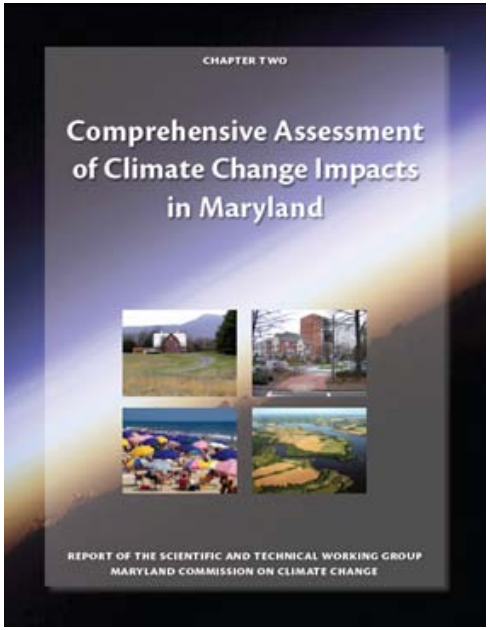
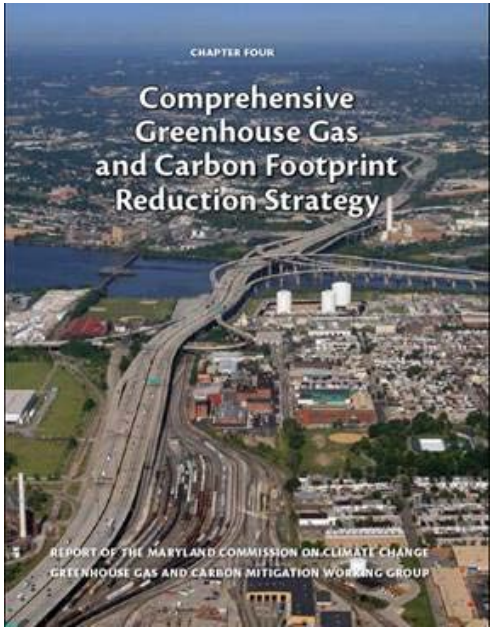
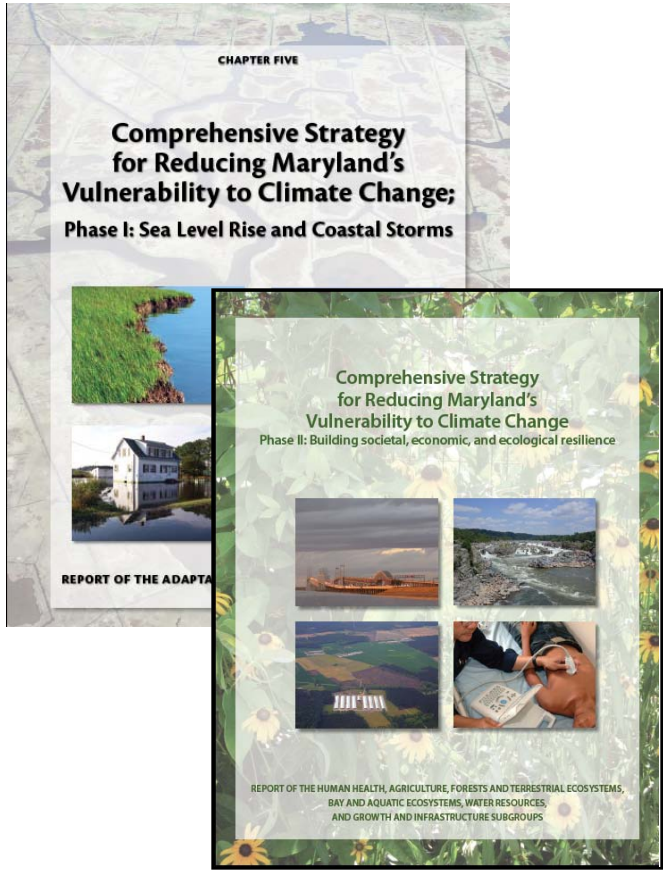
Adapting to Climate Change in the Chesapeake Bay
March 15, 2011







Sector-Based Adaptation Planning

Adaptation 2010 - 2011

- Comprehensive Strategy for Reducing Maryland's Vulnerability to Climate Change, Phase II (Lead: UMCES & DNR)
- Adaptation Toolbox: *The Coastal Atlas* (Lead: DNR)
- Living Shoreline Protection Act-Regulation Development (Lead: MDE)
- SHA Transportation Vulnerability Assessment & Response Strategy (Lead: MDOT)
- Maryland Port Administration Vulnerability Assessment & Policy (Lead: MDOT)
- Historical, Archaeological, and Cultural Resources Vulnerability Study (Lead: MDP)
- Wildlife Action Plan – Climate Change Element (Lead: DNR)
- DNR "Lead by Example" Policy (Lead: DNR)
- Local Government Technical & Financial Assistance: *Building Coast-Smart Communities* (Lead: DNR)
- Targeting Tools for Coastal Land Conservation (Lead: DNR)

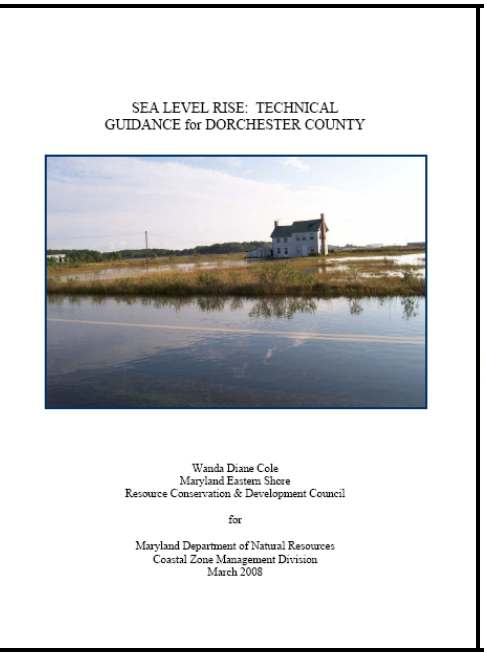
Leading by Example
DNR Policy: *Building Resilience to Climate Change*

DNR policy to guide investments in and management of land, resources and assets so as to better understand, mitigate and adapt to climate change.

- New Land Investments
- Facility Infrastructure Siting & Design
- Habitat Restoration
- Research & Monitoring
- Resource Planning
- Government Operations
- Advocacy

Intent: Through implementation of this policy, DNR will guide its own actions, and will lead by example, encouraging our sister agencies and local government leaders to plan for and to mitigate the effects of climate change.

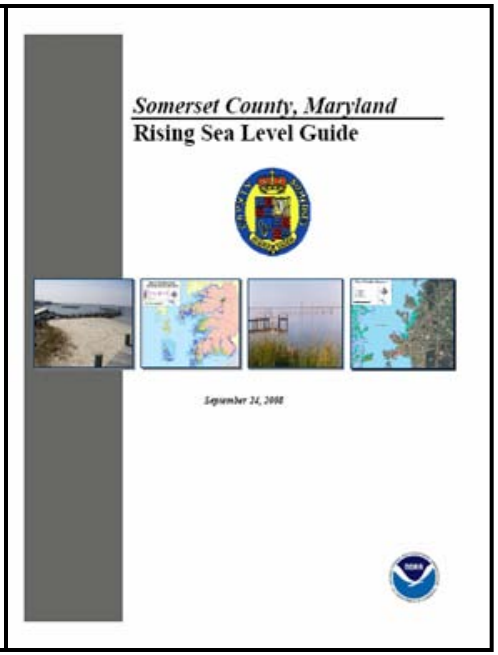
Technical planning guidance to advise adaptation planning at local level


SEA LEVEL RISE: TECHNICAL GUIDANCE for DORCHESTER COUNTY

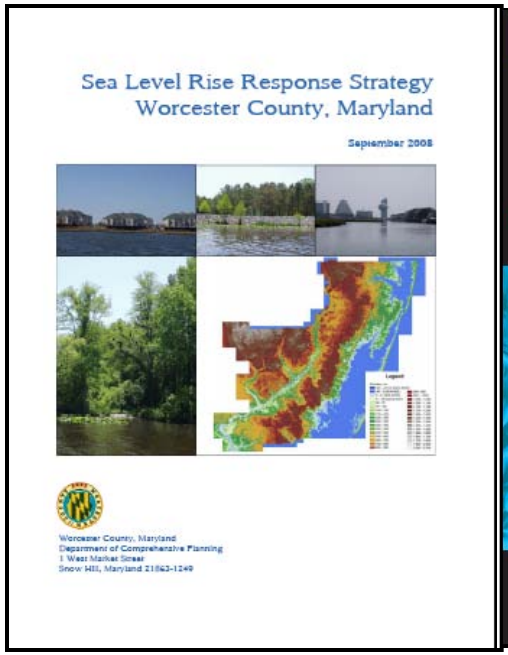
Wanda Diane Cole
Maryland Eastern Shore
Resource Conservation & Development Council

for

Maryland Department of Natural Resources
Coastal Zone Management Division
March 2008

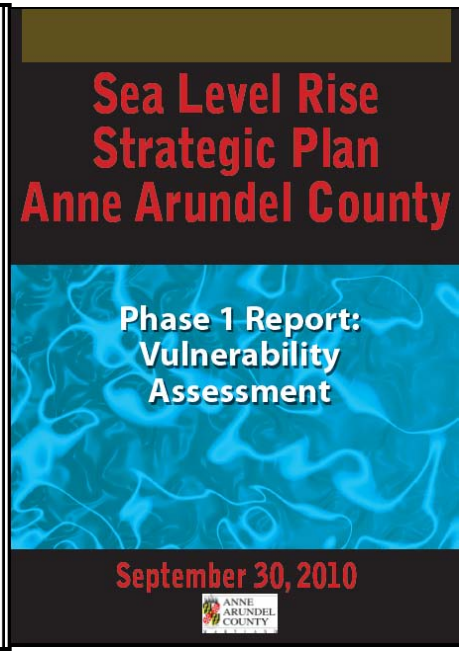

Somerset County, Maryland
Rising Sea Level Guide

September 30, 2008


Sea Level Rise Response Strategy
Worcester County, Maryland

September 2008

Worcester County, Maryland
Department of Comprehensive Planning
1 West Market Street
Snow Hill, Maryland 21863-1249


Sea Level Rise Strategic Plan Anne Arundel County

Phase 1 Report: Vulnerability Assessment

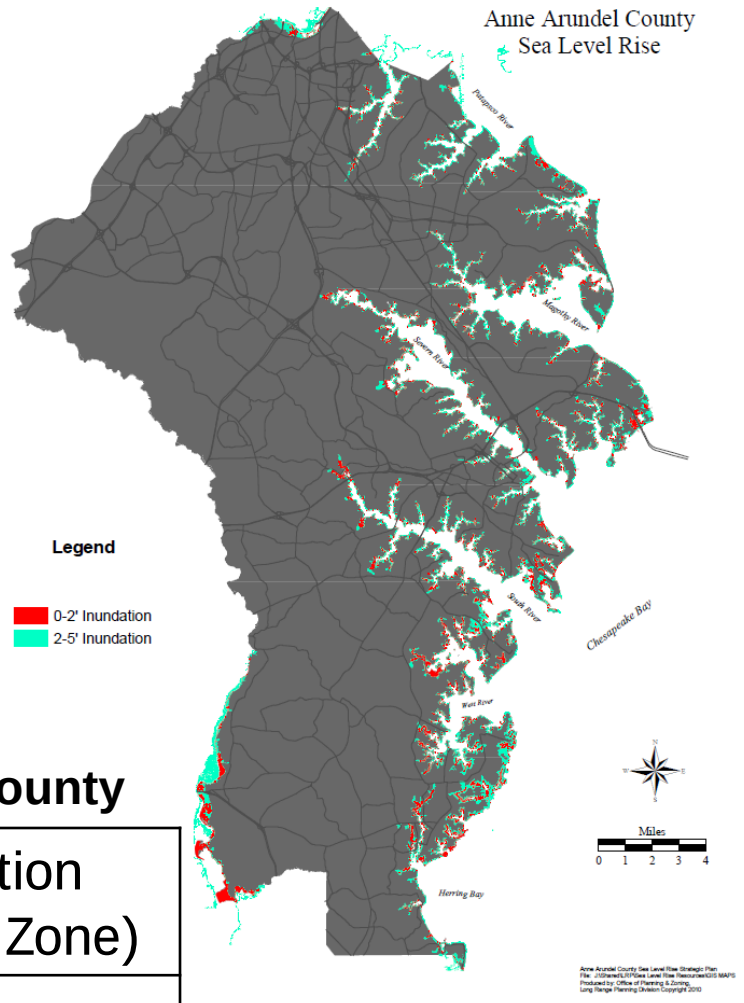
September 30, 2010

ANNE ARUNDEL COUNTY

The Coastal Communities Initiative grant program provides financial and technical assistance to local governments to promote the incorporation of natural resource and/or coastal management issues into local planning and permitting activities.

Identify and strive to remedy water quality impacts

- Septic systems located less than 2 feet above mean sea level are at risk of sea level rise inundation in the next 50 years.
- There are thousands of existing systems in this zone across the state (5,206 in Anne Arundel County alone).
- Placement of additional systems in this zone should be avoided.

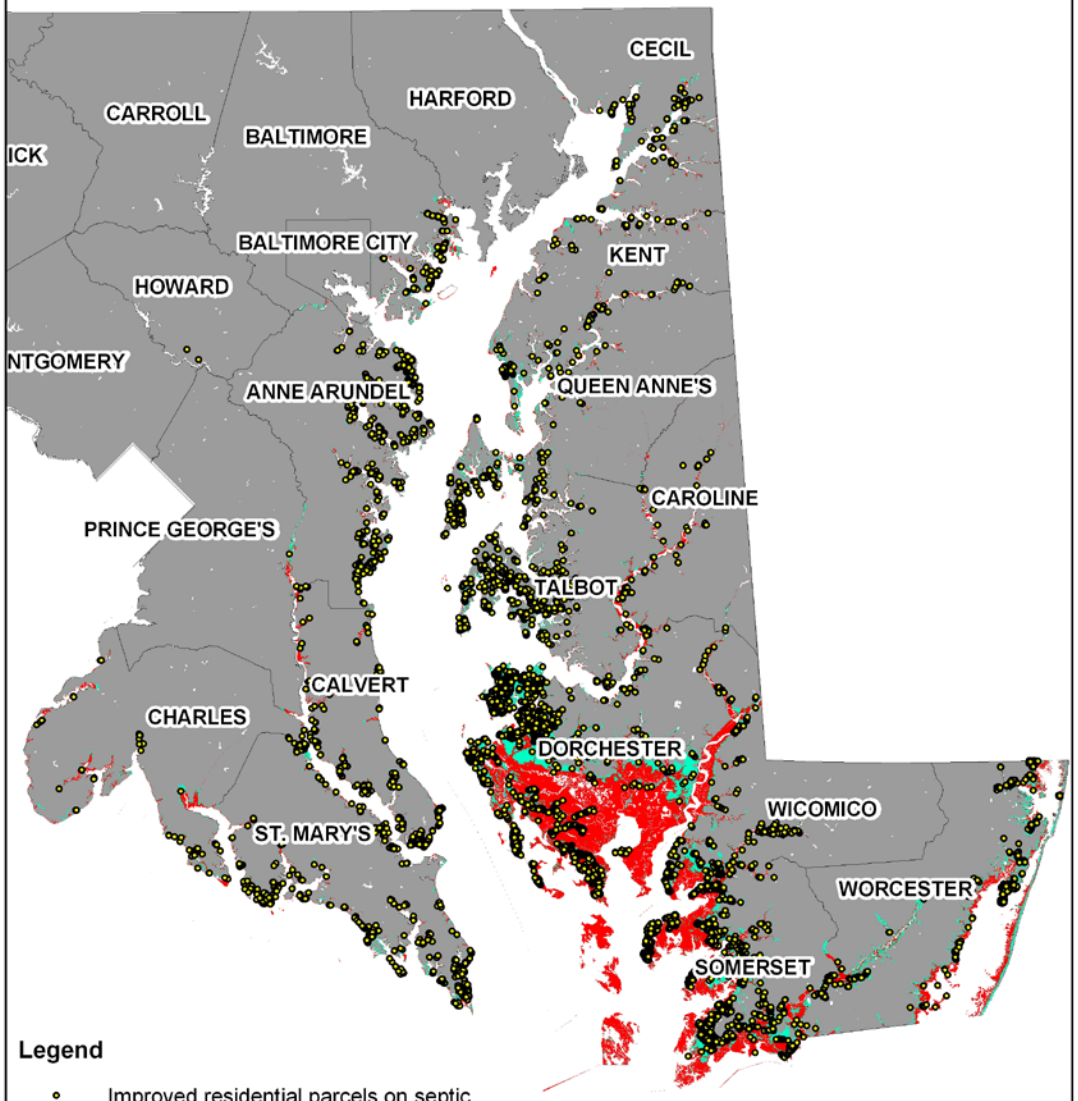


Vulnerable Septic Systems in Anne Arundel County

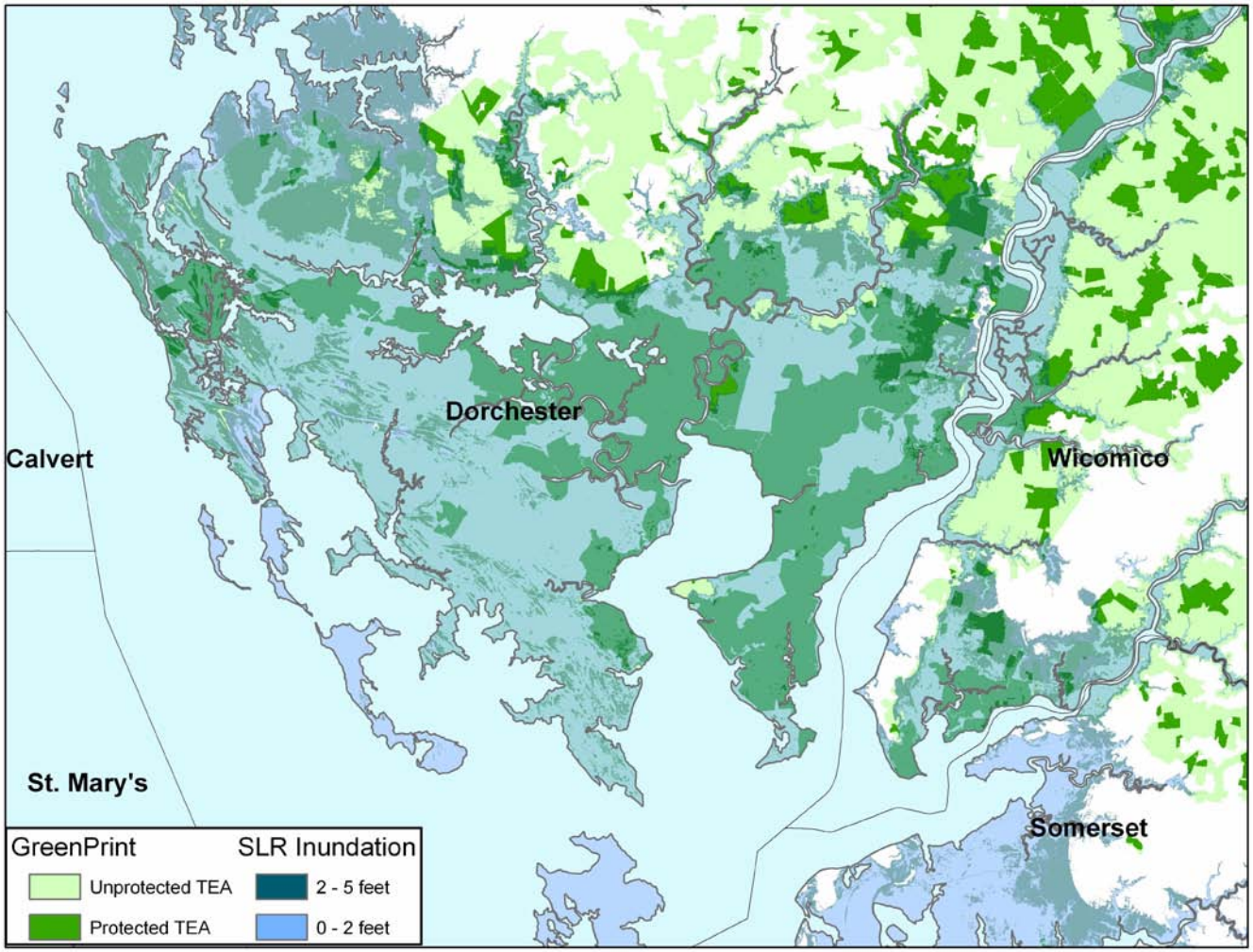
0 – 2 ft Inundation (50-Year Impact Zone)	0 – 5 ft Inundation (125-Year Impact Zone)
5,206	7,238

Source: AA County (2010)

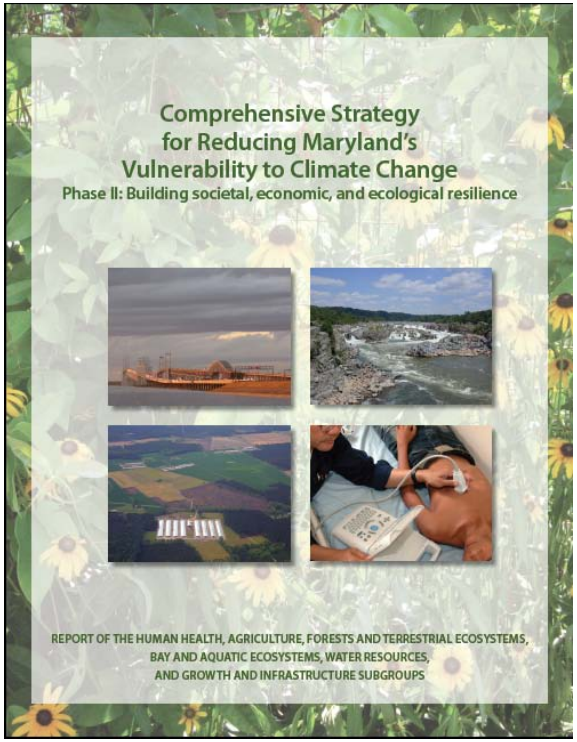
Improved Residential Parcels on Septic inside 0-5 foot Inundation Zone



Targeting Tools for Coastal Land Conservation



Adaptation Strategy: Phase II



- Introduction
- Sector-Specific Analysis
  - Climate Vulnerability
  - Human Dimensions
  - Strategy for Resilience
  - Tools, Research & Education
- Future Steps & Directions

Water Resources

	Priority Recommendations	Lead Agency	Key Partners	Priority	Timeframe	Potential Cost
Ensure long-term safe and adequate water supply for humans and ecosystems.	Adopt and fund the recommendations of the 2008 "Wolman Committee" report.	MDE	DNR, MDP, local governments, federal partners	high	ongoing	high
	Manage water through the lens of future climate and population.	MDE	MDP, DNR, local governments	high	ongoing	TBD
	Enhance planning and coordination within the water resource community.	MDE	MDP, local governments	high	long-term	TBD
	Encourage water suppliers to evaluate and improve their resilience.	MDE	water utilities, local governments, MEMA, EPA	high	long-term	TBD
	Promote demand management and water conservation practices.	MDE	local governments, MDA, business community	medium	ongoing	TBD
	Assess, target, and protect high quality water recharge areas.	MDE	DNR, MDP	medium	long-term	TBD
Reduce the impacts of flooding and stormwater.	Encourage the removal of vulnerable or high-hazard water supply and treatment infrastructure.	MDE	water utilies, local governments	low	long-term	TBD
	Prevent inundation and overflow of on-site disposal systems.	MDE	local governments	medium	long-term	TBD
	Revise Clean Water Revolving Fund criteria.	MDE		low	short-term	low
	Invest in an improved understanding and communication of flood probabilities and hazards.	MDE	DNR	medium	long-term	TBD

Bay and Aquatic Ecosystems

	Priority Recommendations	Lead Agency	Key Partners	Priority	Timeframe	Potential Cost
Advance protection of at-risk species and habitats.	Revise state-level protection targeting programs to reflect climate change adaptation priorities.	DNR	UMD, USACE, USGS, USFWS, NOAA, NGOs	high	ongoing	low
	Develop new protection and conservation mechanisms to promote adaptation stewardship activities on private lands.	DNR	UMD, USACE, USGS, USDOI, USFWS, NOAA, NGOs	medium	medium-term	medium
	Amend legal mechanisms to designate and protect temperature-sensitive streams.	DNR	MDE, EPA	high	ongoing	medium
	Implement an adaptive management approach.	DNR	MDE, MDOT, MDA, MDP, federal partners, NGOs	high	medium-term	low
Restore critical bay and aquatic habitats to enhance resilience.	Proactively pursue, design, and construct habitat restoration projects to enhance the resilience of bay and aquatic ecosystems.	DNR	USACE, USGS, USFWS, NOAA, EPA, CBP, NGOs	high	long-term	high
	Conduct an audit of state-owned lands to identify habitat restoration potential for enhancing ecosystem resilience and increasing on-site carbon sequestration.	DNR		medium	short-term	low
	Increase on-the-ground implementation of existing stream restoration practices.	DNR	USGS, EPA, CBP, USFWS	high	short-term	high
Reduce existing stressors.	Remove barriers to habitat connectivity.	DNR	MDE, USFWS, NOAA	high	ongoing	high
	Reduce impervious surface cover.	DNR, MDE	MDP	high	ongoing	high
	Prepare for new or expanding ranges of invasive species.	DNR	MDA, MD Invasive Species Council, USFWS	high	ongoing	medium
Foster a collective response to climate change.	Adjust bay and watershed restoration priorities in light of a changing climate.	DNR	MDE, UMD, NOAA, USGS, EPA, Penn State, USFWS	medium	ongoing in Coastal Plain	medium
	Integrate both adaptation and mitigation reduction strategies into natural resource management plans and programs.	DNR	USFWS, NOAA, NGOs	high	short-term	low
	Revise fishery and wildlife management to build climate resilient safeguards.	DNR	USFWS, NOAA, NGOs	high	long-term	medium
	Increase collaboration among federal, state, regional, and local climate change adaptation partners.	DNR	UMD, NOAA, USGS, EPA, NGOs	high	short-term	low

Focus: 2011 & Beyond

- Promote adoption of sea level rise adaptation guidance at local level
- Institutionalize consideration of climate change:
  - State Hazard Mitigation Plan
  - Local Comprehensive Planning
  - Etc.
- State Investment Policy
  - Siting & design standards for state-funded infrastructure
  - State "funding policy" for "lands subject to climate change impacts"
- Work with federal and regional partners to develop "Climate-Smart" restoration guidelines and criteria
- Create a 2+ foot "Freeboard" standard for tidal floodplain (State-wide)
- Critical Area regulation development
- Find the nexus between bay restoration plans (WIP: Phase I and II) and climate change mitigation and adaptation goals
  - Calculate "carbon benefit" of Bay restoration efforts
  - Tie "state investment policy" to infrastructure upgrades
  - Pursue "climate-smart restoration efforts"
- Expand our focus beyond sea level rise impacts in the coastal zone
  - Further develop and implement adaptation strategies to address temp. increase, changes in precipitation, etc.
    - Agriculture
    - Human Health
    - Forests & Terrestrial Ecosystems
    - Growth & Infrastructure
  - Work with federal, state and regional partners to tackle laundry list of tools, research and education needs.

Acknowledgements:
It takes a collective effort

Maryland
Smart, Green & Growing

ccp
Maryland's Chesapeake & Coastal Program

Integration & Application Network

University of Maryland
Center for Environmental Science

National Oceanic and Atmospheric Administration
NOAA
U.S. Department of Commerce

Maryland Geological Survey

Towson University
Center for Geographic Information Sciences

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Virginia Institute of Marine Science
School of Marine Science

Sea Grant
Maryland

Burke
environmental associates

USGS
science for a changing world

Maryland Eastern Shore
Resource Conservation & Development Council

Center for Climate Strategies
Helping States and Nations Tackle Climate Change

The Conservation Fund
America's Partner in Conservation

Zoë P. Johnson

zjohnson@dnr.state.md.us

(410) 260-8741

http://www.dnr.state.md.us/climatechange

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Wanda Cole, Maryland RC&D