17OZ2337.