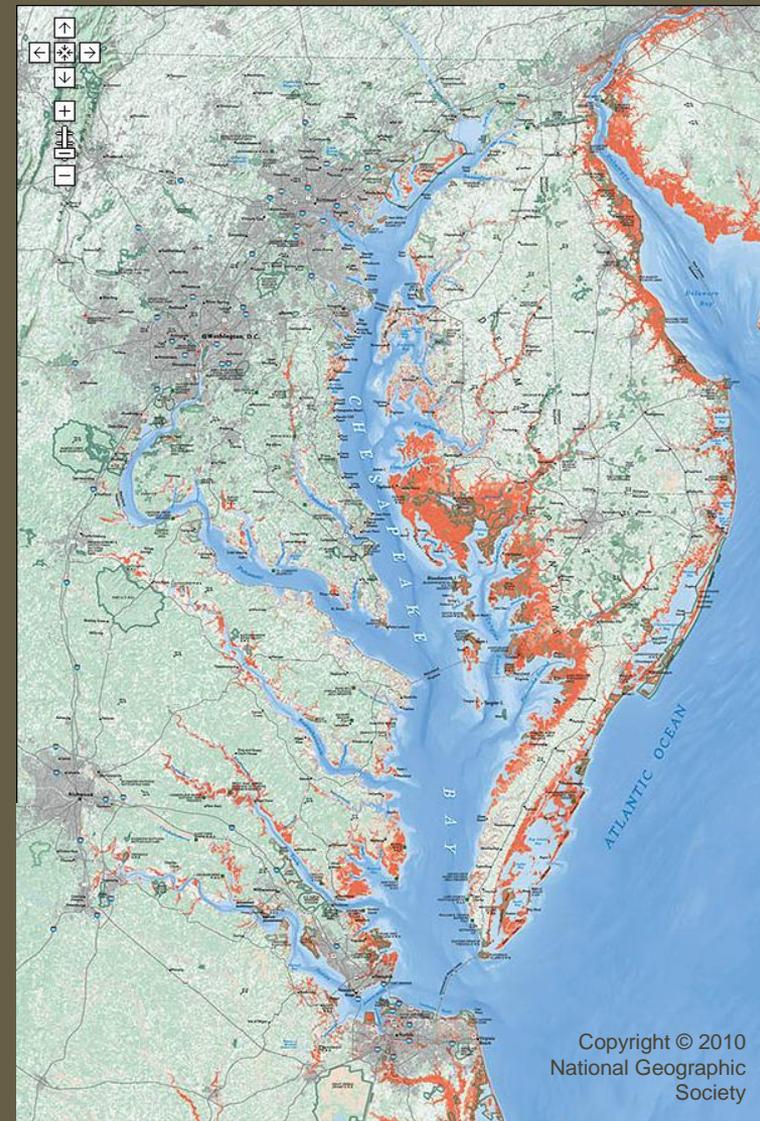


Sea-level Rise Planning in the Chesapeake Bay



Chesapeake
Conservancy

Location



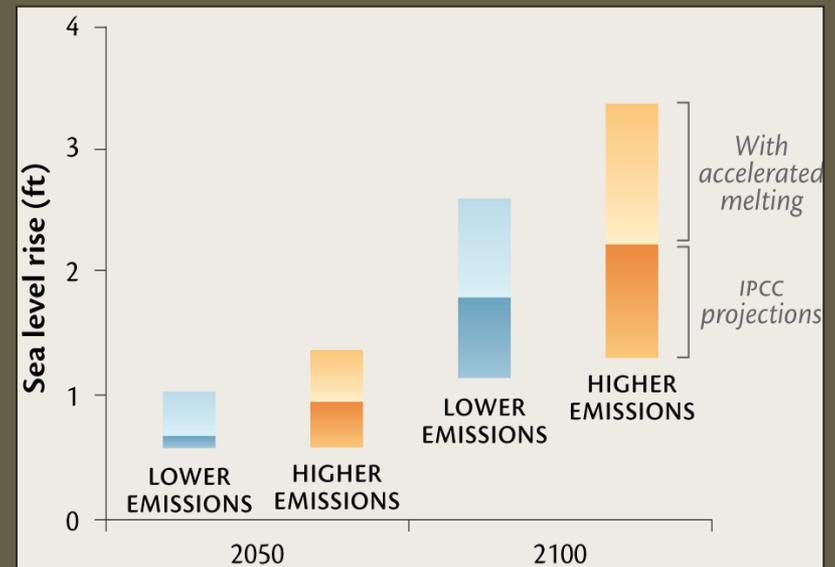
Copyright © 2010
National Geographic
Society

Chesapeake Conservancy

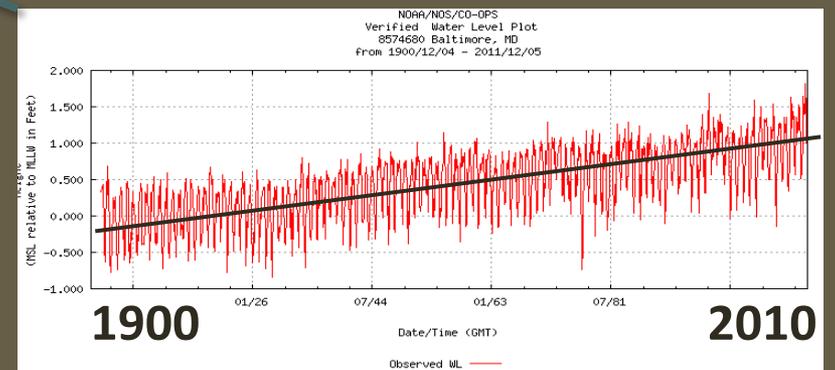
History



Sea level has risen approximately 0.3 m in the last century



Sea level is expected to rise between 0.82-1.04 m by 2100



Chesapeake Conservancy

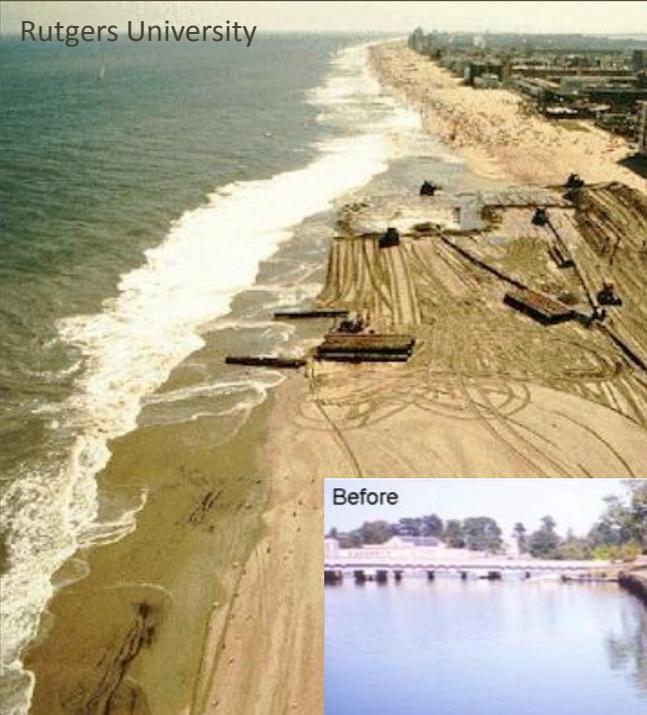
Source: www.umces.edu/climateimpacts/

Sea Level Rise Impacts on the Shoreline

- Increased flooding/storm surge
- Shore erosion
- Inundation of low-lying lands
- Saltwater intrusion
- Higher water tables



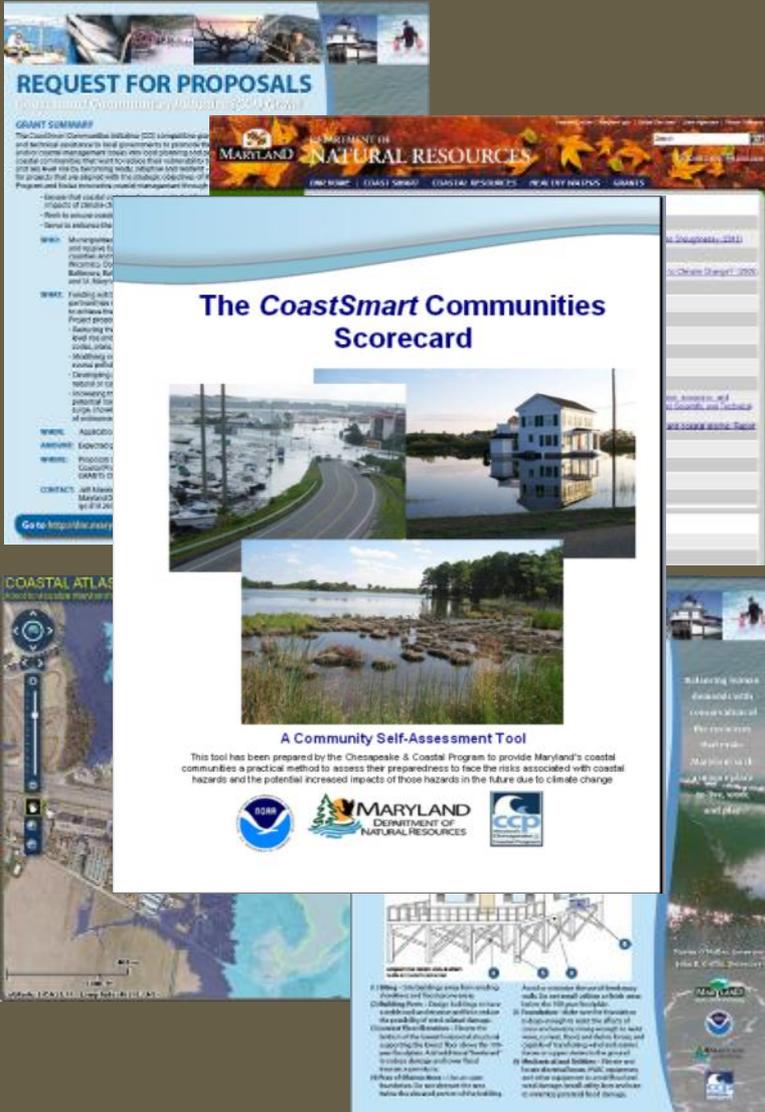
Engineering Solutions



Chesapeake Bay Trust

- Adaptation of existing structures
- Living Shorelines
- Hardened Shorelines (Seawalls, Rip-rap)
- Beach Nourishment
- Dikes

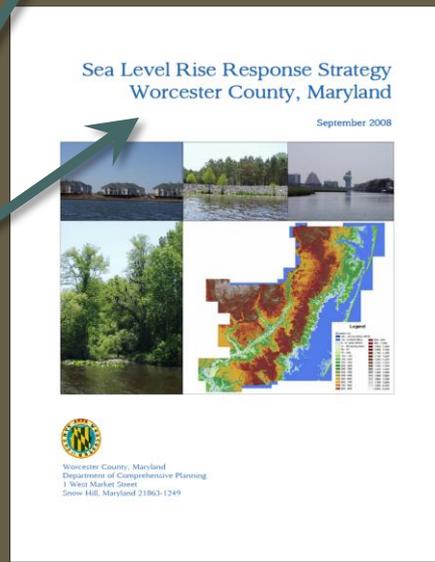
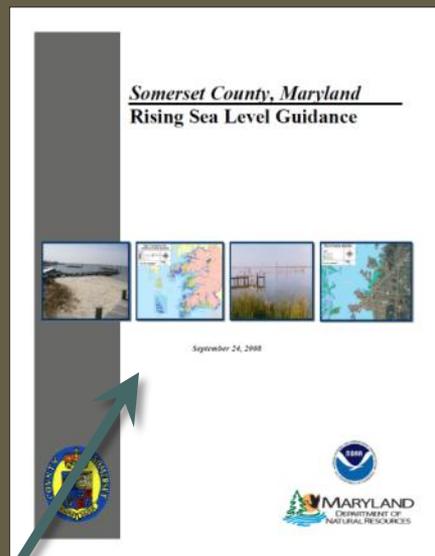
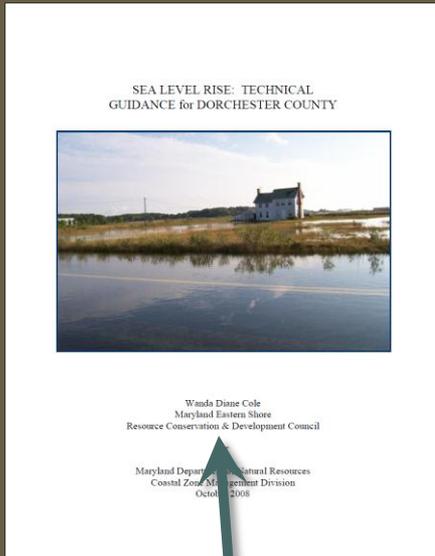
CoastSmart Communities Initiative



- Provides financial support to local communities to help offset the cost of incorporating coastal hazards into planning efforts
 - CoastSmart Communities Competitive Grant Program
- Develops and provides technical tools and skill-building opportunities to local communities to help incorporate coastal hazards into local policies and programs
 - CoastSmart Online Resource Center
 - Maryland's Coastal Atlas
 - Informational factsheets
 - CoastSmart Communities Scorecard

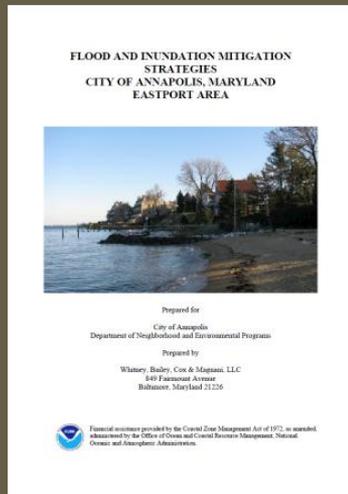
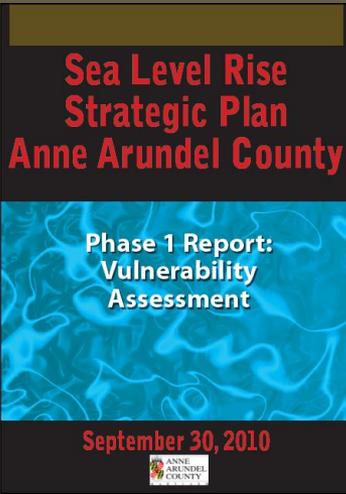
Chesapeake Conservancy

Local Planning Efforts in Maryland



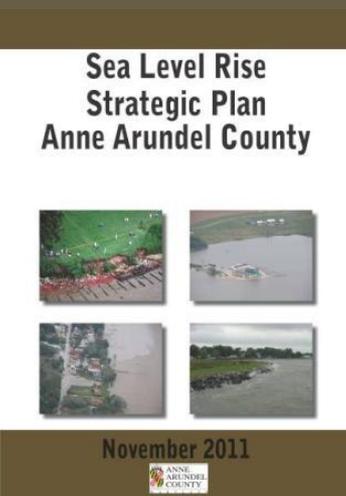
- Early Planning Documents
 - No required actions
 - Analyzed potential issues
 - Identified problem areas
 - Proposed both policy and engineering solutions
 - Not much done due to politics and beliefs

Local Planning Efforts in Maryland



Anne Arundel County and City of Annapolis

- **Phase 1: Vulnerability Analysis**
 - Identified potential areas of sea level rise, storm surge inundation, and shoreline erosion
 - Created inventory of at risk resources
- **Phase 2: Policy Analysis**
 - Identified potential ways (regulatory and structural) to address issues identified in Phase 1



Local Planning Efforts in Maryland

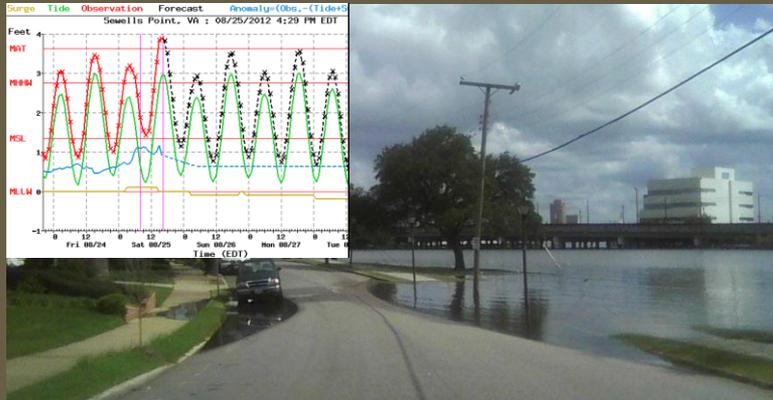


Caroline County

- Updated Flood Plain Ordinance
 - County is not on the coast
 - More frequent river flooding
 - Raised minimum standards to incorporate increased rates of flooding
 - Focused on the issue of flooding and stayed away from climate change



“Recurrent Flooding” in Virginia



- Planning efforts are beginning to take shape
- Focus is on how to adapt infrastructure
- Still political issues with long-term adaptation

ODU Climate Change and Sea Level Rise Initiative

Sea Level Rise (SLR) Acceleration in the Hampton Roads: a Scientific Perspective

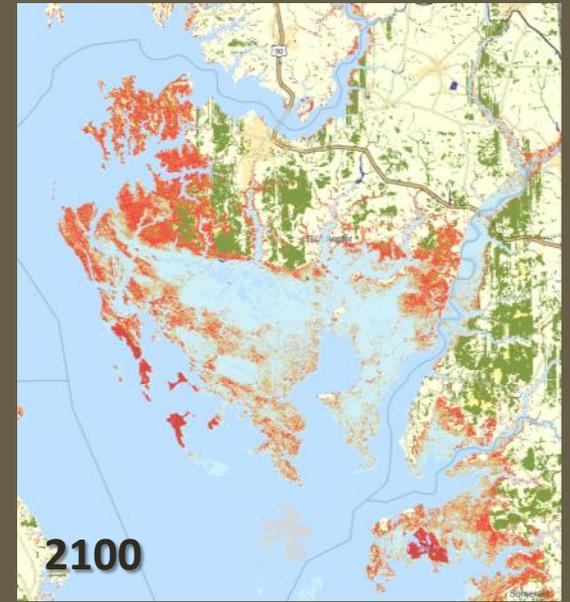
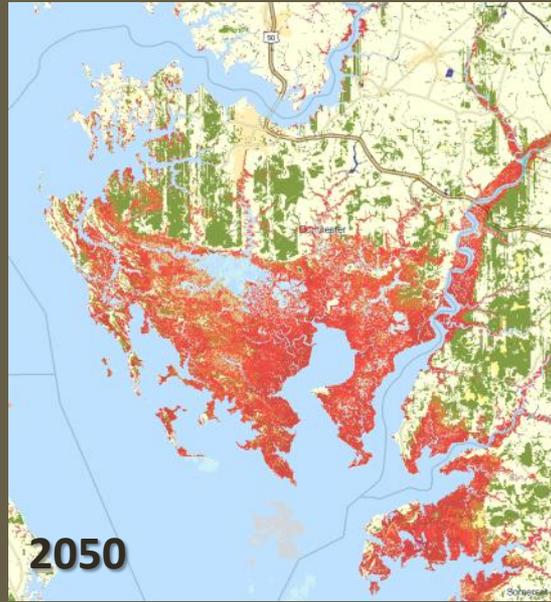
Tal Ezer and Larry Atkinson
Center for Coastal Physical Oceanography
Old Dominion University (ODU)

Hampton Roads Sea Level Rise Adaptation Forum
VMASC, Friday, November 16, 2012



Chesapeake
Conservancy

Innovative Sea-level Rise Adaptation



Swamp	Estuarine Beach	Estuarine Open Water
Cypress Swamp	Tidal Flat	Tidal Creek
Inland Freshwater Marsh	Ocean Beach	Irregularly Flooded Marsh
Tidal Freshwater Marsh	Rocky Intertidal	Freshwater Shoreline
Transitional Salt Marsh	Inland Open Water	Tidal freshwater Swamp
Regularly Flooded Marsh	Riverine Tidal Open Water	Blank

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Encouraging News

As Coasts Rebuild and U.S. Pays, Repeatedly, the Critics Ask Why



Jeff Heller for The New York Times

Multiple storms have shifted the sands on Dauphin Island. More Photos »
By JUSTIN GILLIS and FELICITY BARRINGER
Published: November 18, 2012

DAUPHIN ISLAND, Ala. — Even in the off season, the pastel beach houses lining a skinny strip of sand here are a testament to the good life.

They are also a monument to the generosity of the federal government.

Multimedia



Slide Show
In Alabama, a Community on Shifting Sands

The western end of this Gulf Coast island has proved to be one of the most hazardous places in the country for waterfront property. Since 1979, nearly a dozen hurricanes and large storms have rolled in and knocked down houses, chewed up sewers and water pipes and hurled sand onto the roads.

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MIA WASIKOWSKA

THAT Sinking Feeling

Imagining Sea Level Rise in the Chesapeake Bay

The very first map of the Chesapeake Bay, drawn by guess which bushy-bearded English explorer, was published 400 years ago. Reasonably accurate, it was also designed to introduce the recently scouted, resources-rich estuary to prospective settlers. ¶ Well, we're here. Seventeen million and counting, some three million living in areas less than about three feet above seal level. Now we can contemplate the latest in Chesapeake cartography: computer-enhanced renderings of Captain John Smith's "faire Bay" circa 2100, by which time,



AP/WIDEWORLD After tropical storm Isabel, Annapolis residents got a good look at what three feet of sea level rise would look like on the waterfront.

CHESAPEAKE BAY MAGAZINE November 2012

scientists estimate, sea level could be anywhere from two to five feet higher. If these modern "maps" prove to be reasonably accurate simulations, this is what a supersized Bay portends:

- The disappearance of Smith, Tangier, Hooper and Deal islands like 13 other once-chartered Chesapeake islands before them.
- Storm-induced flooding in downtown Annapolis, Baltimore, Norfolk, Virginia Beach and Washington D.C., where iconic national

by Marty LeGrand

SEA LEVEL RISE – PLANNING FOR WHAT'S COMING

In the last century the sea level of the Chesapeake Bay rose about a foot. That was twice the global average, in major part because the land around the bay is slowly sinking.

In the present century the consensus forecast is for the rate of sea level rise in the Bay to accelerate—another foot or so of rise by mid-century then two more feet by the century's end.

Consequences
A rising sea level in the Bay has numerous major consequences. It intensifies coastal flooding from storm surge, increases shoreline erosion, causes salt-water intrusion into fresh-water aquifers, and submerges tidal wetlands and other low-lying areas.

As Ron Kibell reports in the January 2012 *Chesapeake Bay Journal*, the consequences of sea level rise are already being felt in the Bay's most vulnerable locations:

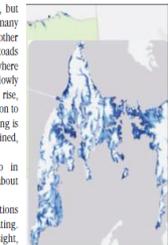
"Imagine living in a neighborhood where people check the tide gauges to figure out where they should park their cars. A place where front yards sprout wetland plants and small like marsh grass, where city leaders

debate spending millions of dollars to raise yet another street, and where prospective homeowners consult computerized flood maps to determine if it's safe to buy a house.

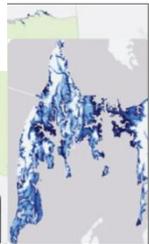
"It may sound like science fiction, but it's the brutal reality in Norfolk and many other cities that make up the Hampton Roads area. The ground in these areas near where the Chesapeake meets the ocean is slowly subsiding. That, coupled with sea-level rise, is bringing record flooding and destruction to these coastal neighborhoods. The flooding is happening faster than many ever imagined, and every solution to fix it is expensive."

Tom Iltis wrote a year ago in *Urbanistic Baltimore Magazine* about similar problems farther up the Bay:

"The southern and eastern portions of Dorchester are already depopulating. Abandoned dwellings are a common sight, as are homes being jacked several feet in the air as a last resort. Earth berms surround many yards, and driveways sport humps of earth pushed up for parking cars during frequent high water. Well before century's end, the 338,000-acre county could lose an astounding 25,000 acres of forest and small like marsh grass, where city leaders



Source: Chesapeake Bay Foundation



continued on Page 2



continued on Page 2

Maryland Commission on Climate Change, and its Adaptation and Response Working Group weekly (August 2009) issued an in-depth report on **Sea-Level Rise and Coastal Storms**. The report's first recommendation was to "expedite the integration of coastal erosion, coastal storm, and sea-level rise adaptation and response planning strategies into existing state and local policies and programs".

Practising that lead, we went to the local level and discovered that our neighbor across the Deluge, Anne Arundel County using a grant from the Chesapeake Bay Coastal Program, has completed, and issued just this past November, an impressive Sea Level Rise Strategic Plan. The Plan comprehensively assesses the impacts of projected sea level rise on the full range of the county's resources: properties, structures, roads, utilities, private wells and septic systems, marinas, parks, and archaeological and historic resources.

The Anne Arundel assessment found that about 9,000 acres of its lands (out of a total of 264,000 acres) were vulnerable to sea level rise. Although this is only a small percentage of the county's lands, this vulnerable acreage contains, among other assets, over 2,000 residential structures and 35 miles of roads. Accordingly the Plan says, "the total value of properties at risk is not insignificant at nearly \$1 billion under the 6-5 foot scenario and over \$4.1 billion in the 9-5 foot scenario."

Planning: Queen Anne's County
Queen Anne's County has not so far accomplished anything like the Anne Arundel study, but citizens and planners have not been oblivious to the challenge of sea level rise and storm surge.

One impressive example of attention to the problem is the 2010 Quantitative Community Plan. Reviewing the scientific data and focusing on the increased impacts from storm surge with sea level rise, the Plan "directs future development to occur outside of areas identified as Category 1 storm (12-foot storm surge)". Lacking adequate maps from federal or state sources, the Town staff "identified potential flood areas based on identification of land areas less than 12 feet above normal sea level using

continued on Page 3

Questions?



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<http://www.ChesapeakeConservancy.org>

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