Applying Adaptive Management to Improve Water-Quality Decision Making for Restoring the Nation's Largest Estuary

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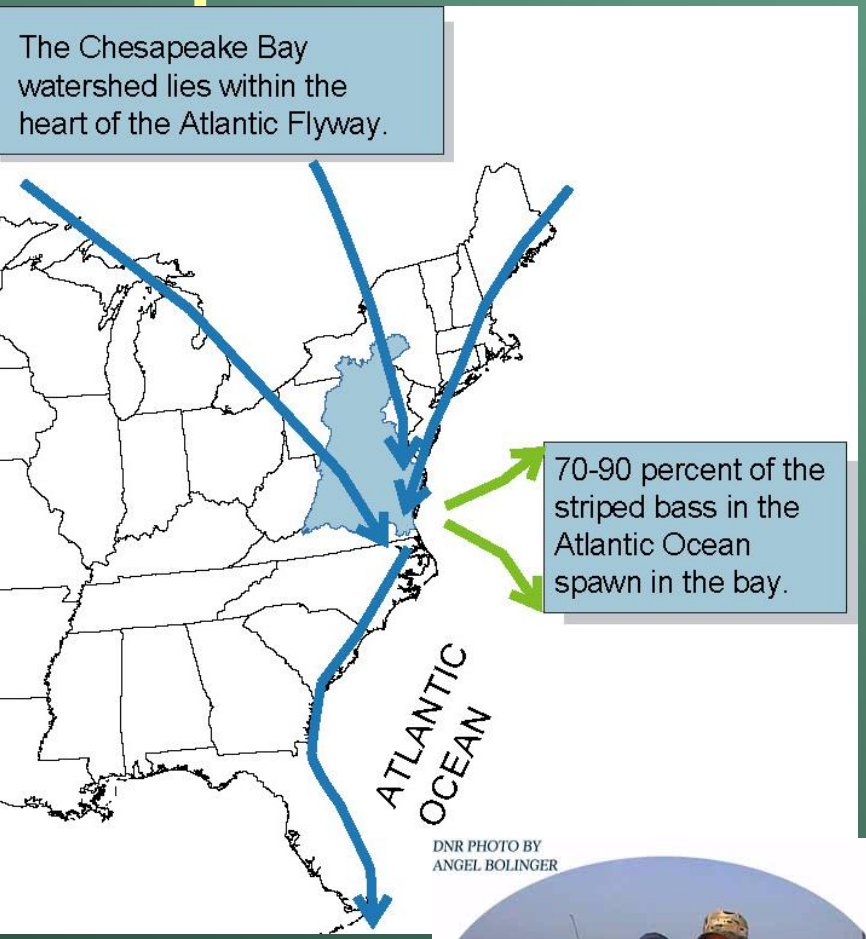
Importance of the Nation's Largest Estuary



- Ecological
  - Fisheries and migratory birds
- Economic
  - $1 trillion value
- Recreation and heritage
- Degraded condition
- Chesapeake Bay Program
- Executive Order

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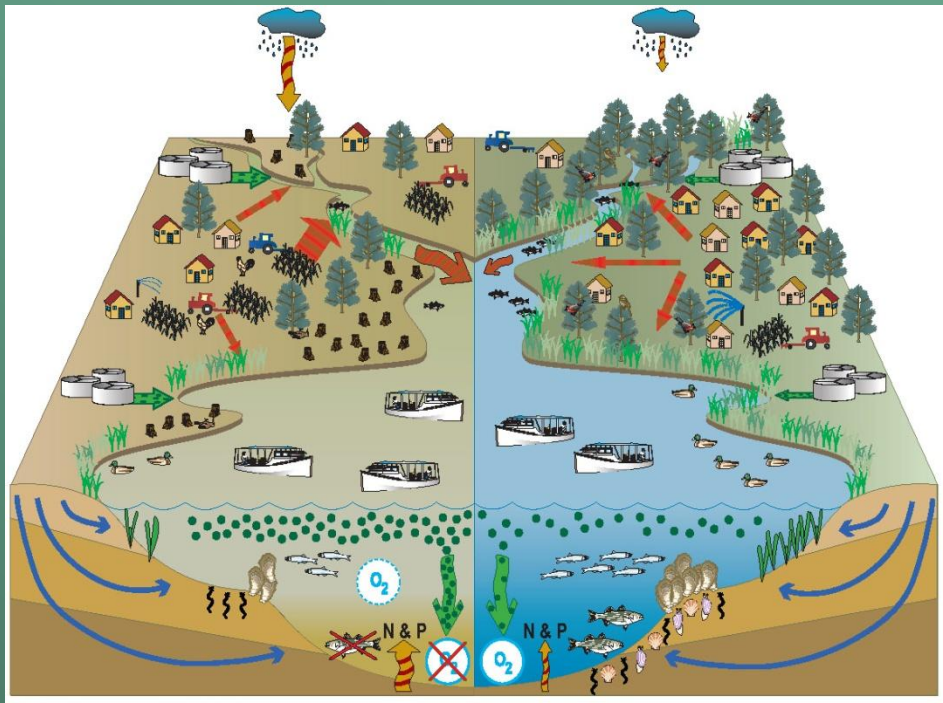
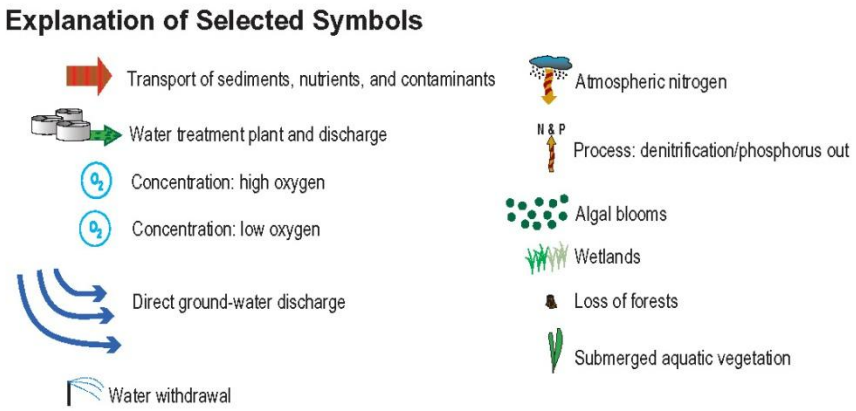
Water Quality Issues and TMDL

- Poor DO, loss of SAV
- Decline in fisheries
- TMDL
  - Achieve water-quality standards
  - Reduce nutrients and sediment
  - States and federal agencies
  - Implement actions by 2025



(Modified from CBP and IAN, 2005)



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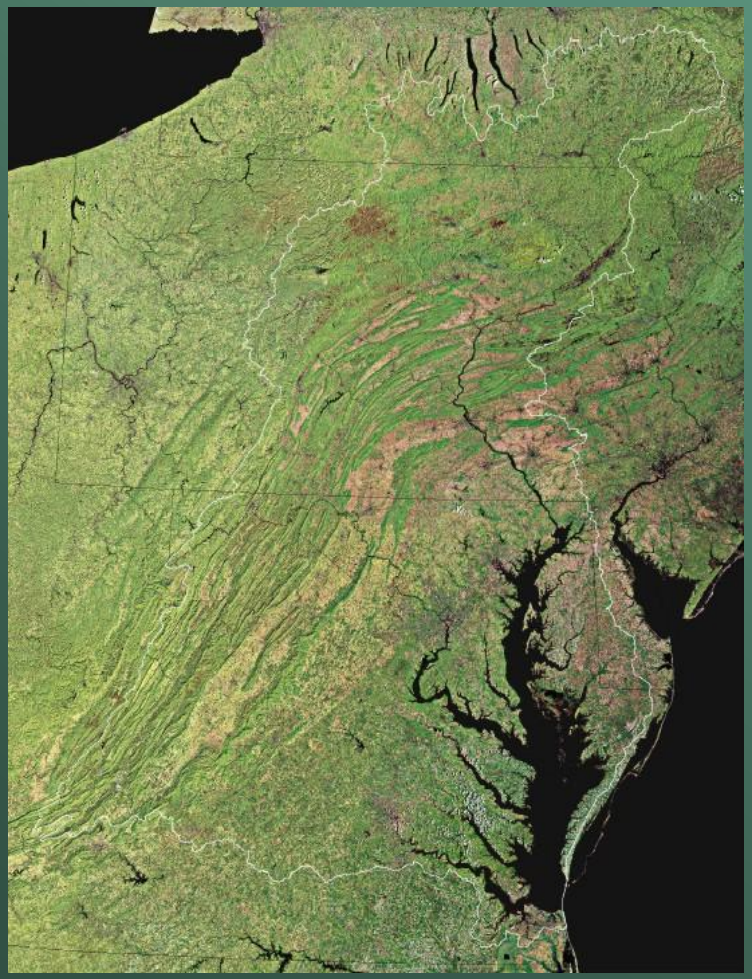
Chesapeake Bay Program and TMDL



- Federal
  - EPA
  - DOI, USDA, NOAA, DoD
- Six States & DC
- Bay Commission
- Local Governments

- TMDL
  - Watershed implementation plans
  - Two year milestones
  - 2017 evaluation
- Adaptive management

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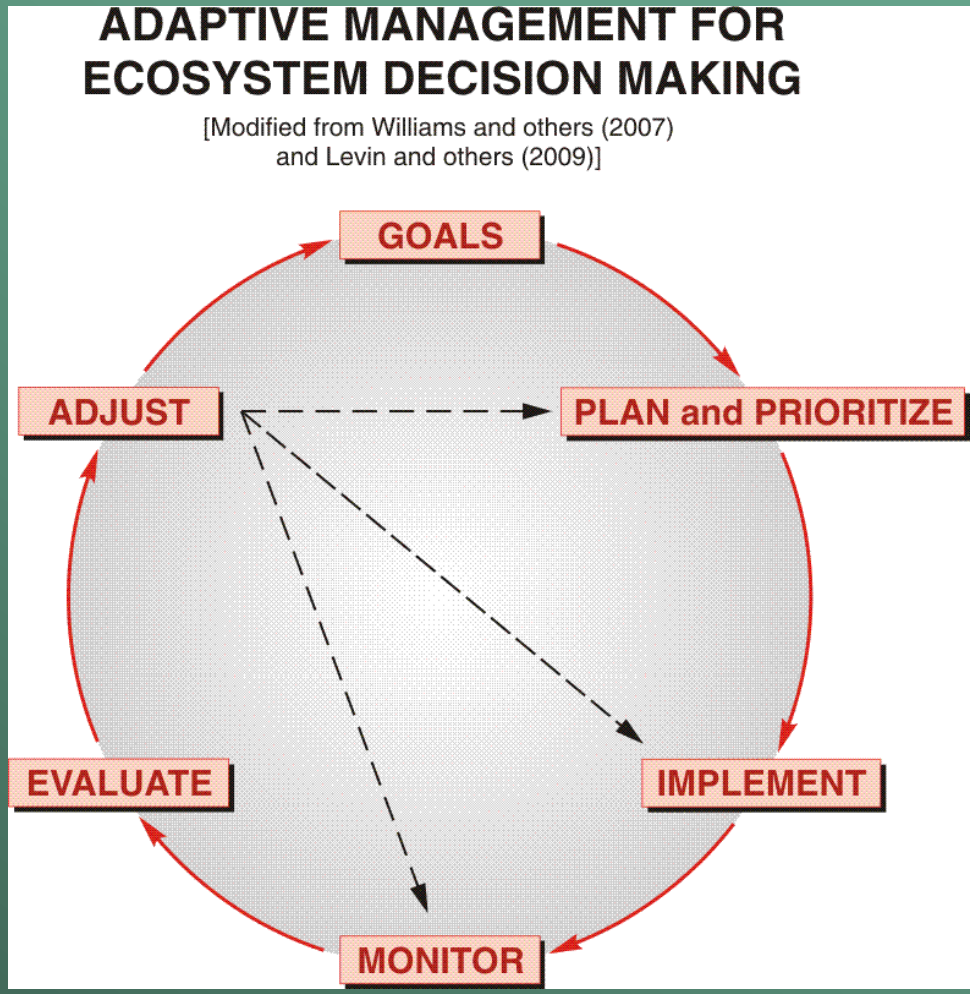
Adaptive Management

- Enhance use in CBP
  - CBP decision framework
  - NRC report
- Modeling, monitoring and research to assess and explain change
- Learning and applying new findings
- Reduce uncertainty in decision making



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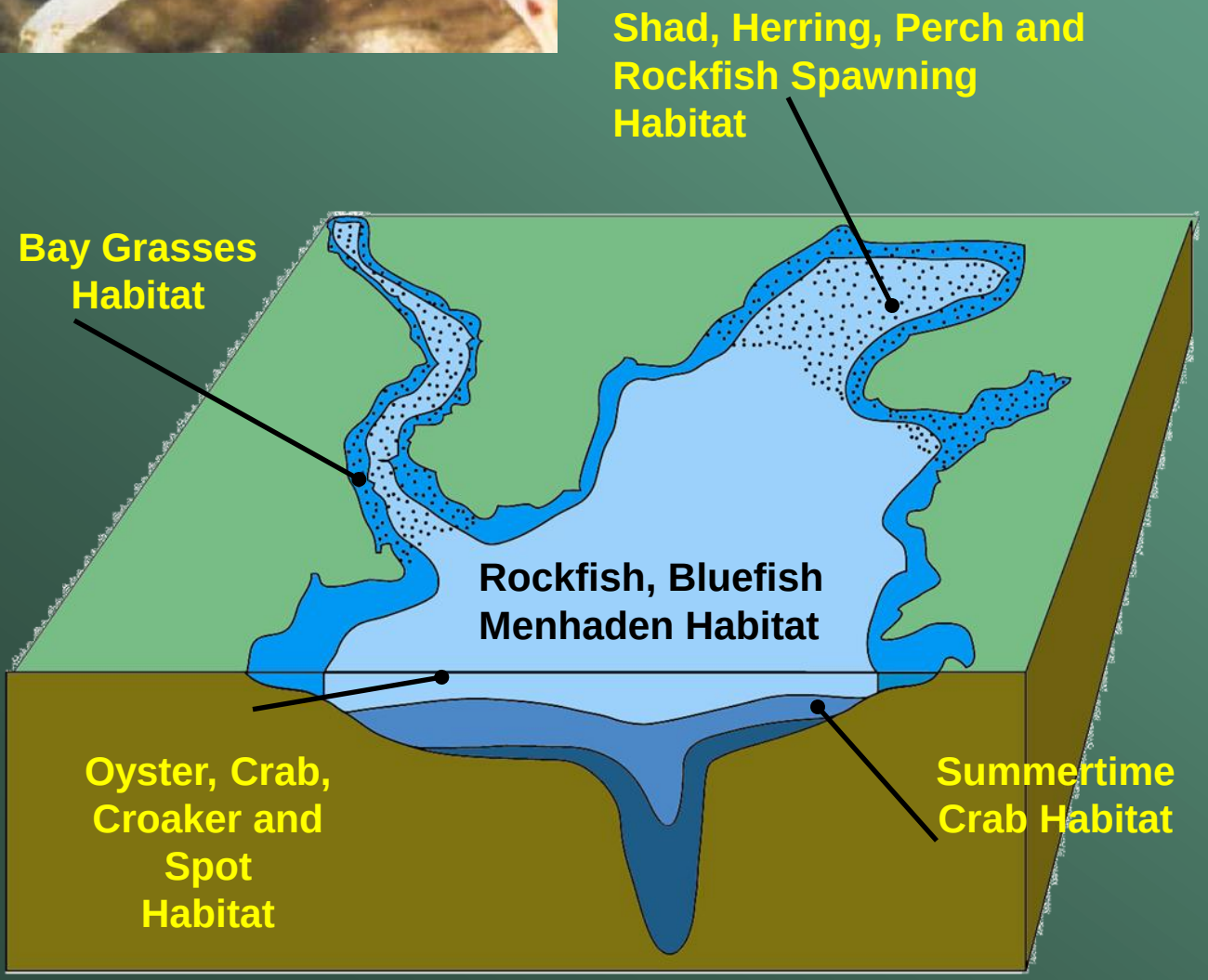
Setting Goals

-Water-quality standards

-Nutrients and sediment allocations

-Model scenarios



Source: EPA

Management Strategies

- Watershed Implementation Plans
- Plan and prioritize
- Finer spatial information
  - CBP models
  - SPARROW model

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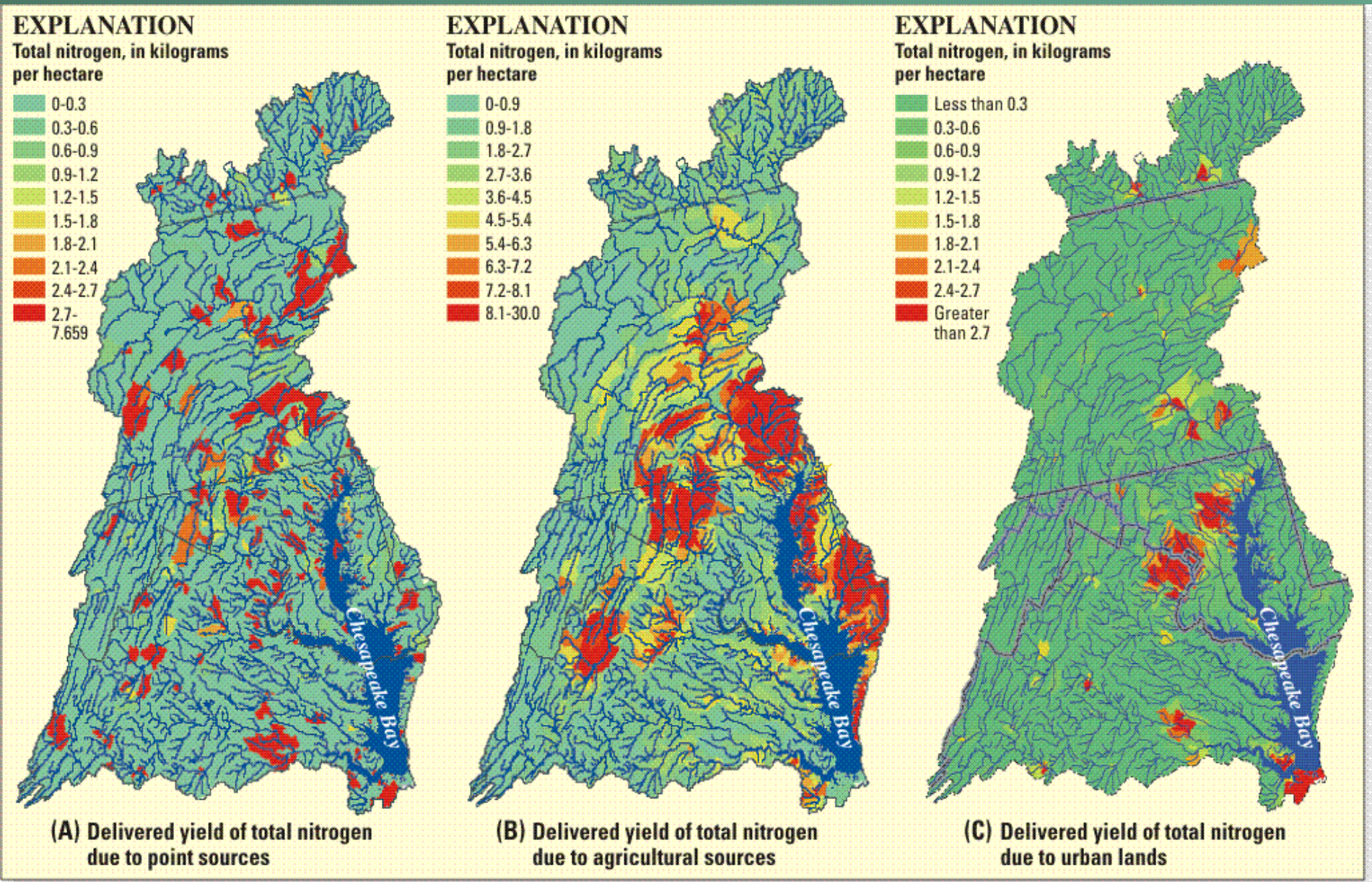
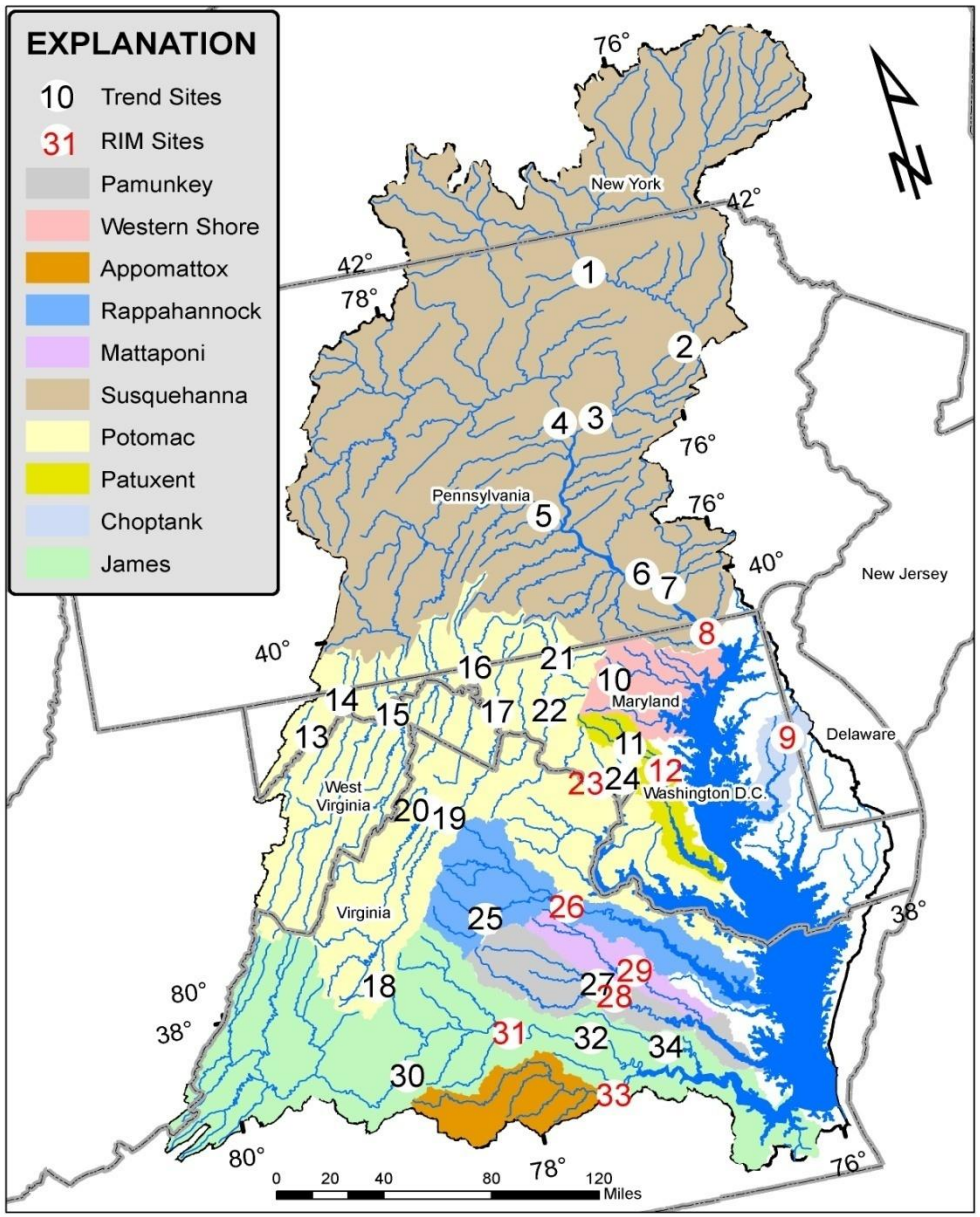
Sources-Nitrogen



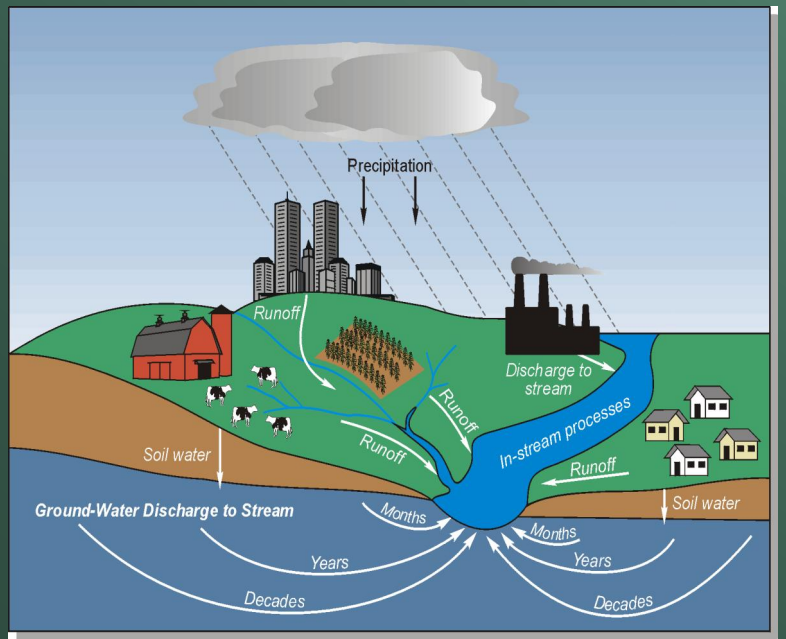
Monitoring

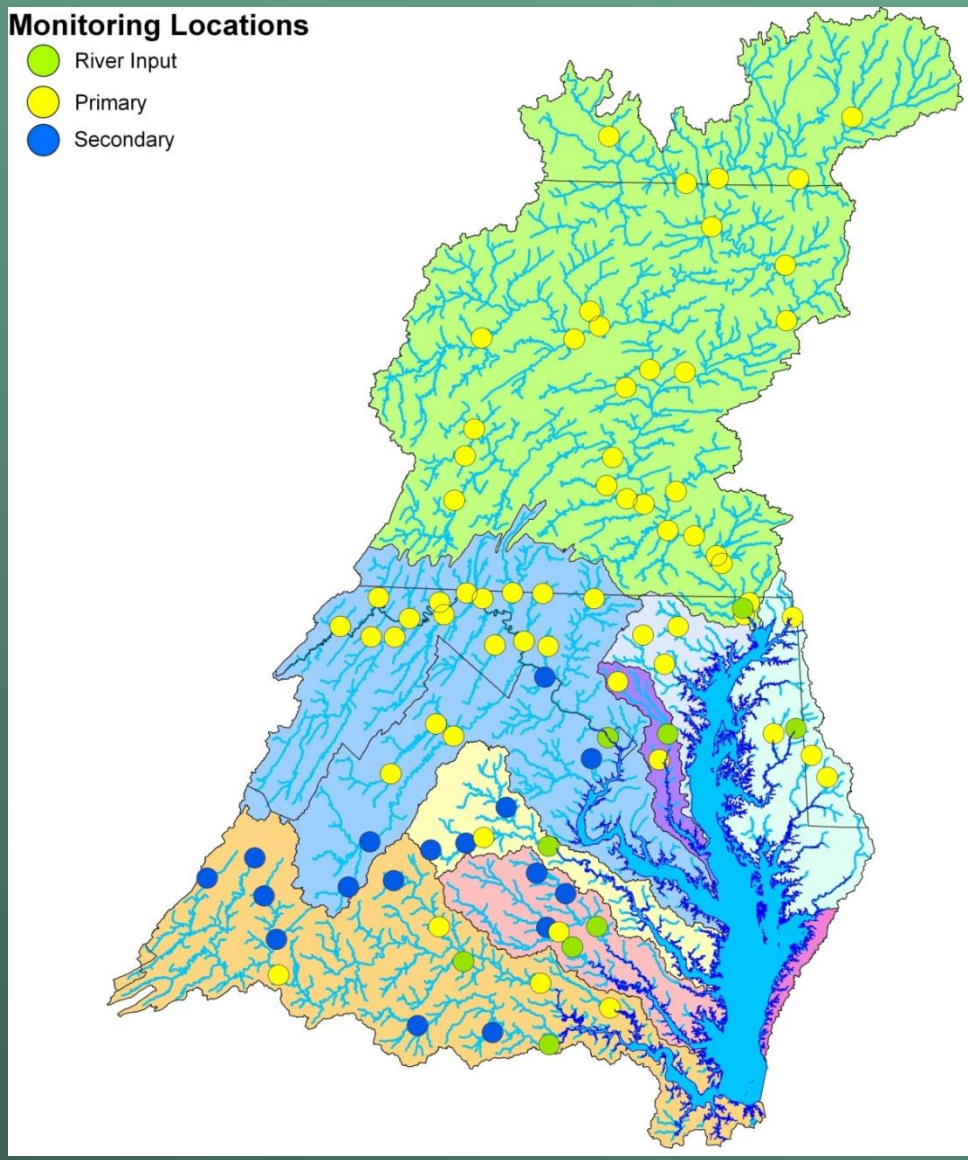


- Networks
  - Watershed
  - Estuary
- Used to calibrate CBP models
- Improvements

Monitoring Improvements

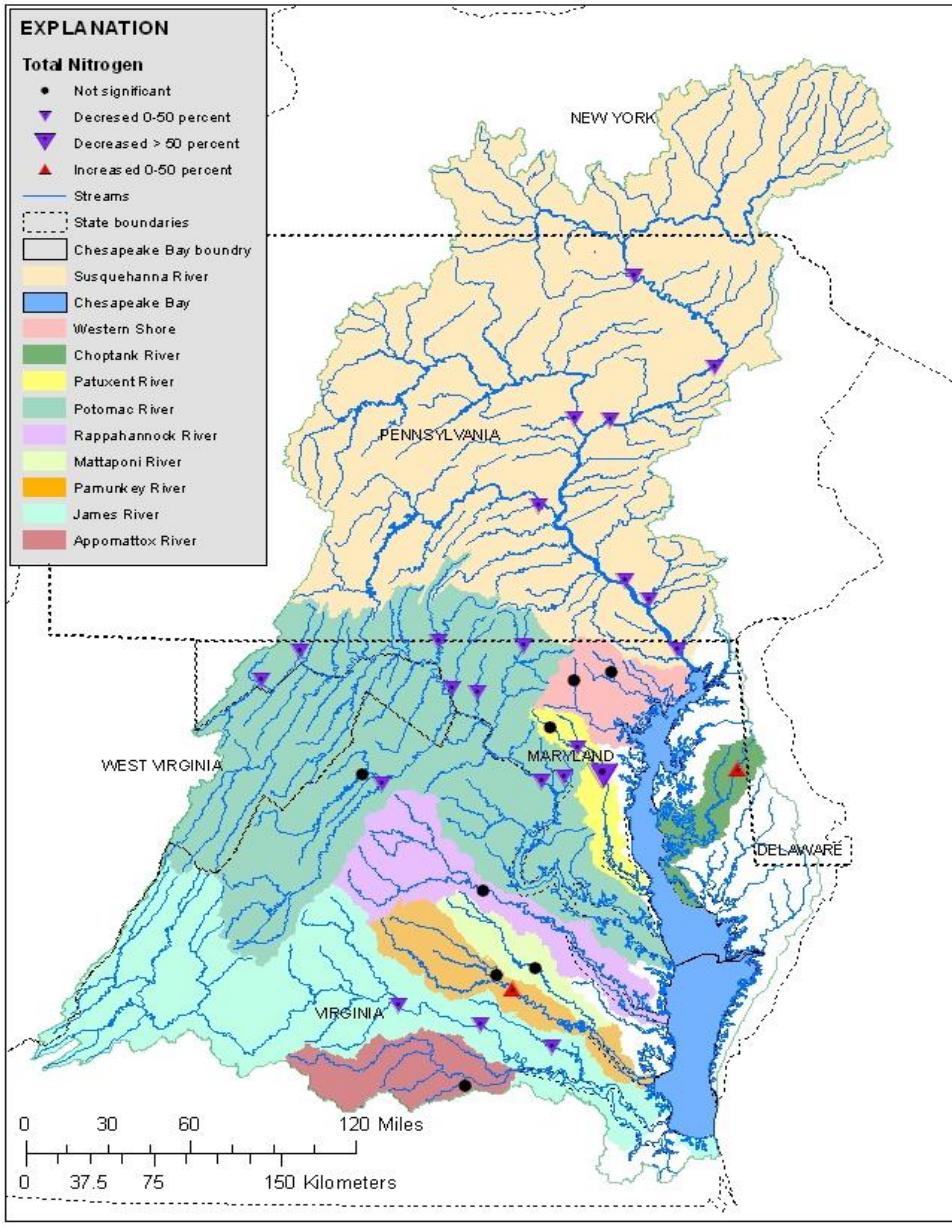
- Water quality
  - Ag and urban areas
- Small watershed research
- Implementation reporting





Assess Performance and Evaluate

- Expected reductions
  - Model predictions
  - Two-year milestones
- Monitoring
  - Trends
  - Indicators
- Assess change
  - Better compare model and monitoring results



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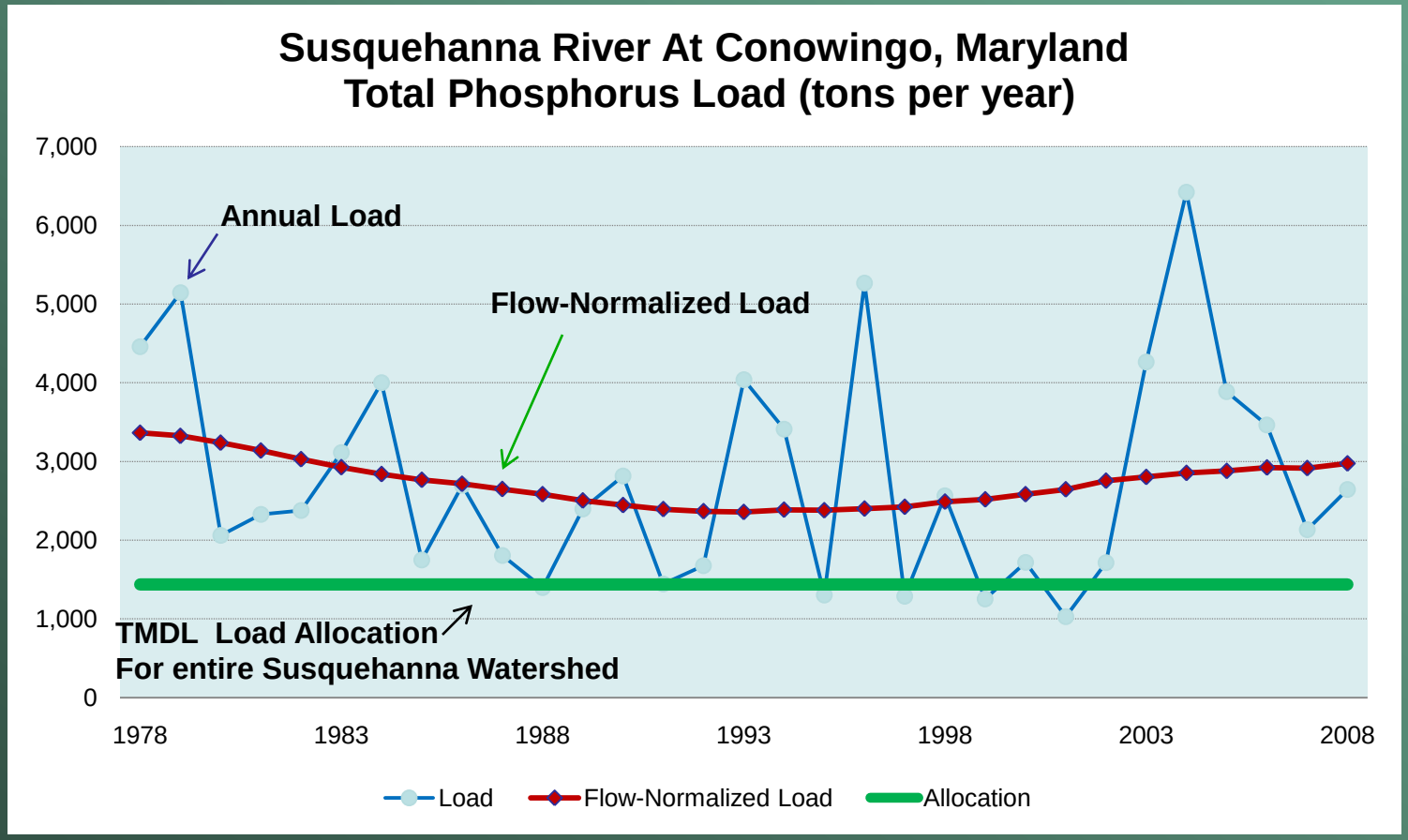
Progress Towards Nutrient Allocations

(modified from Hirsch and others, 2010)



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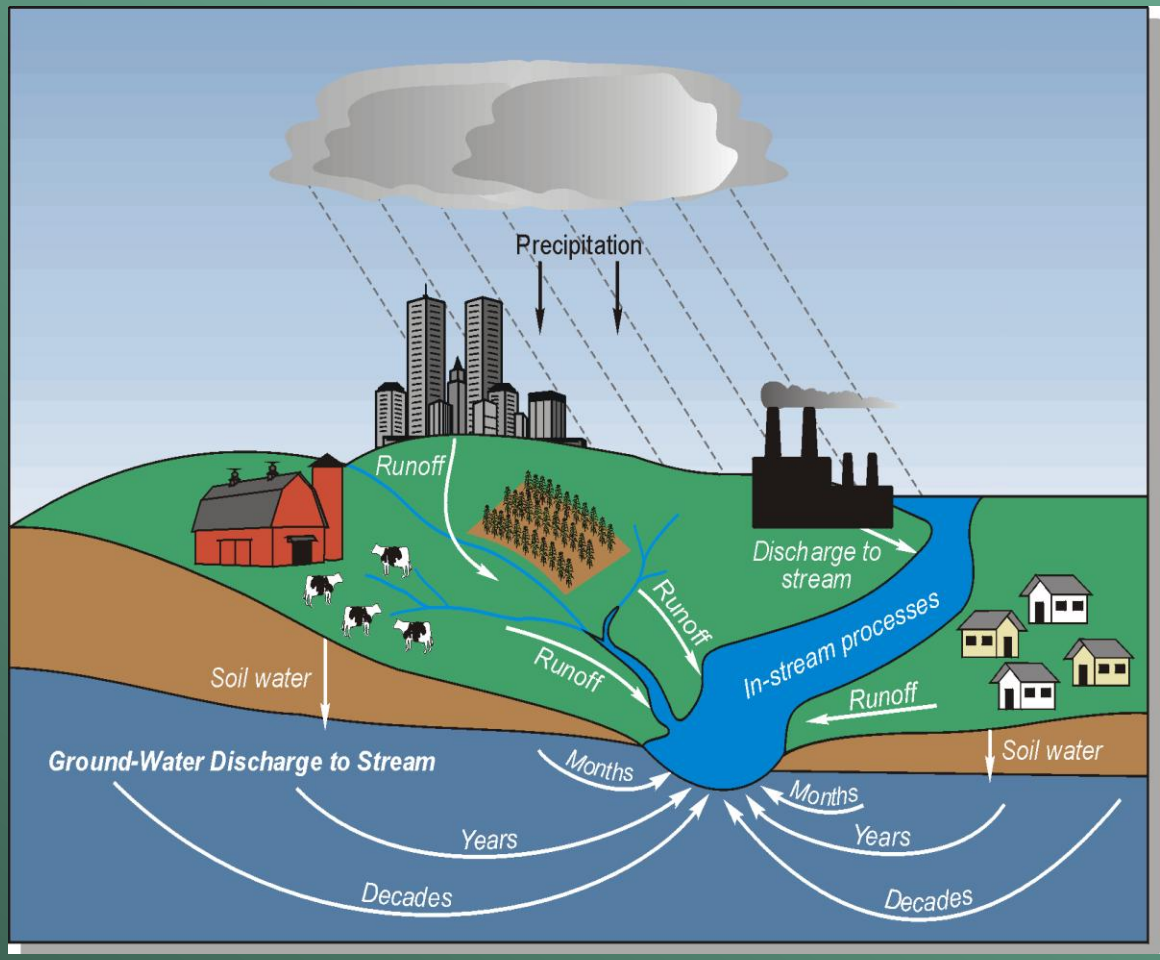
Explain Water-Quality Change

- Sources
- Management actions
- Streamflow variability
- Response times
- Implications
  - Effect of BMPs
  - Milestones
  - 2017 evaluation



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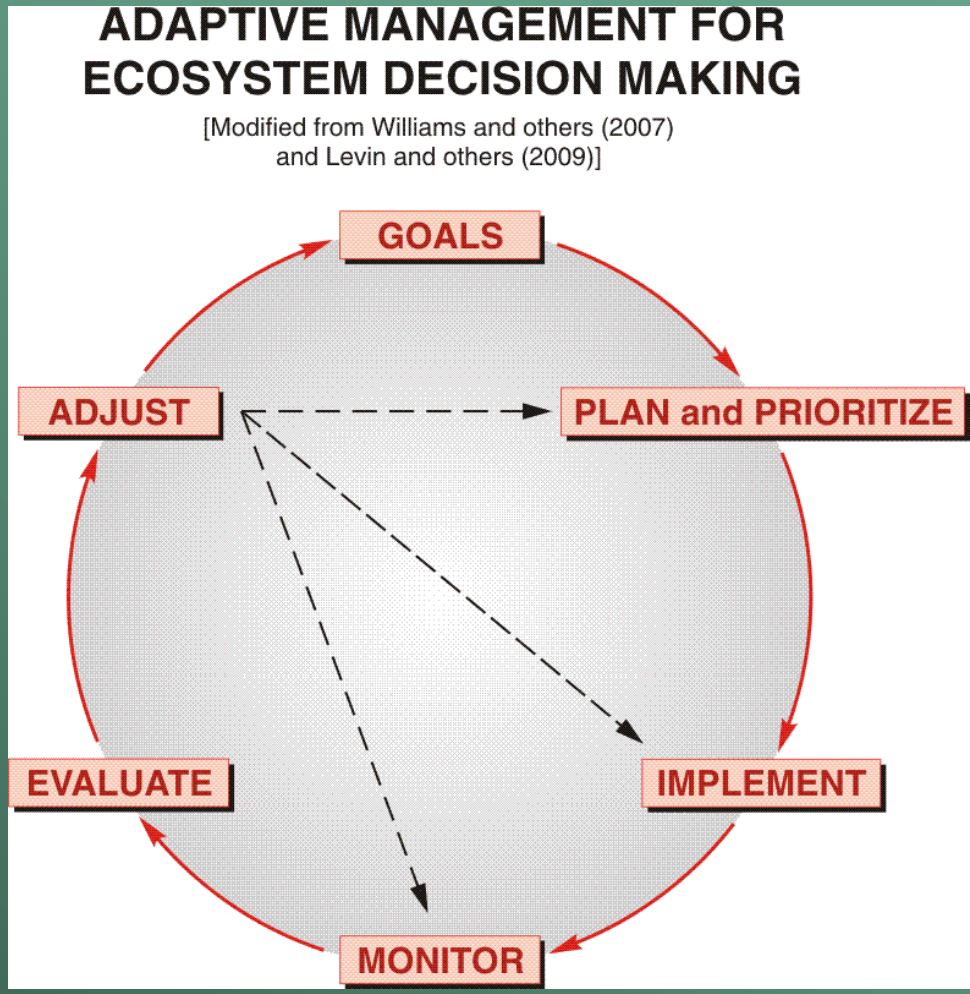
Manage Adaptively: Adjust

- Summarize and communicate
  - Improve understanding
  - Reduce uncertainty
- Short-term adjustments
  - Implementation
  - 2-year milestones
- Longer-term adjustment
  - TMDL allocations in 2017
  - Modeling and monitoring



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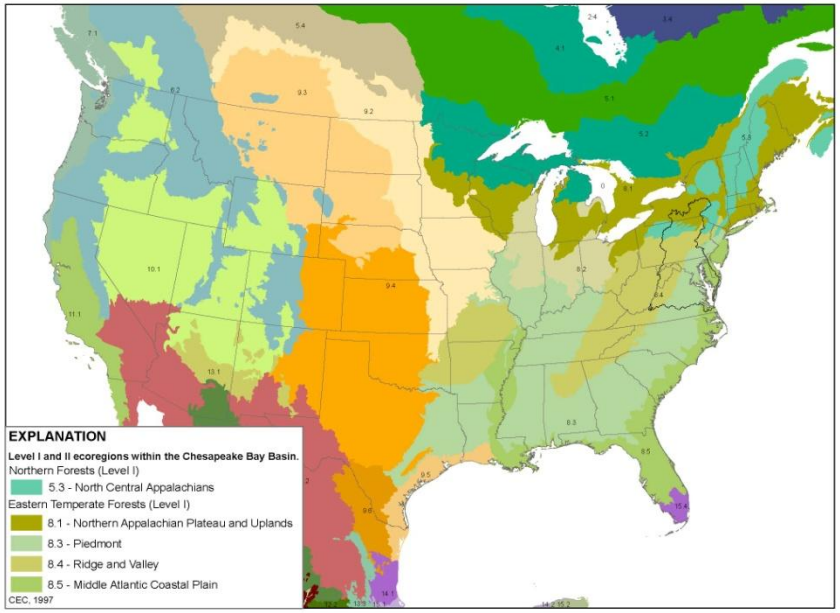
Challenges and Summary



- Major estuaries
- Opposition to increased regulation
- Inadequate funding and policy
- Citizen involvement
- Economic considerations
- Population growth
- Science for improved decision making

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