Chesapeake Bay Restoration Effort

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Innovation for a better future
University of Maryland
CENTER FOR ENVIRONMENTAL SCIENCE

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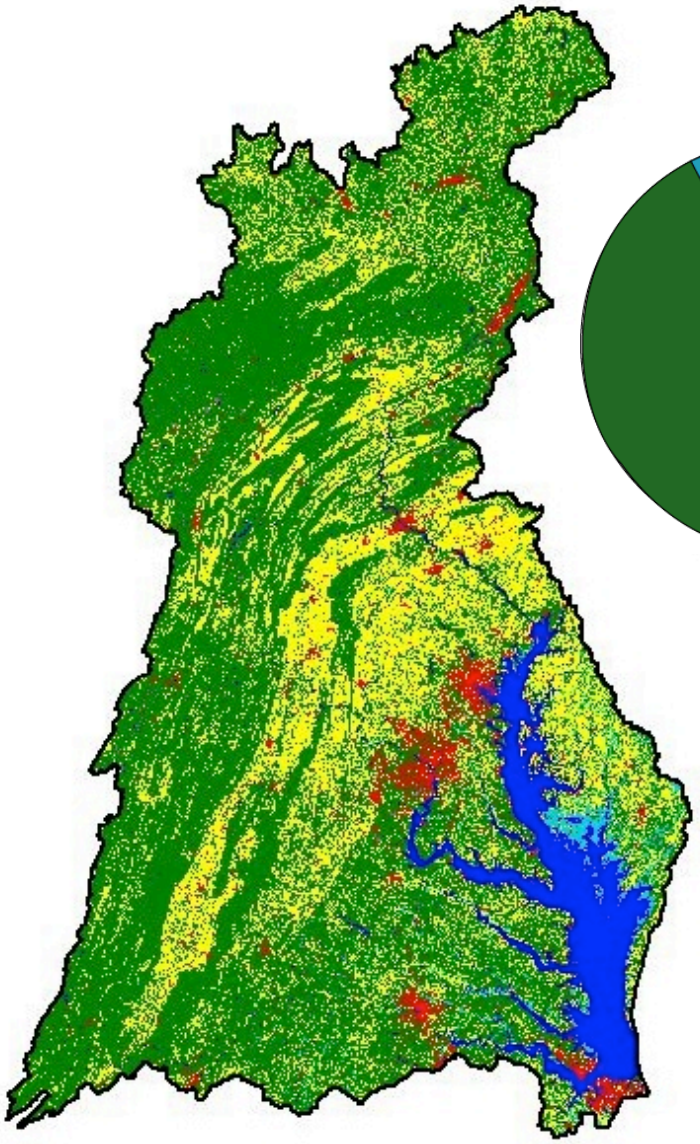
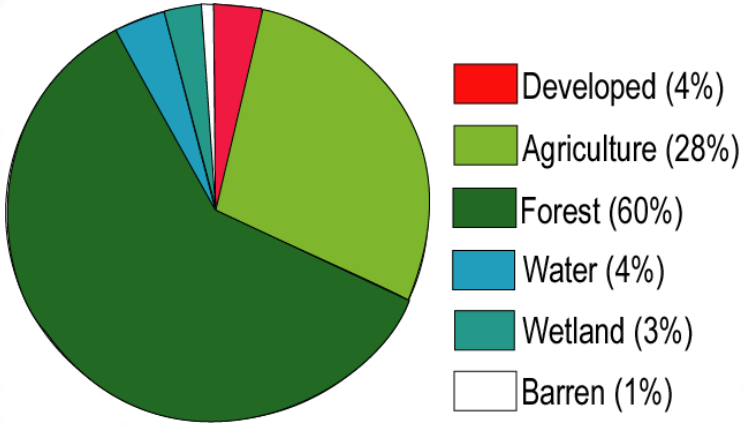
Leadership Maryland

A Shallow Bay with a Large Watershed

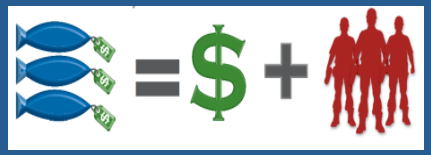




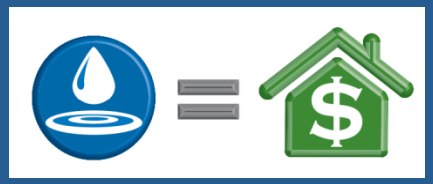
Watershed: 64,000 m^2
Ave Depth: 6 m
Max Depth: 50 m
Population: 17 million

The Chesapeake Bay is the Economic Engine of the Region

INVESTMENT: **$1 of water and sewer infrastructure investment increases private output (Gross Domestic Product) in the long term by $6.35.**



FISHERIES: **Commercial seafood industry in Maryland and Virginia contributed $3.39 billion in sales, $890 million in income, and almost 34,000 jobs to the local economy. (2009 Fisheries Economics of the U.S. report)**

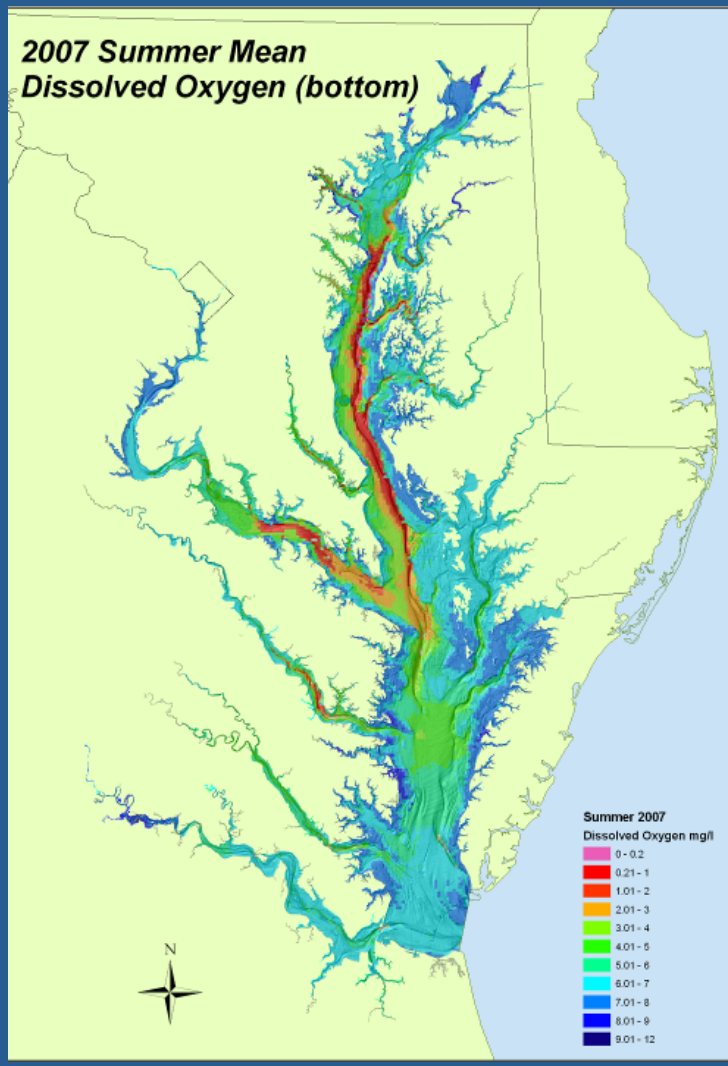


PROPERTY VALUES: **An EPA study indicated that clean water can increase the value of single family homes up to 4,000 feet from the shoreline by up to 25 percent.**

Source: Chesapeake Bay Foundation, 2012 "The Economic Argument for Cleaning Up the Chesapeake Bay and its Rivers

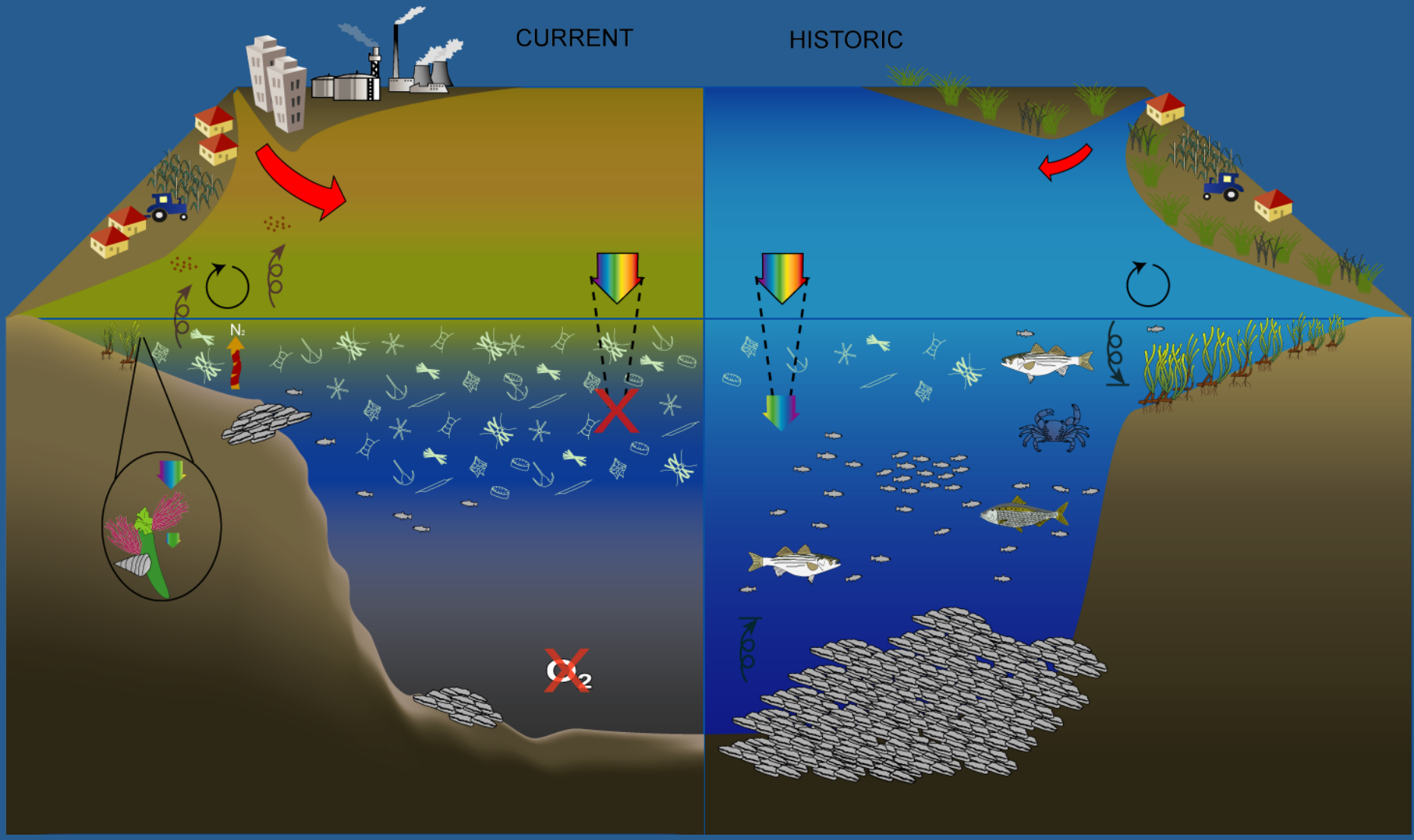
Chesapeake Bay Challenges

- water quality impaired by pollution
  - Extensive low to no summer dissolved oxygen conditions
- historic overfishing
- population growth
- poor land use management
- loss of habitat
- invasive species
- climate change and sea level rise

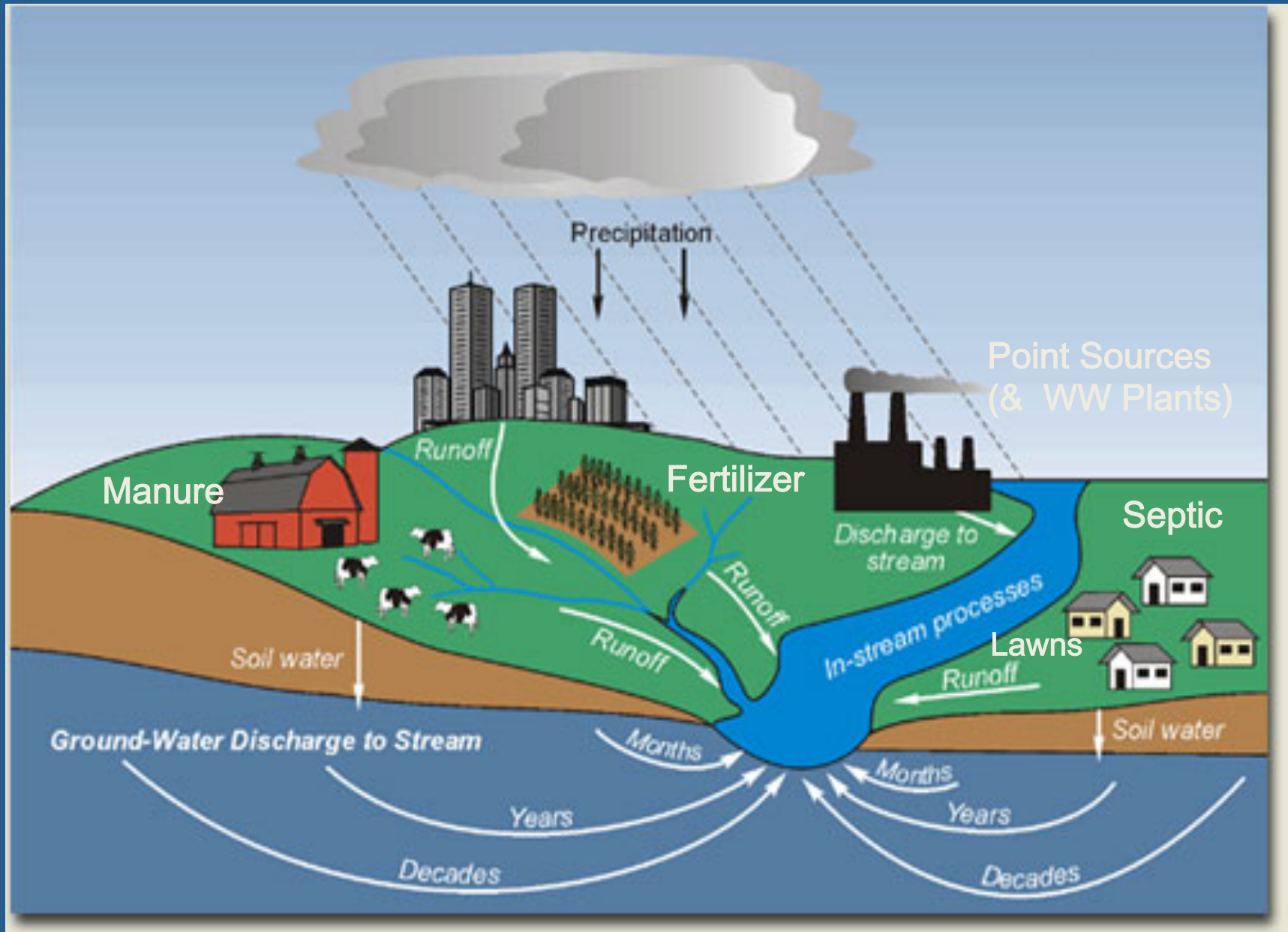


Big Challenge: Nutrient Over-enrichment

Causes fundamental, pervasive alteration of the ecosystem

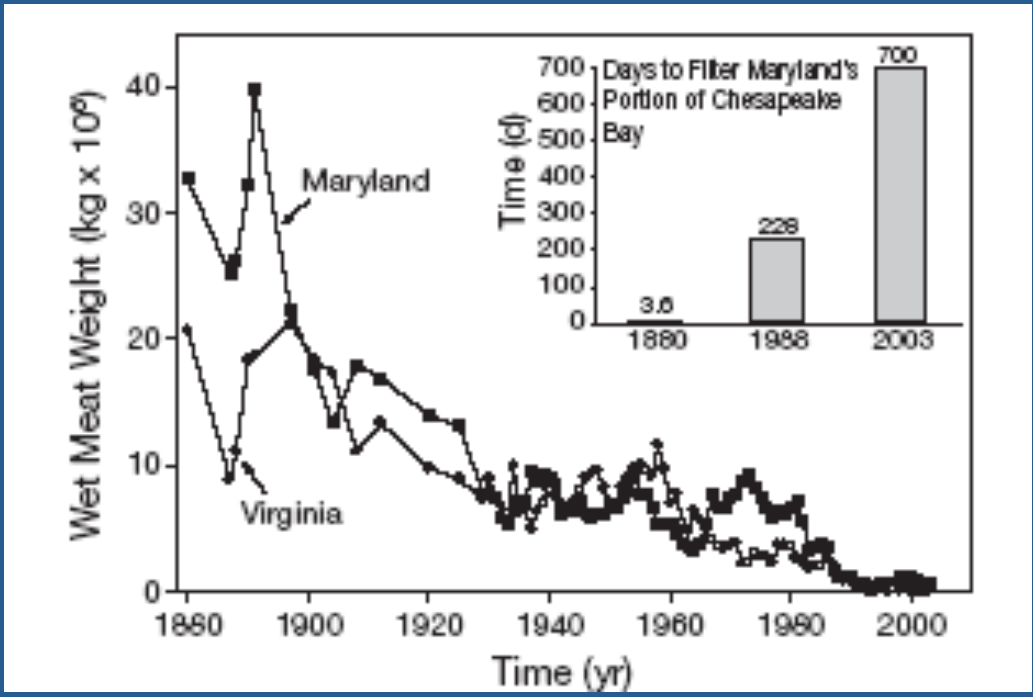


Nutrients come from all sectors



Key Habitats Declined

- Oysters are at 0.3% of historic populations
  - Decline caused by overfishing and disease
  - Oyster reefs are important
  - Economic potential
  - filtration of water
  - Only natural hard substrate
  - Increase biodiversity
  - Sanctuaries and targeted restoration programs
  - Stable (but small) population is increasing



Key Habitats Declined

- Seagrass beds have declined 8-10 fold

- Decline caused by eutrophication and warming temperatures

Seagrass beds are important

- Fishery nursery grounds
- Reduce resuspension
- Increase water clarity
- Act as nutrient filter
- Limit shoreline erosion

- Currently rebounding in some areas

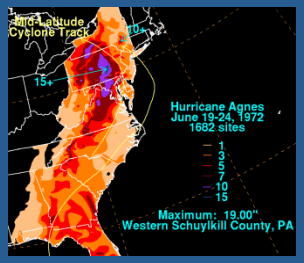
Chesapeake Bay Management: 25 Years

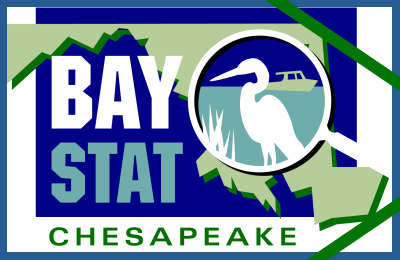
Ches Bay Agreement: 1987-2000

- Reduce nutrients by 40% from all controllable sources by 2000
- Focus on *modeling* and monitoring

Accountability Phase: 2003-2008

- Focus on *monitoring* and modeling
- Cost and nutrient reduction effectiveness assessments





Governments Work Together: 1983 -1987

- Md, Pa, Va, DC, and USEPA
- Recognize degradation of Bay after Tropical Storm Agnes (1972)

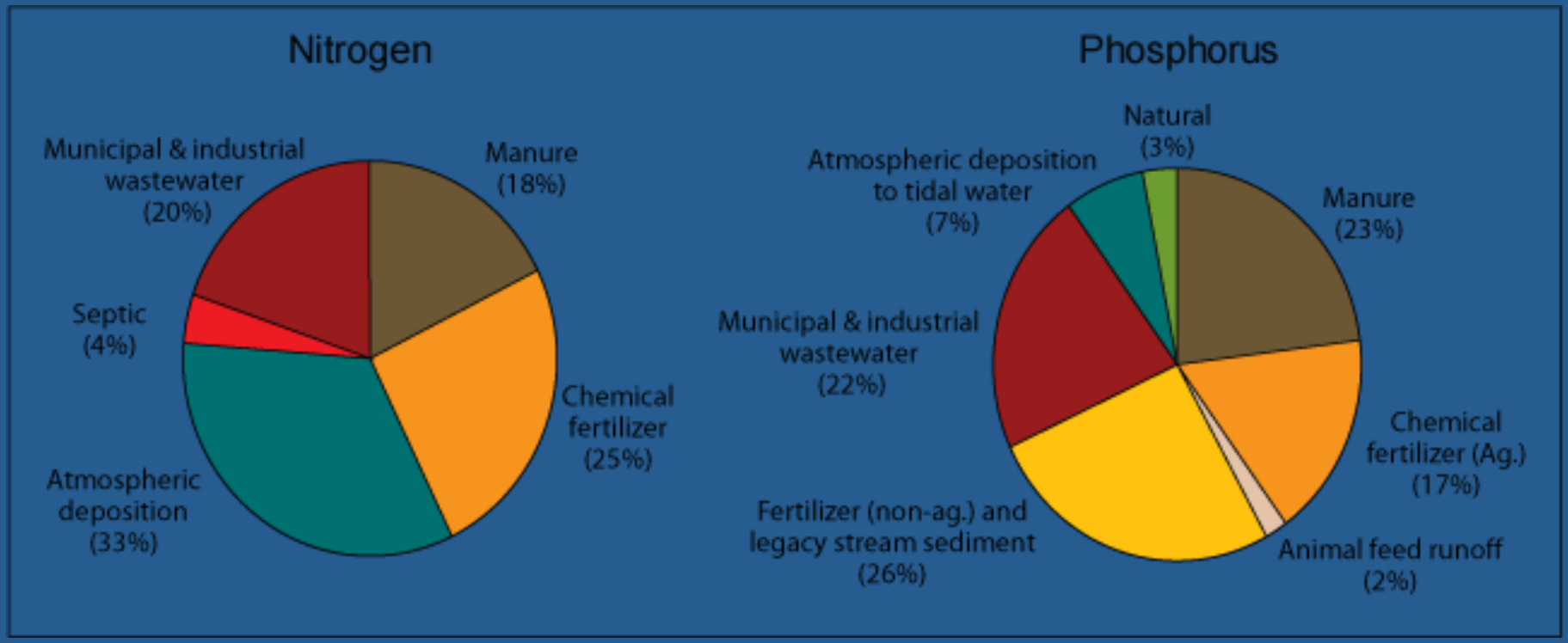
Chesapeake 2000:

- 1987 nutrient goals remain unmet
- Begin Enforcement of TMDL in 2010
- Establish over 100 new goals – many unrelated to nutrients

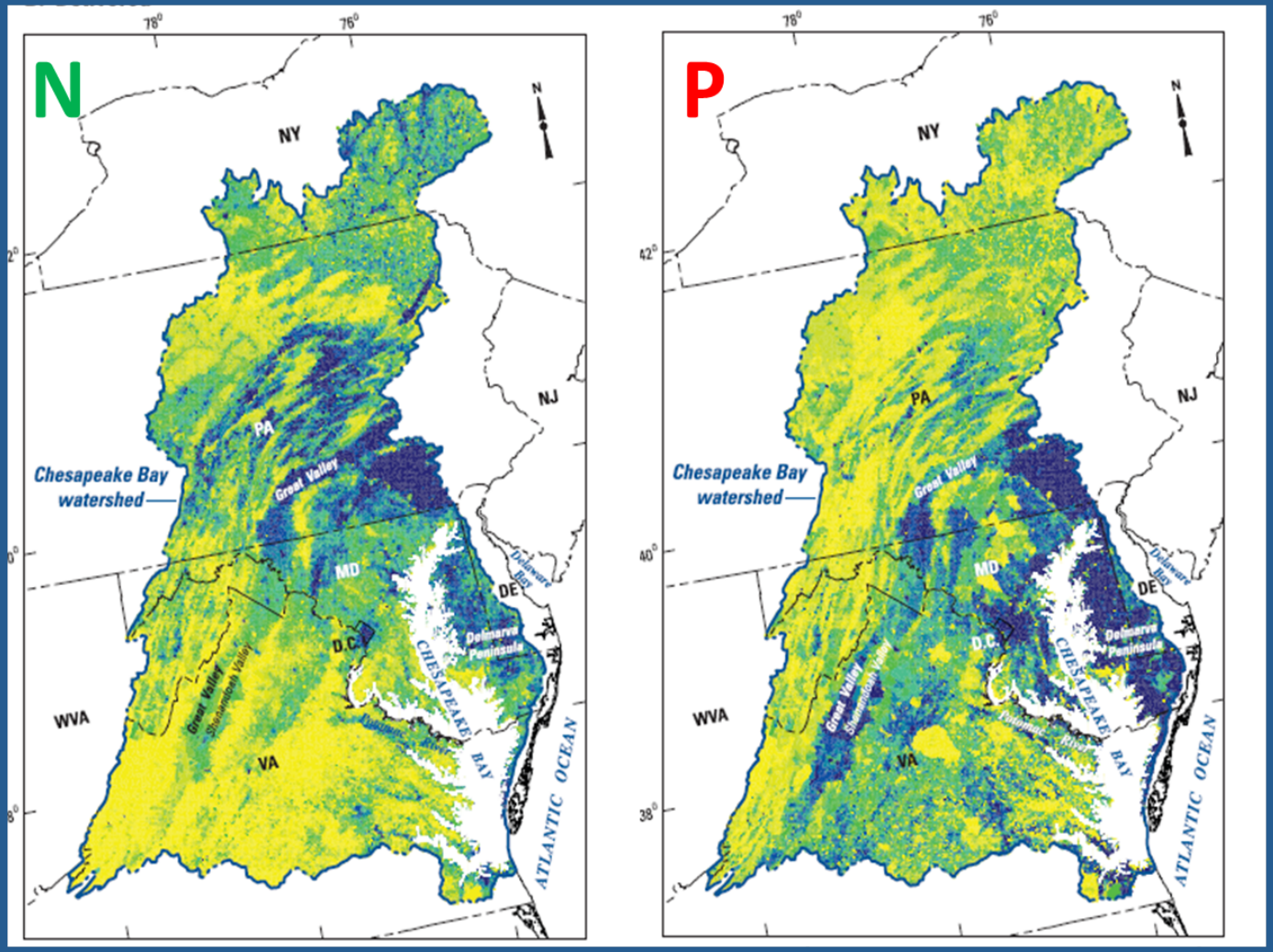
Adaptive Management 2009 - Future

- 2 Year Goals to hold politicians accountable
- Enforce TMDL beginning in 2011
- Target problem areas & focus on Bay response

Sources of N and P to the Bay are Diverse

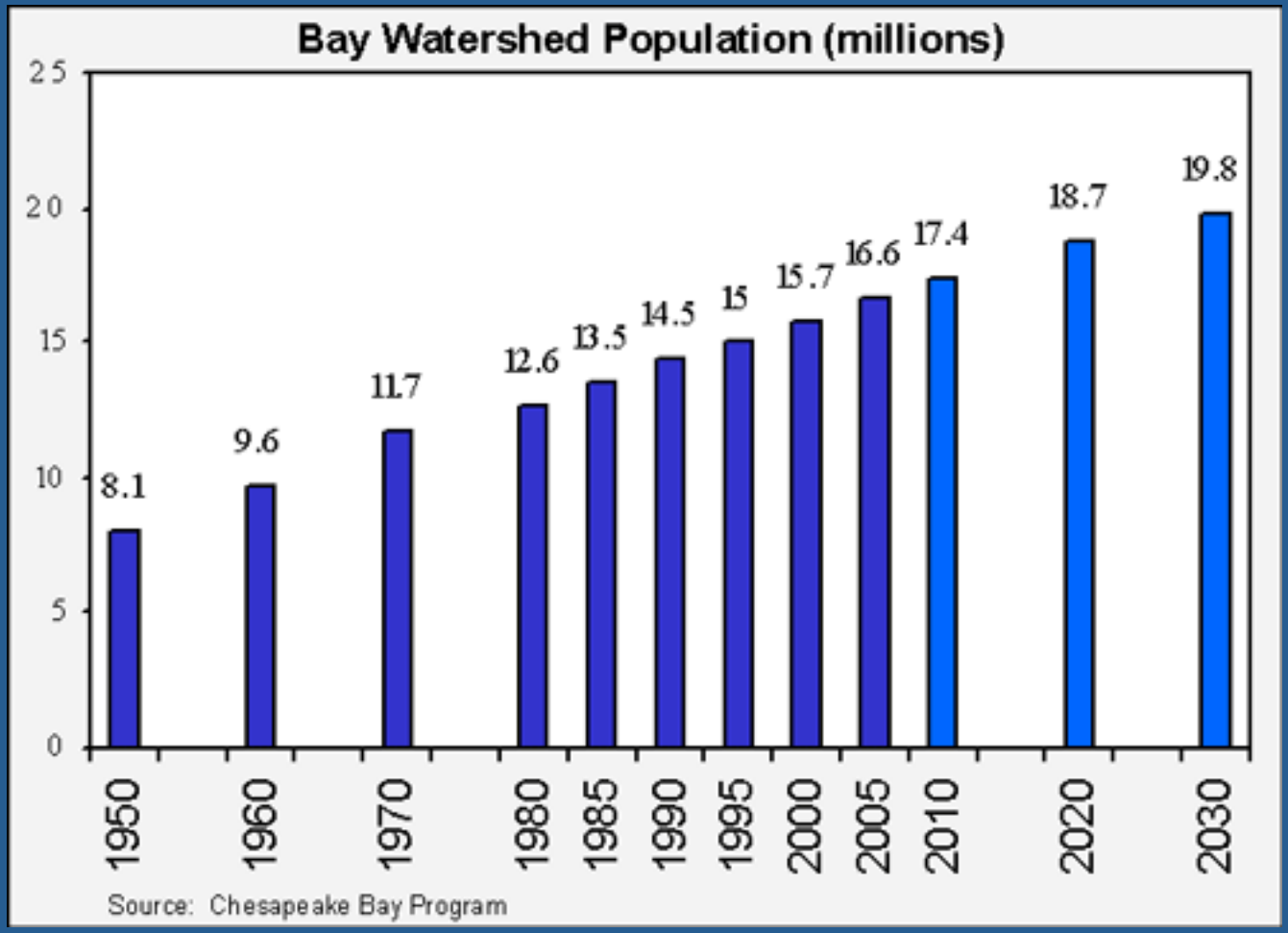


Geography Matters
Delivered loads of Nitrogen and Phosphorous

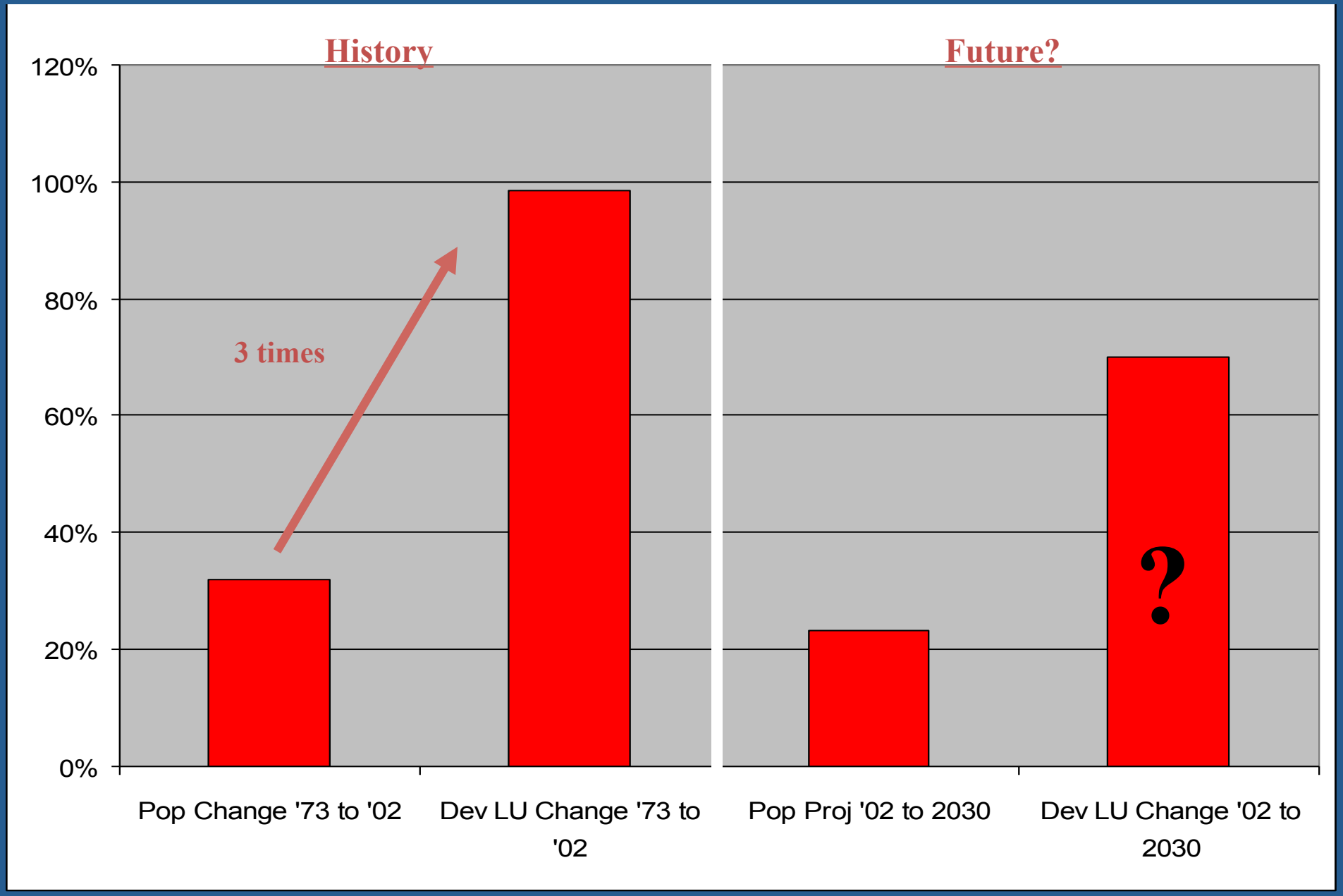


Based on the SPARROW model, U.S. Geological Survey . 2011. Scientific Investigations Report 2011-5167.

Watershed Population Continues to Increase



Each Person is Using More Developed Land



Applying Adaptive Management Principles

Academia's Role in Bay Restoration

- Formal Role: Science and Technical Advisory Committee of the Chesapeake Bay Program
- Focus on the Big Challenges
- Apply adaptive management principles
  - Analyze and assess Bay health
  - Identify new problems and challenges
  - Provide advice to the management community
- Remain engaged with restoration programs for the long-term
- Provide advice to emerging challenges in a timely manner

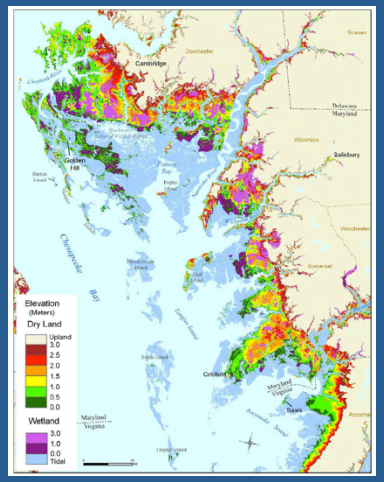
Provide Scientific Leadership to Emerging Challenges

Organize scientific panels to provide consensus on causes and solutions

Engage the management community in the deliberations

Provide reports in a public friendly manner to communicate the problems and solutions to a broad audience

Harmful Algal Blooms



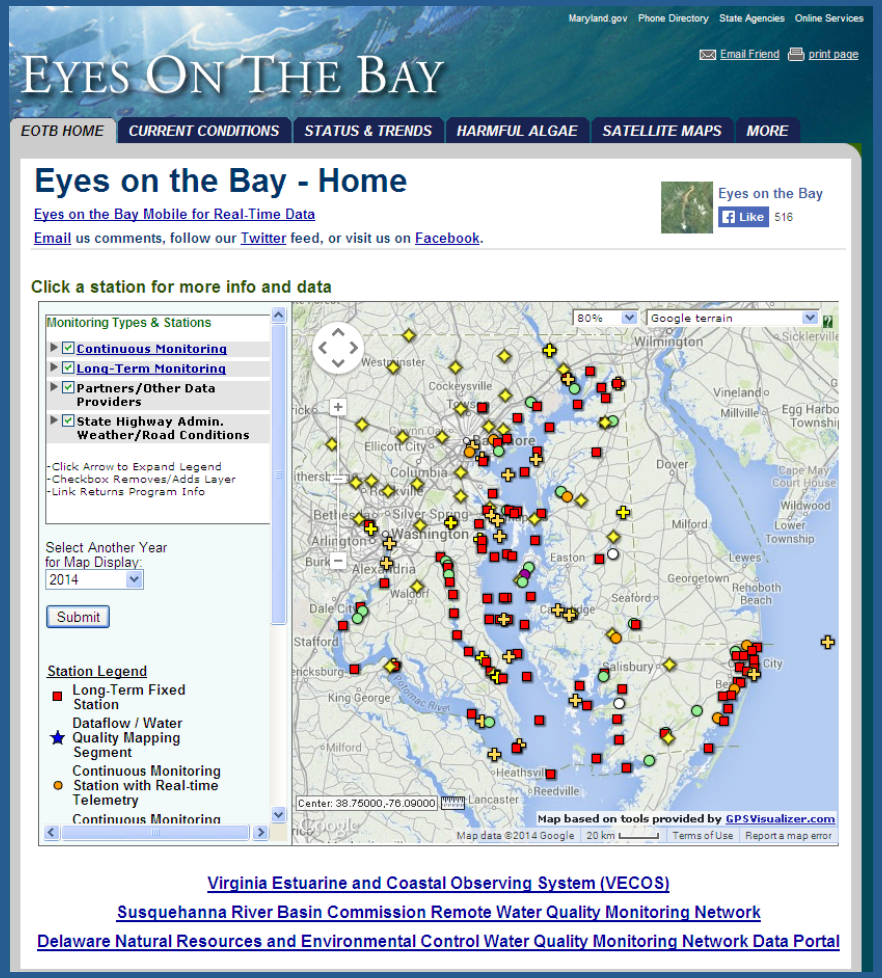
Sea Level Rise

Introduced Species

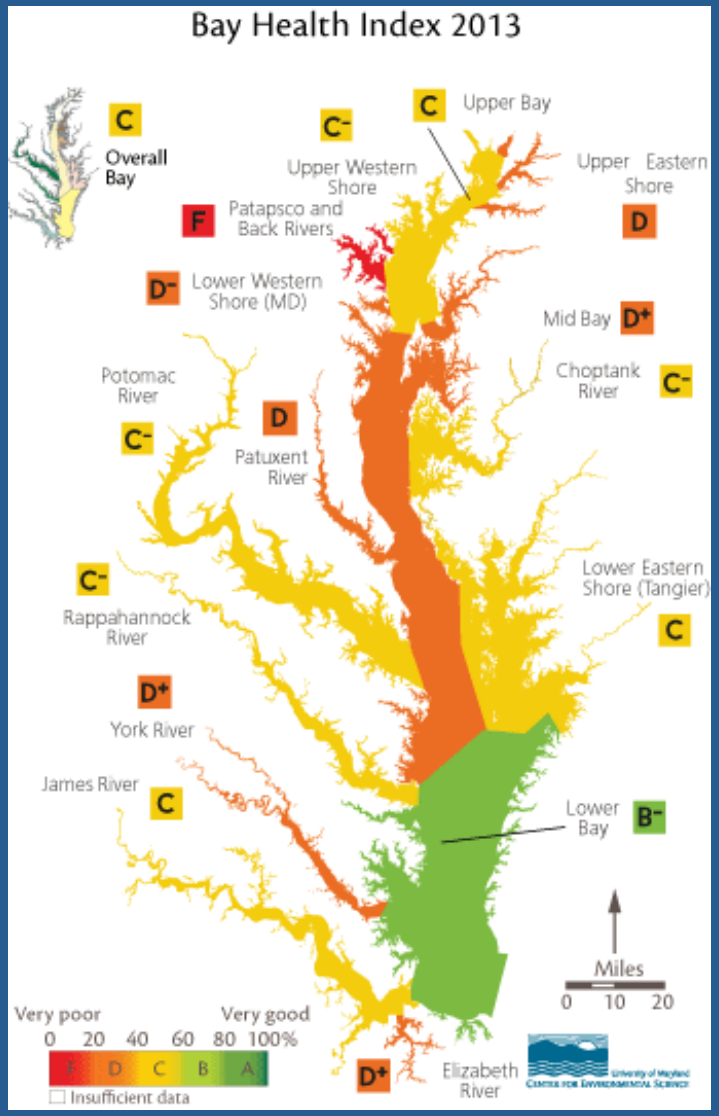
Conowingo Dam

Adaptive Management: Monitor and Measure Bay Health

- Track changes over time to determine responsive to management actions
- Develop metrics that addresses both the habitat and biological response
- Communicate results to a broad audience
- Improve scientific understanding and impact of management actions

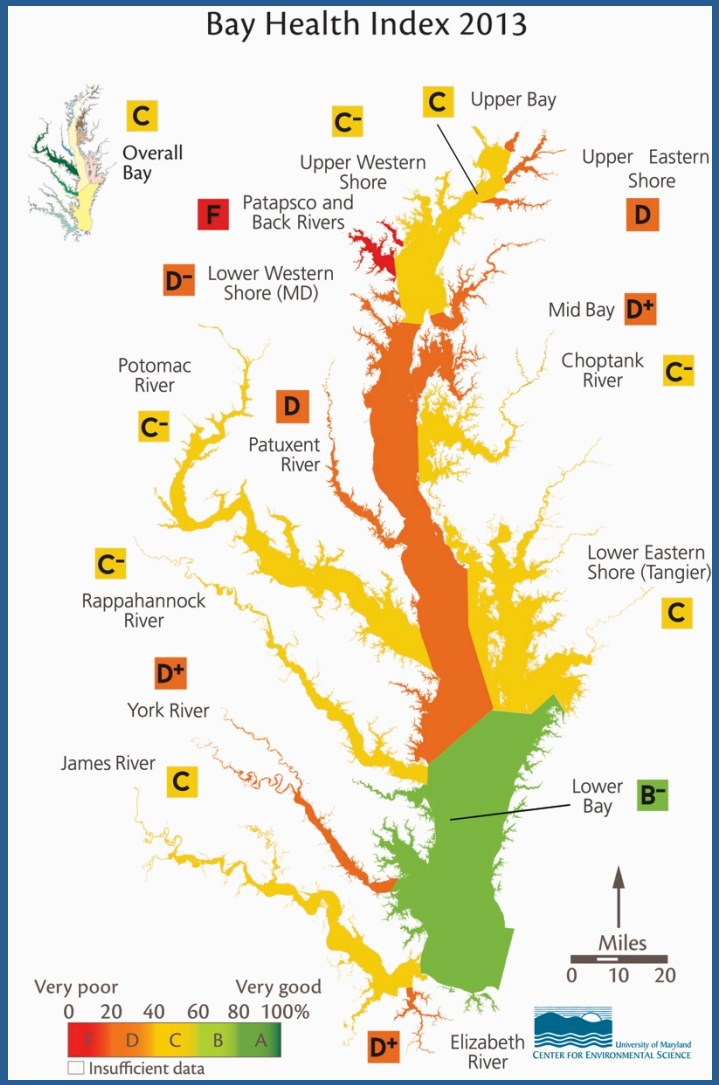


Current Health

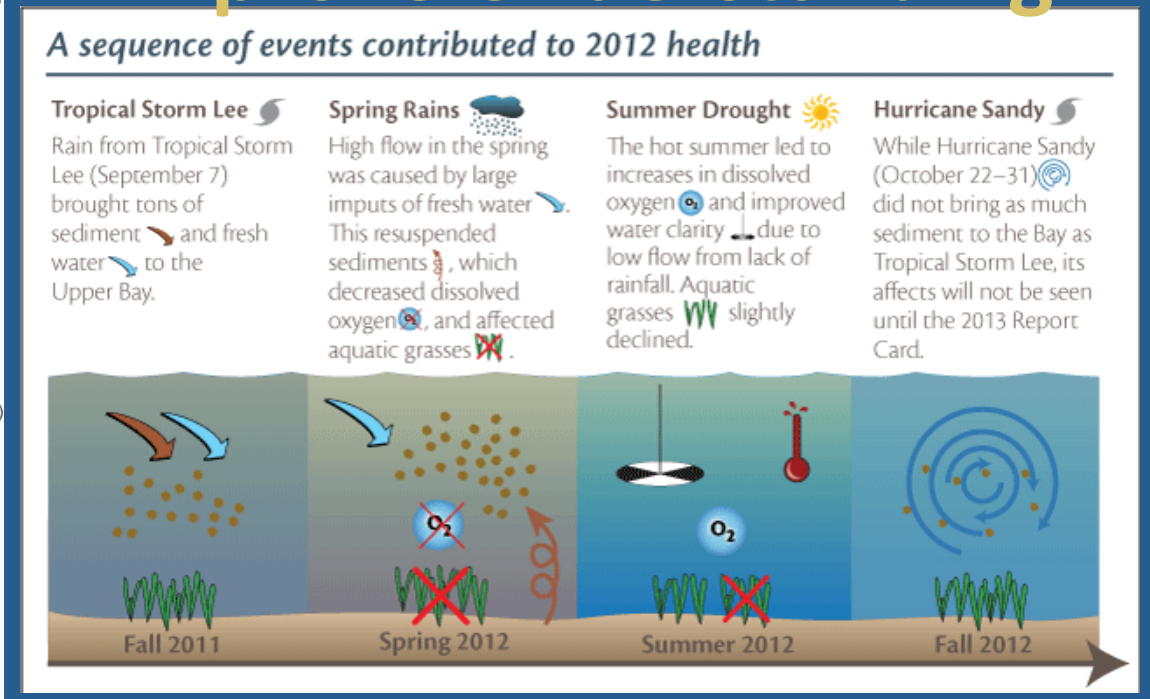


- UMCES bases the Bay Health Index on 7 indicators
- These indicators include:
  - Water Clarity
  - Dissolved Oxygen
  - Nitrogen Concentrations
  - Phosphorus Concentrations
  - Aquatic Grasses
  - Phytoplankton Community
  - Chlorophyll *a*

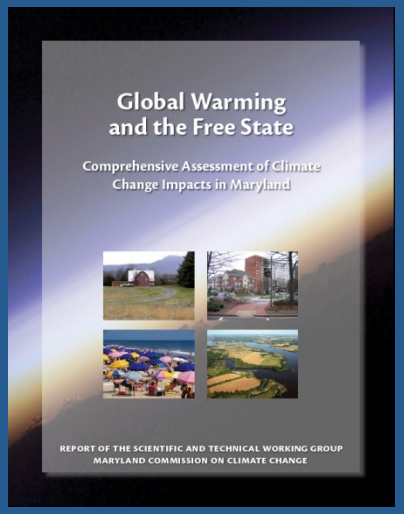
Analyzing and Integrating Monitoring Data

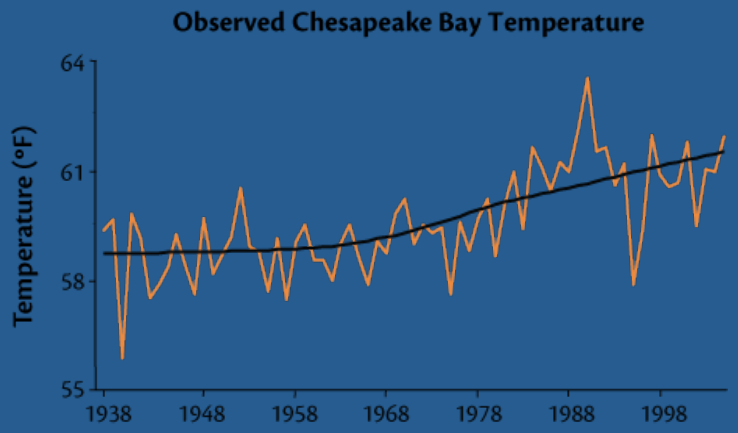


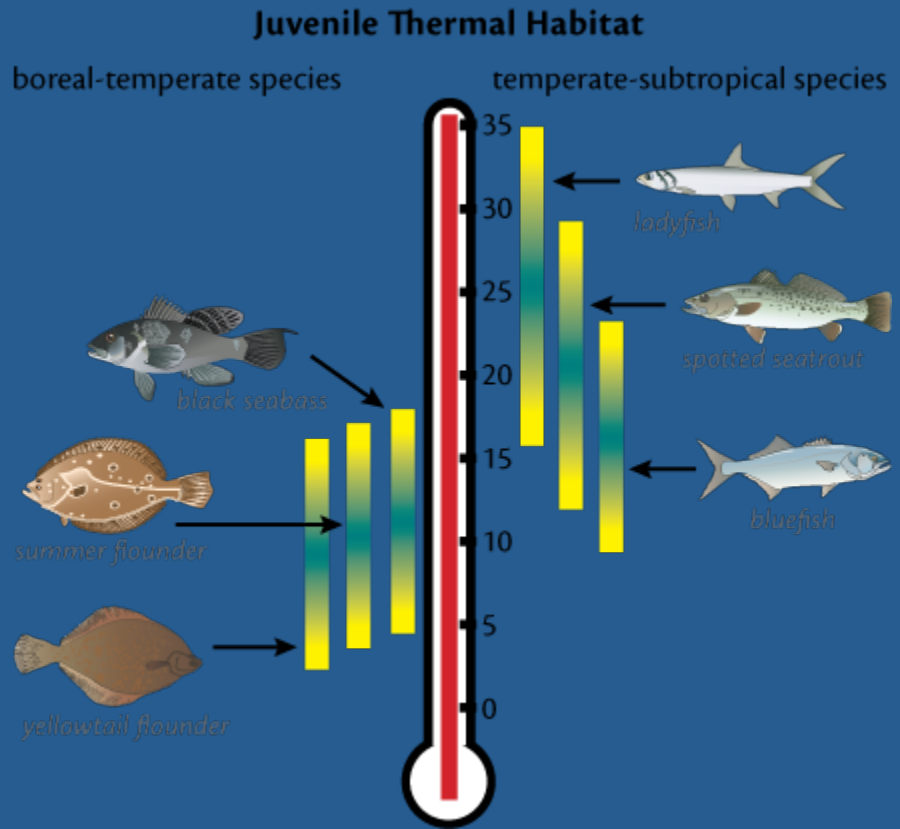
Improve Understanding



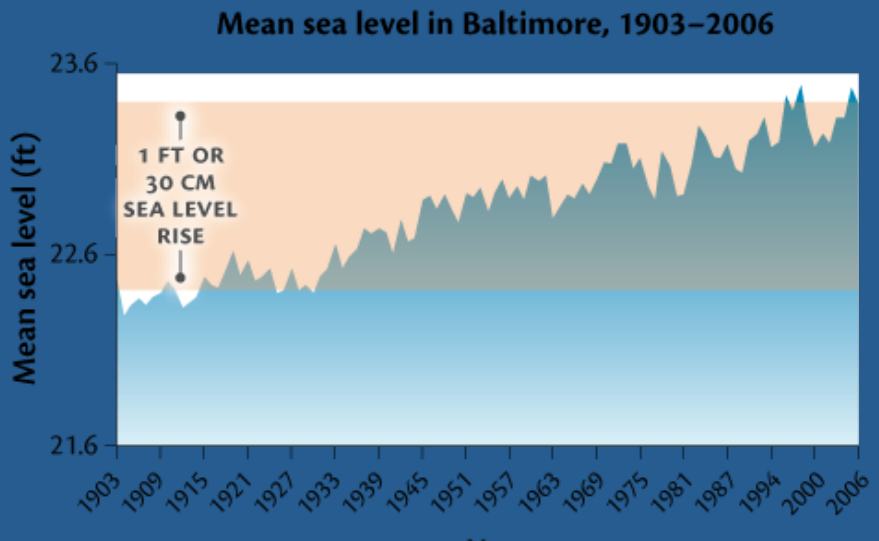
A Warmer Chesapeake Bay

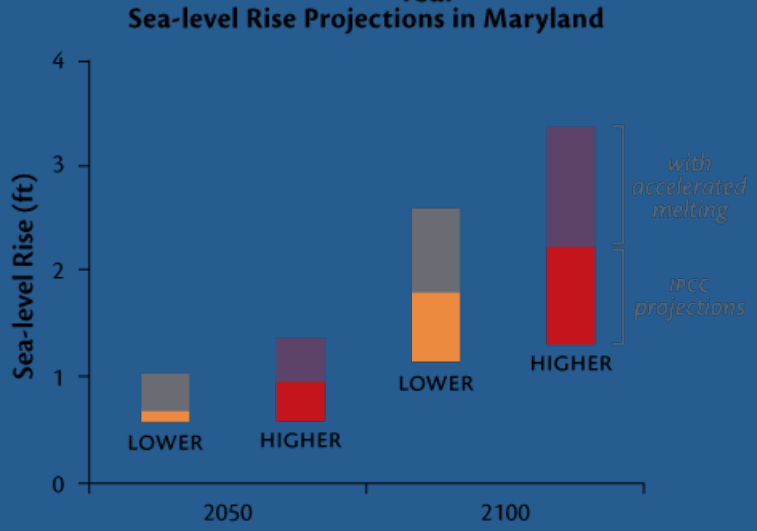


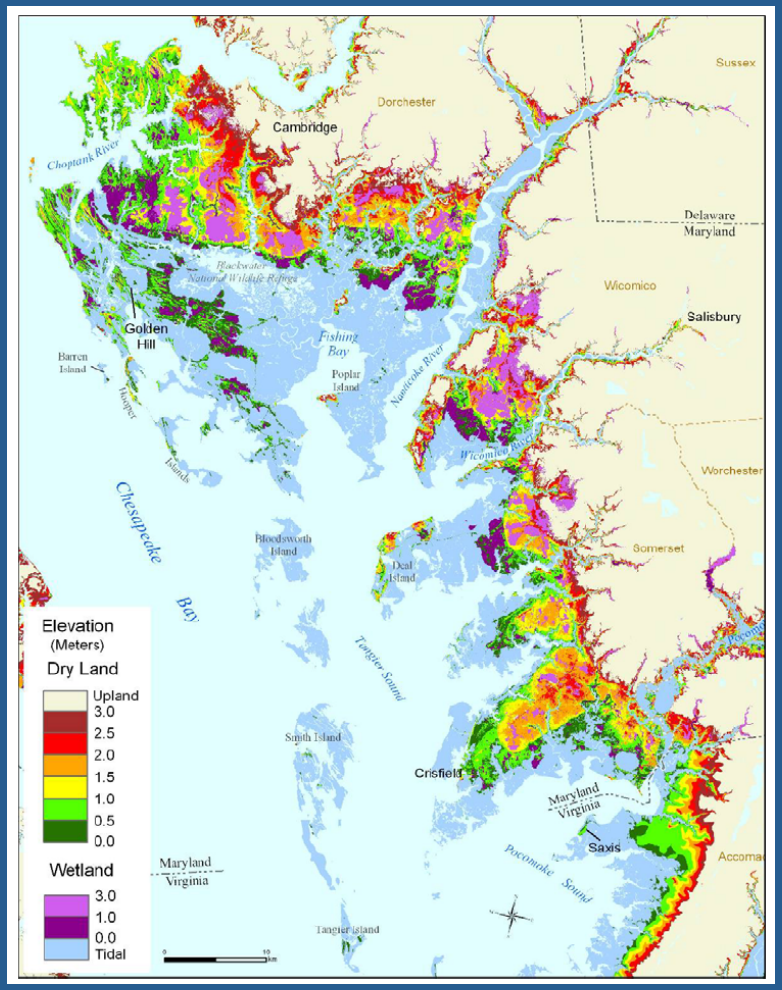




Sea-level Rise Will Redraw Maps

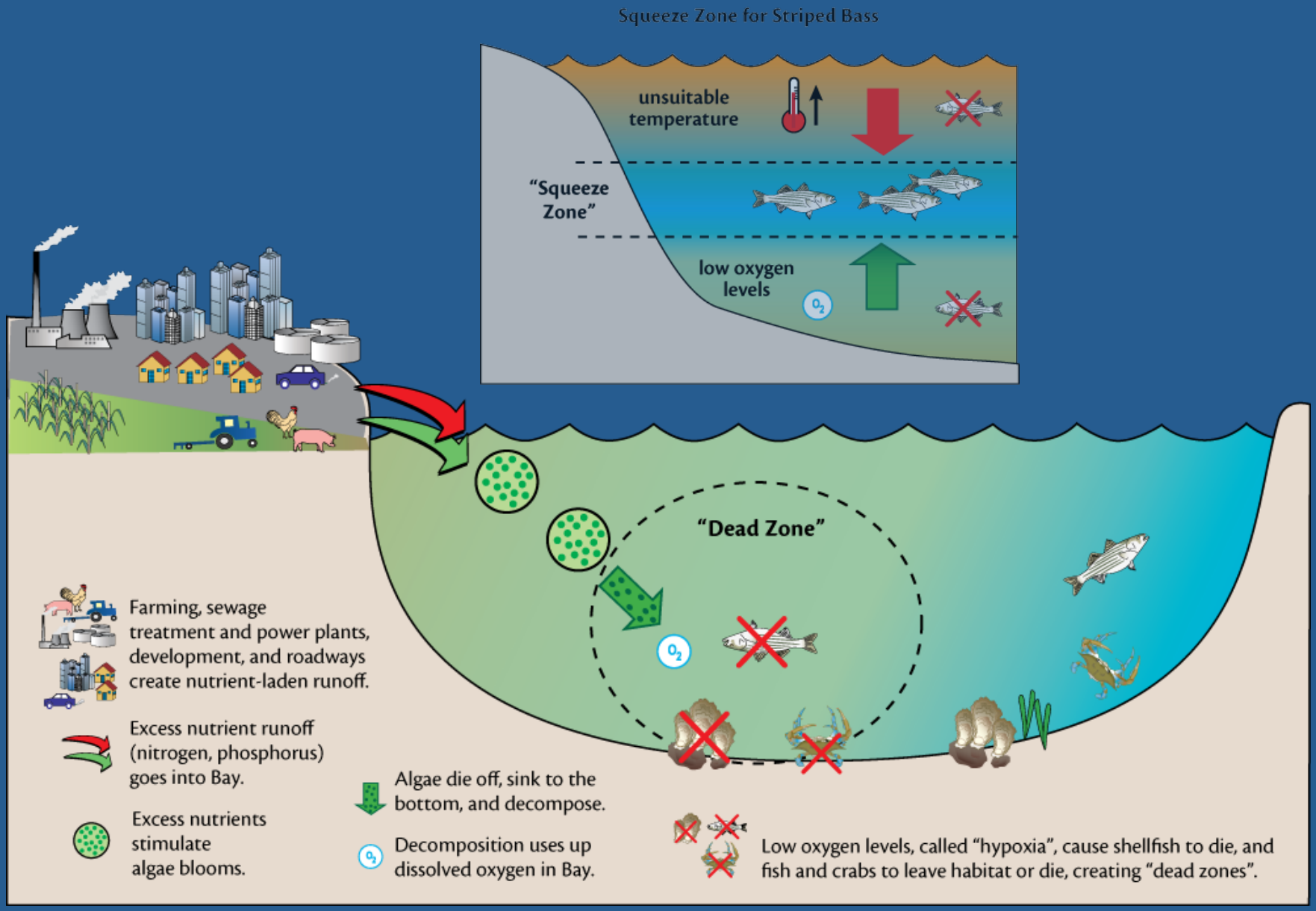






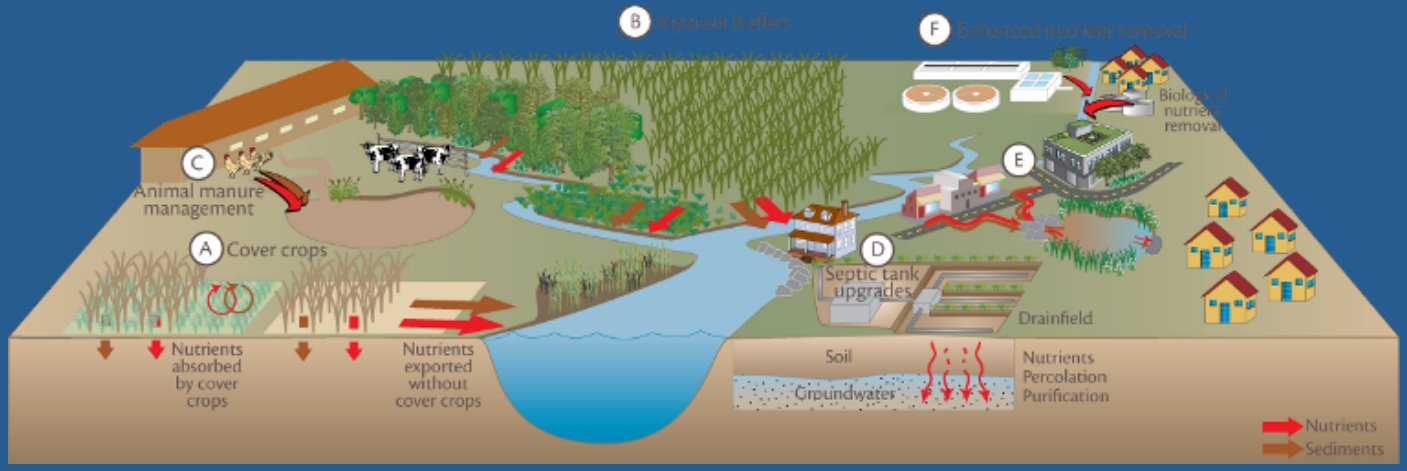
Global Warming in the Free State

More Challenging Coastal Restoration



Solutions to Restore the Bay be Diverse

- Critical Areas Law (1984) – protection of shorelines (revised in 2008)
- Phosphate Laundry Detergent Ban (1988) – reduced phosphorous loads
- Water Quality Improvement Act (1998)– nutrient management on farms
- Bay Restoration Fund (2005) – primarily for waste water treatment plant upgrades, also funds cover crops and septic upgrades
- Water Resources Element of Comprehensive Plans (2006) - ensure water and sewer capacity available for growth
- Chesapeake Bay 2010 Trust Fund (2008) – reduce non-point sources of pollution



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Websites for more info:
www.baystat.maryland.gov
www.chesapeakebay.net
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