

Enhancing Approaches to Explain Management Effects on Water Quality Trends



Chesapeake Bay Program's

Scientific and Technical Advisory Committee

Co-Sponsors

Chesapeake Bay Program Scientific and Technical
Advisory Committee

And

The Harry R. Hughes Center for Agro-Ecology



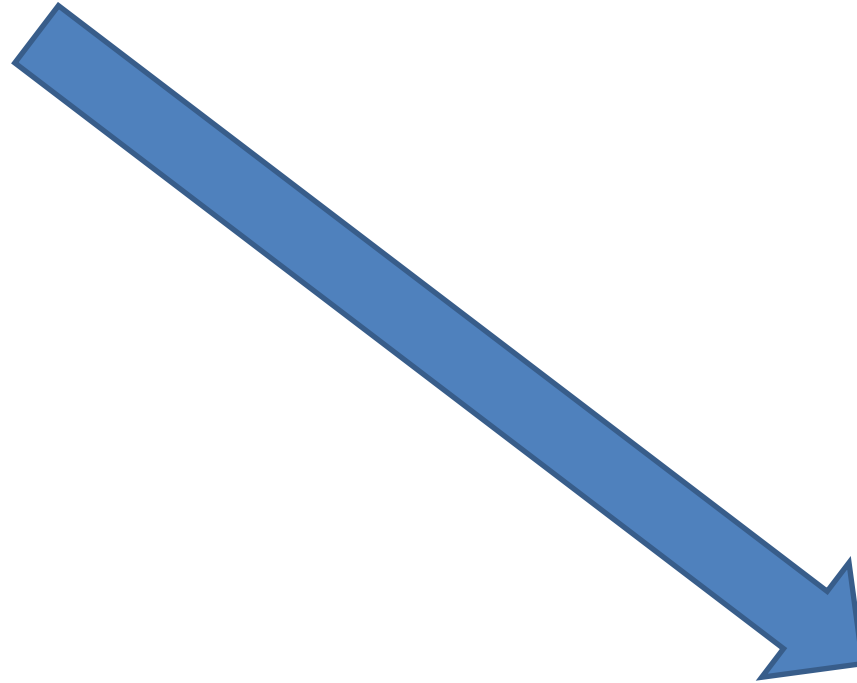
HARRY R. HUGHES CENTER FOR
AGRO-ECOLOGY, INC.



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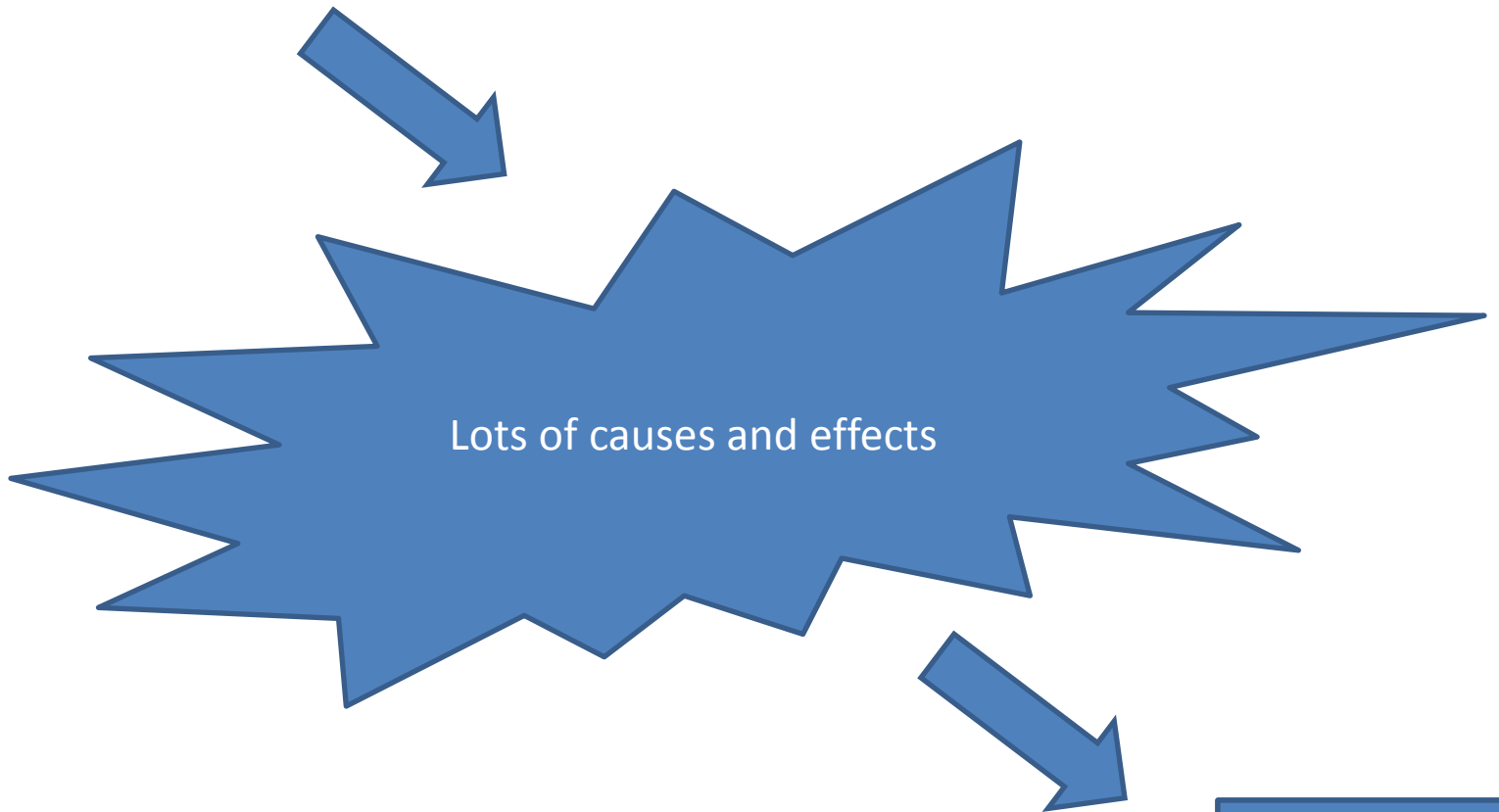
Management Actions

Chesapeake Restoration: the short version



Bay Health

Management Actions



Bay Health

Management Actions

Reduce/Readjust Loads to Meet Standards

INPUTS

BMP Data
LU Data
Point Sources Data
Septic Data
U.S. Census Data
Agricultural Census Data

MODEL-DERIVED

Airshed Model

Land Use Change Model

Precipitation Data
Meteorological Data
Elevation Data
Soil Data

SCENARIO BUILDER



WATERSHED MODEL



CHESAPEAKE BAY MODEL

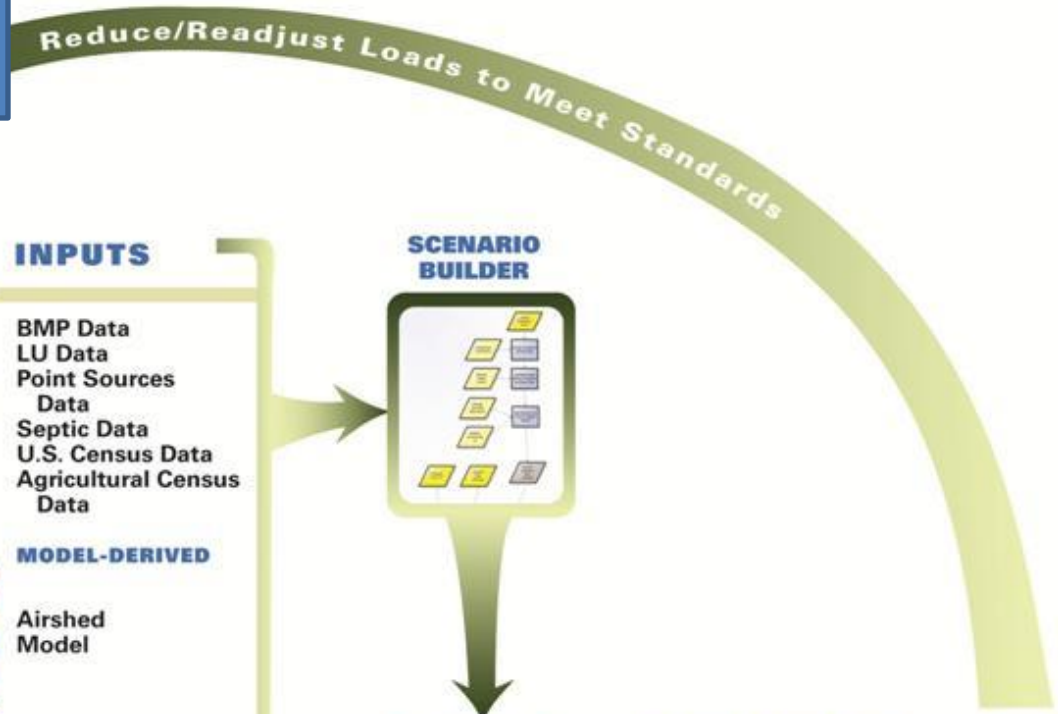


MEET WQS?



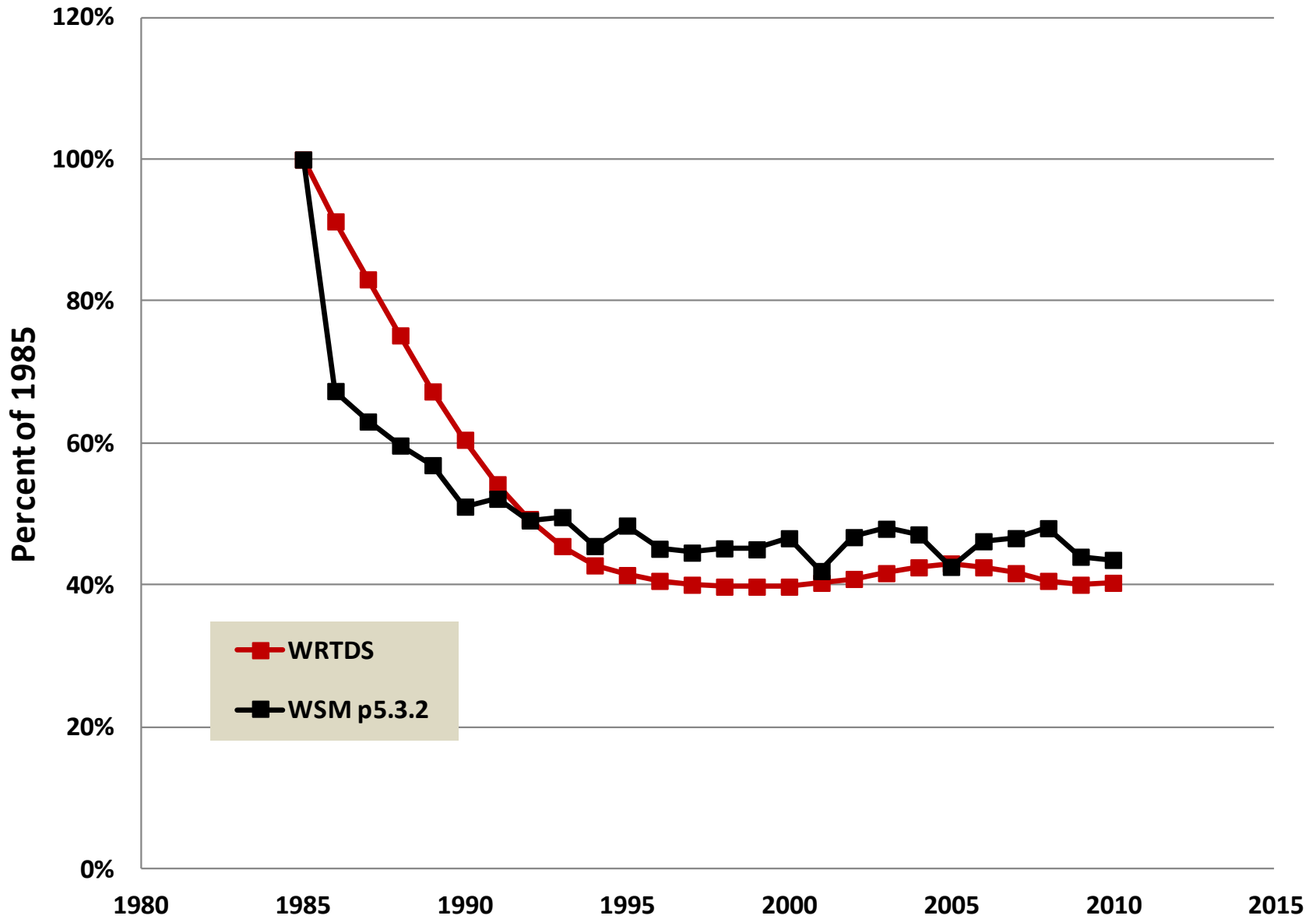
ALLOCATION METHODOLOGY

Bay Water Quality



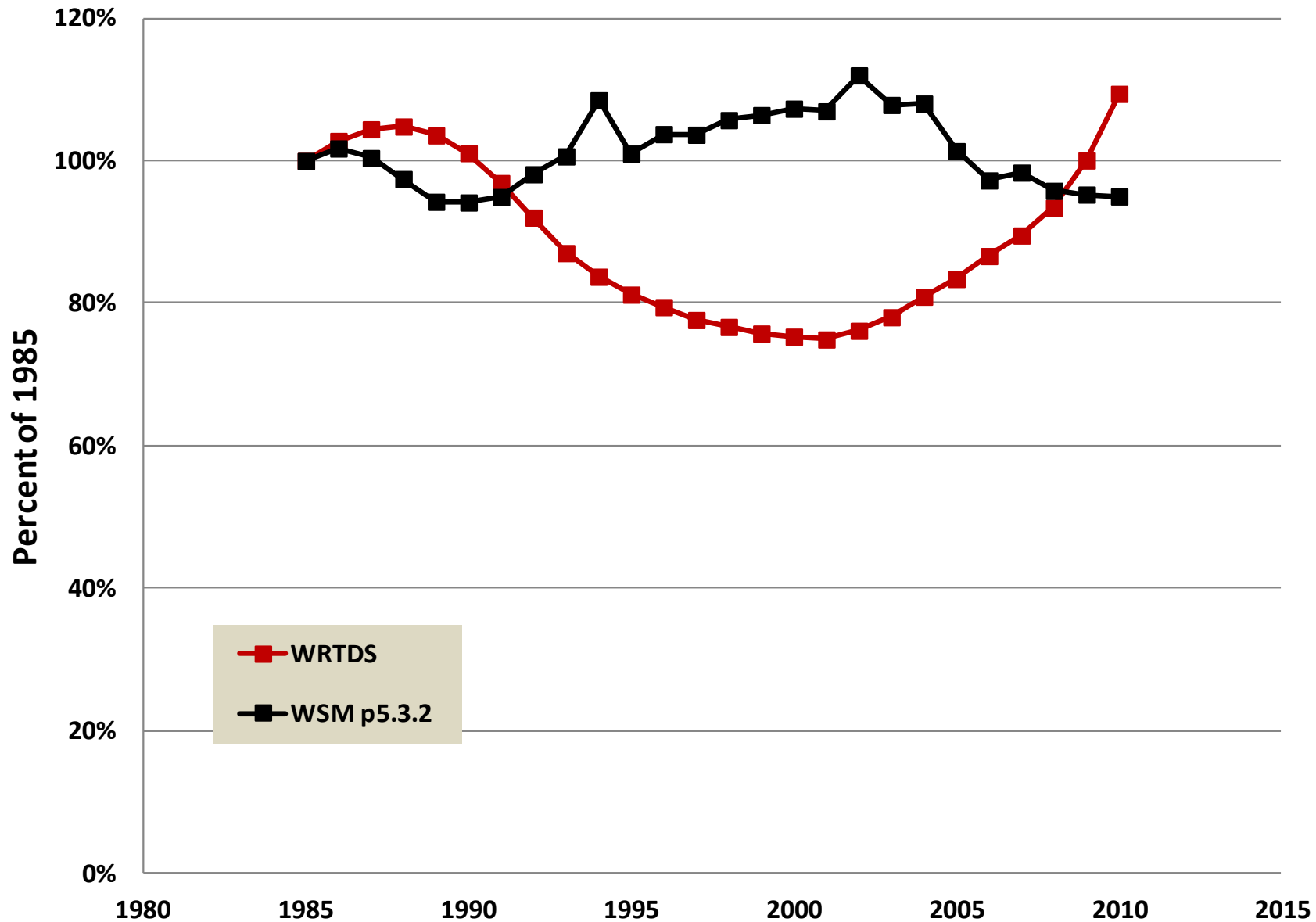
WRTDS and WSM p5.3.2 flow-normalized P flux

Patuxent



WRTDS and WSM p5.3.2 flow-normalized P flux

James



Why not more agreement?

- Unknown uncertainties of both methods
- Natural Factors More Significant
- Lag times
- BMP effectiveness information
- BMP implementation information
- Uncaptured anthropogenic effects
- Sunspots?
- ...

Management Actions

Reduce/Readjust Loads to Meet Standards

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SCENARIO BUILDER



WATERSHED MODEL



CHESAPEAKE BAY MODEL



MEET WQS?

NO
YES

ALLOCATION METHODOLOGY

Bay Water Quality



Management Actions

Reduce/Readjust Loads to Meet Standards

INPUTS

- BMP Data
- LU Data
- Point Sources Data
- Septic Data
- U.S. Census Data
- Agricultural Census Data

MODEL-DERIVED



Airshed Model



Land Use Change Model

- Precipitation Data
- Meteorological Data
- Elevation Data
- Soil Data

SCENARIO BUILDER



WATER MODEL



CHESAPEAKE BAY MODEL



MEET WQS?

NO
YES

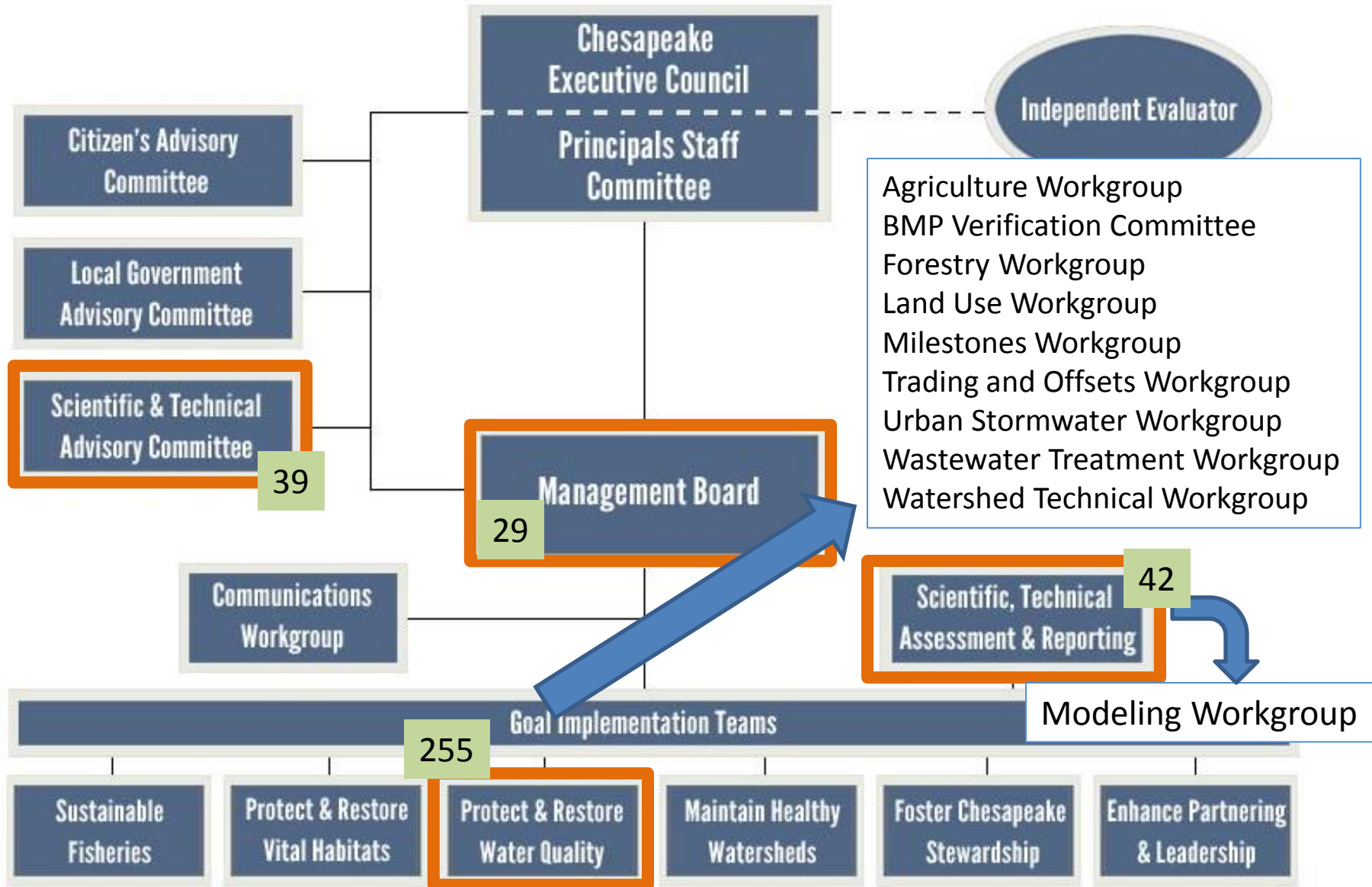
ALLOCATION METHODOLOGY

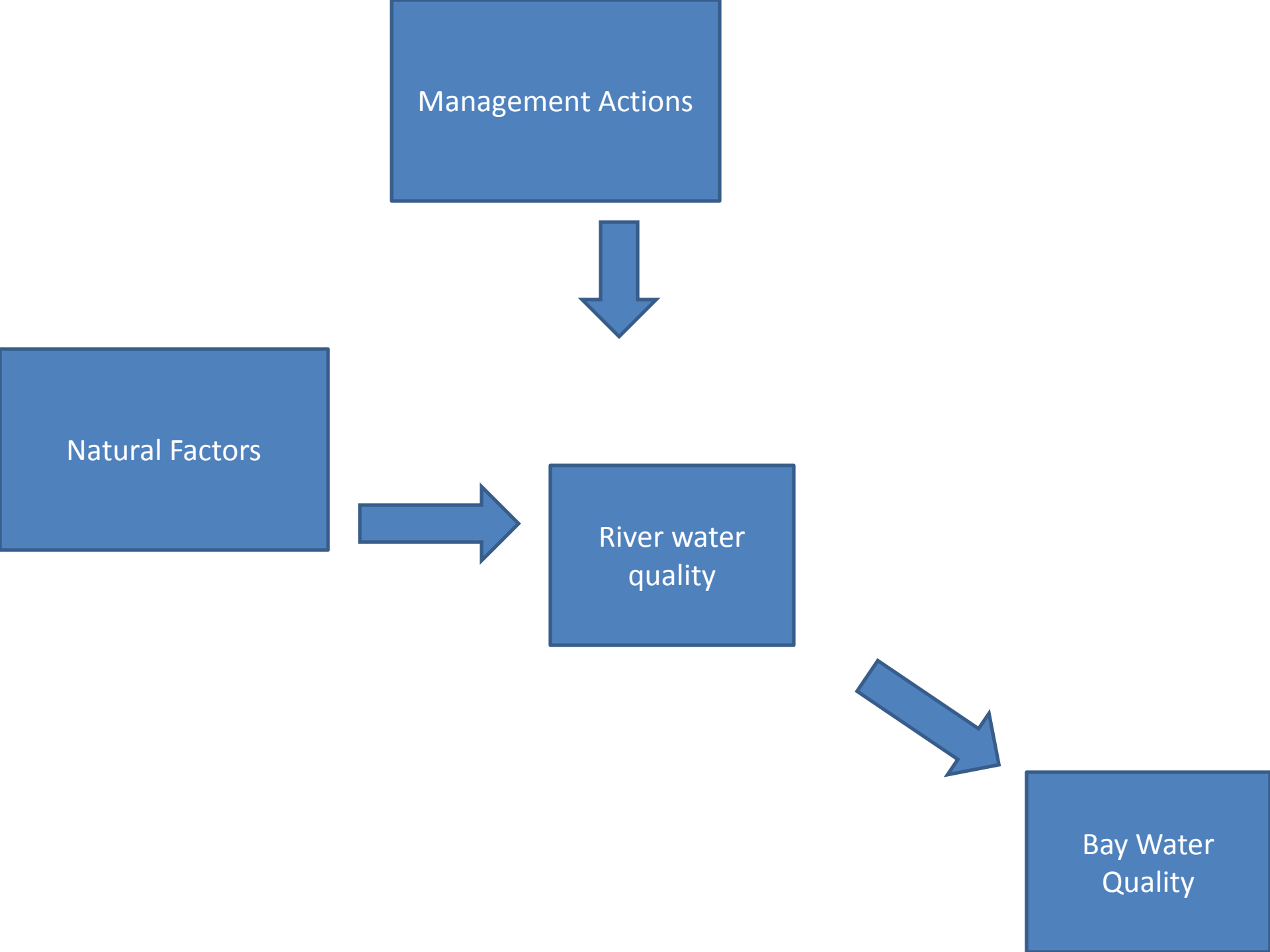
Bay Water Quality



Model related Membership as of 7/2013 – 365 individuals

Chesapeake Bay Program Partnership





Management Actions



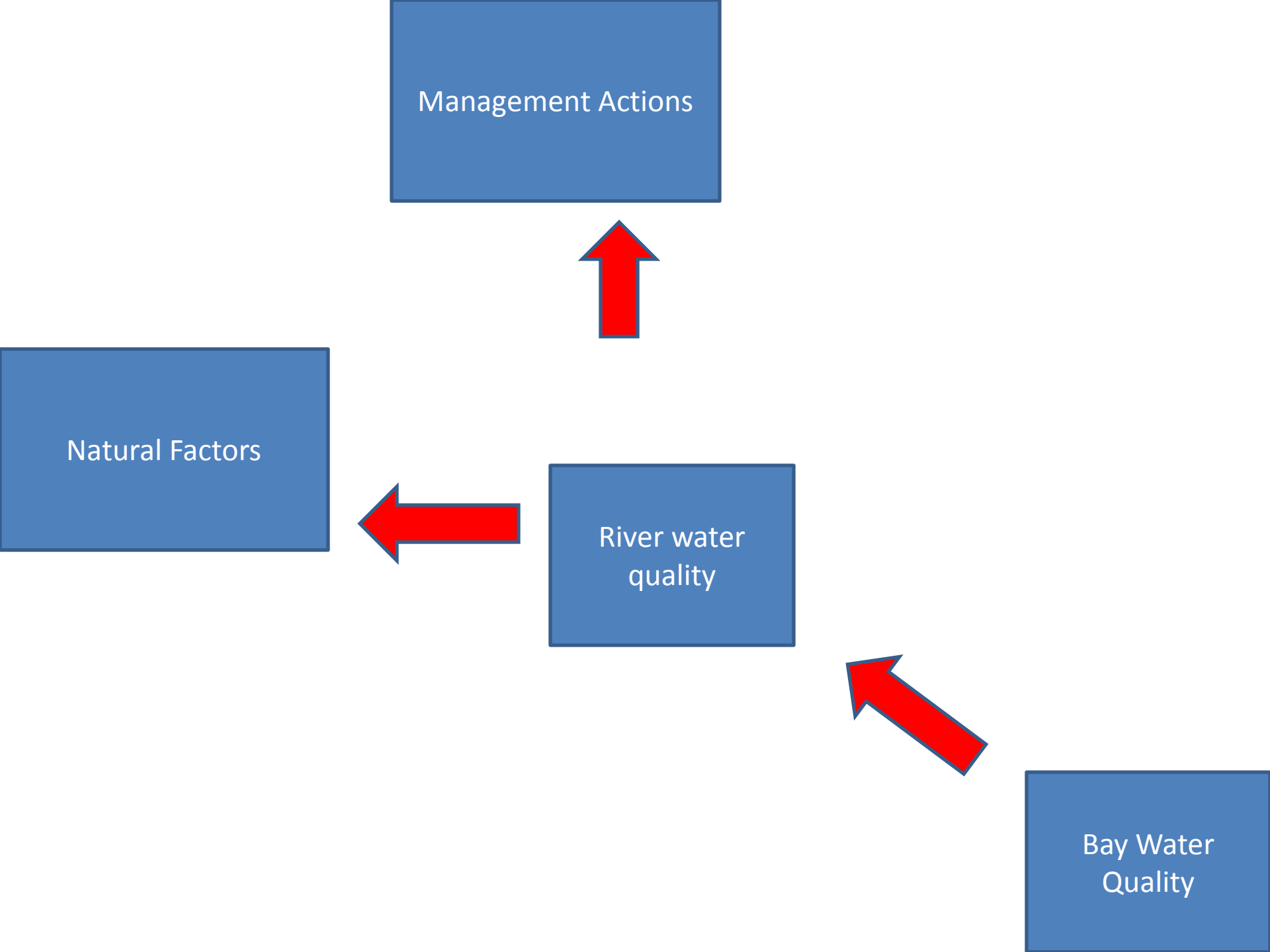
Natural Factors



River water
quality



Bay Water
Quality

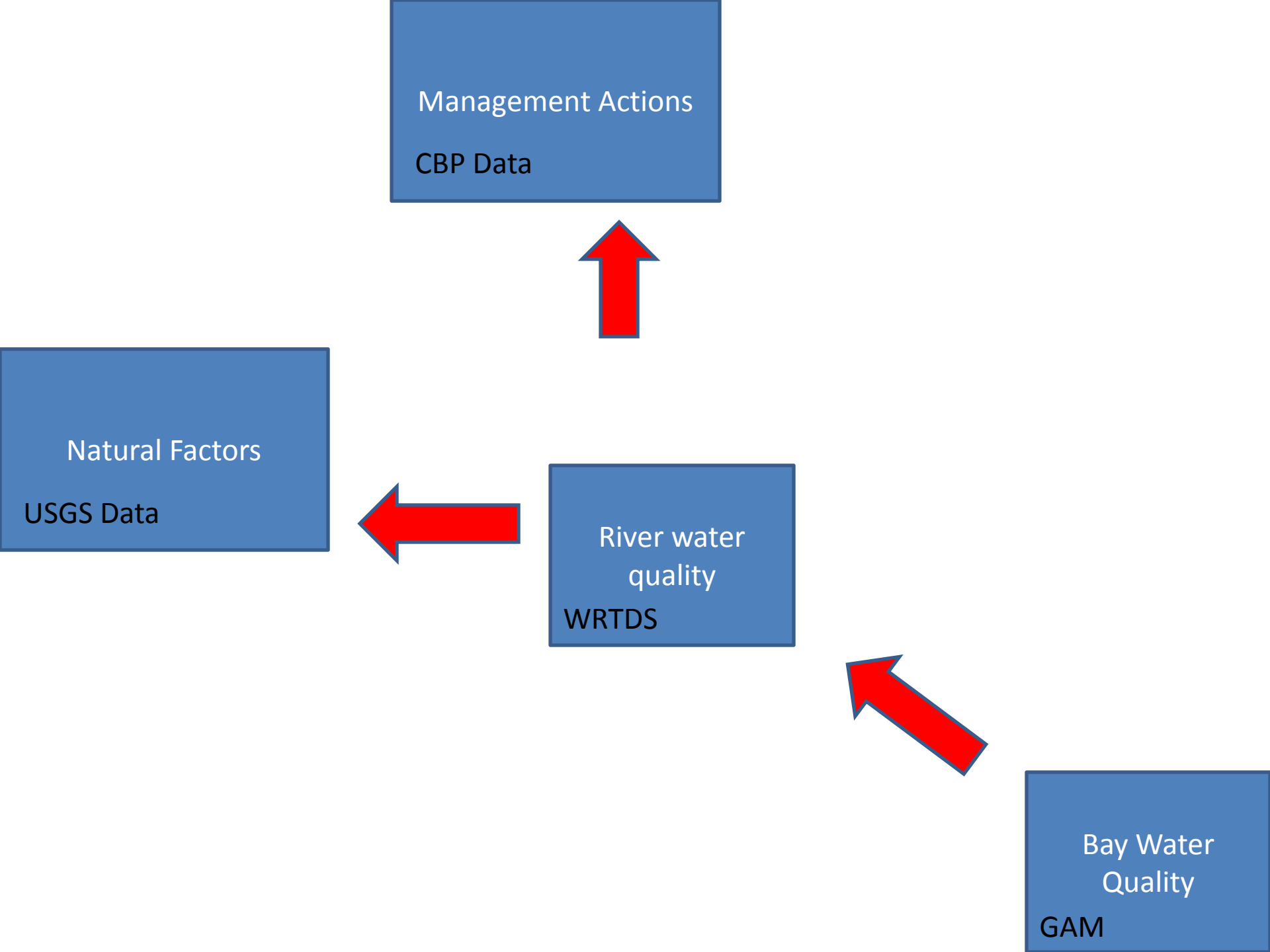


Management Actions

Natural Factors

River water
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Bay Water
Quality



Management Actions

CBP Data

Natural Factors

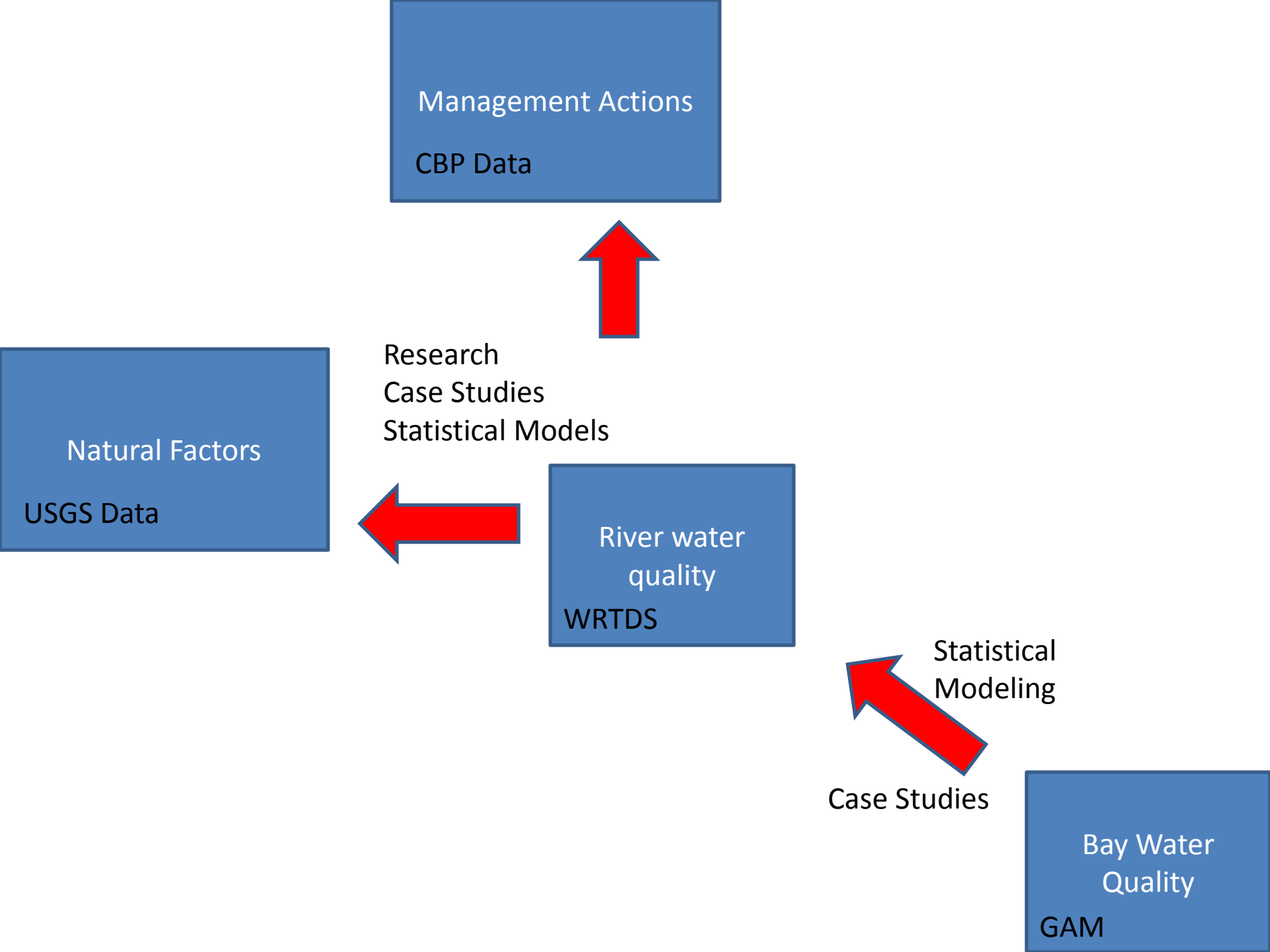
USGS Data

River water
quality

WRTDS

Bay Water
Quality

GAM



Management Actions

CBP Data

Natural Factors

USGS Data

River water
quality

WRTDS

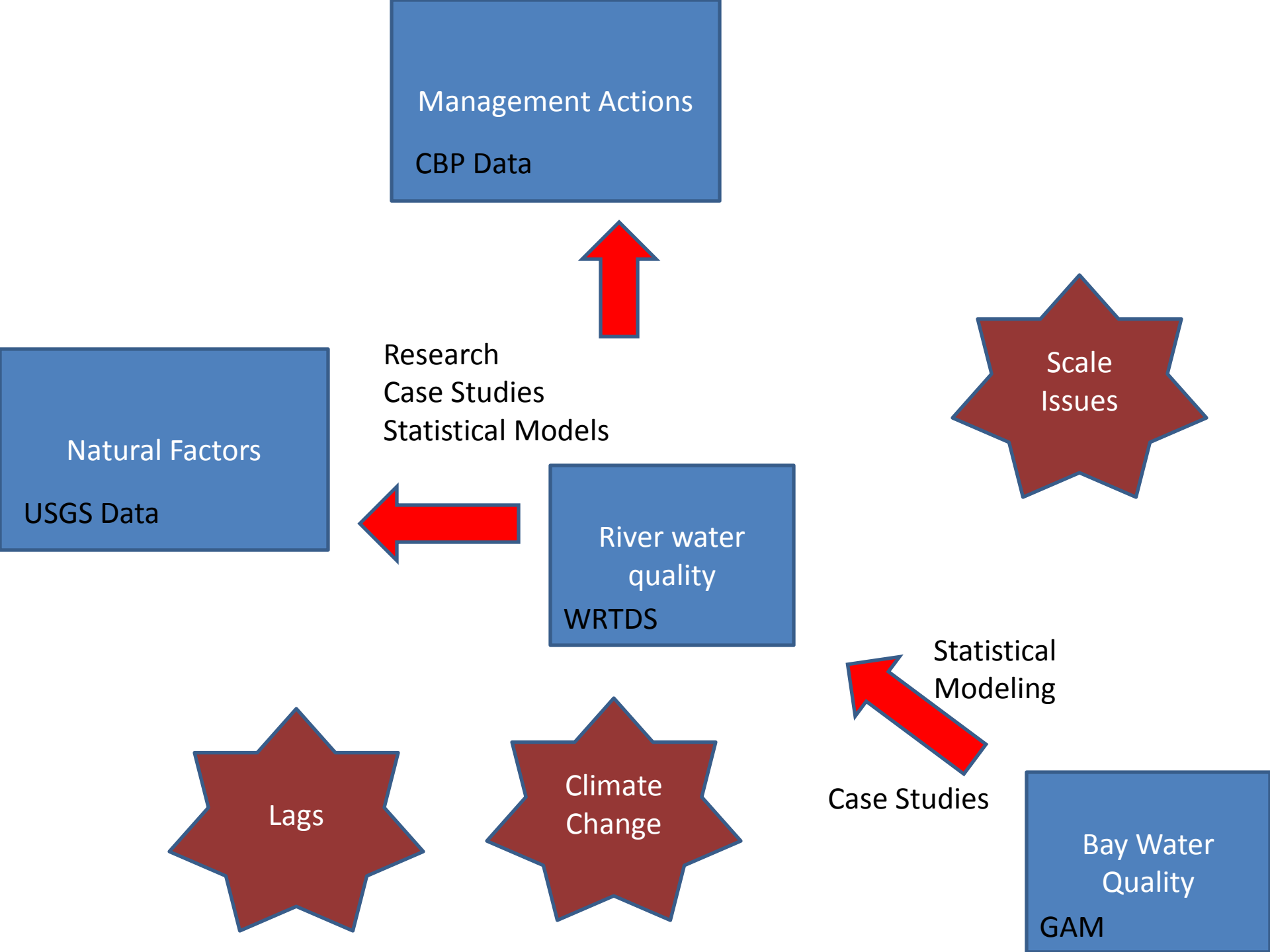
Bay Water
Quality

GAM

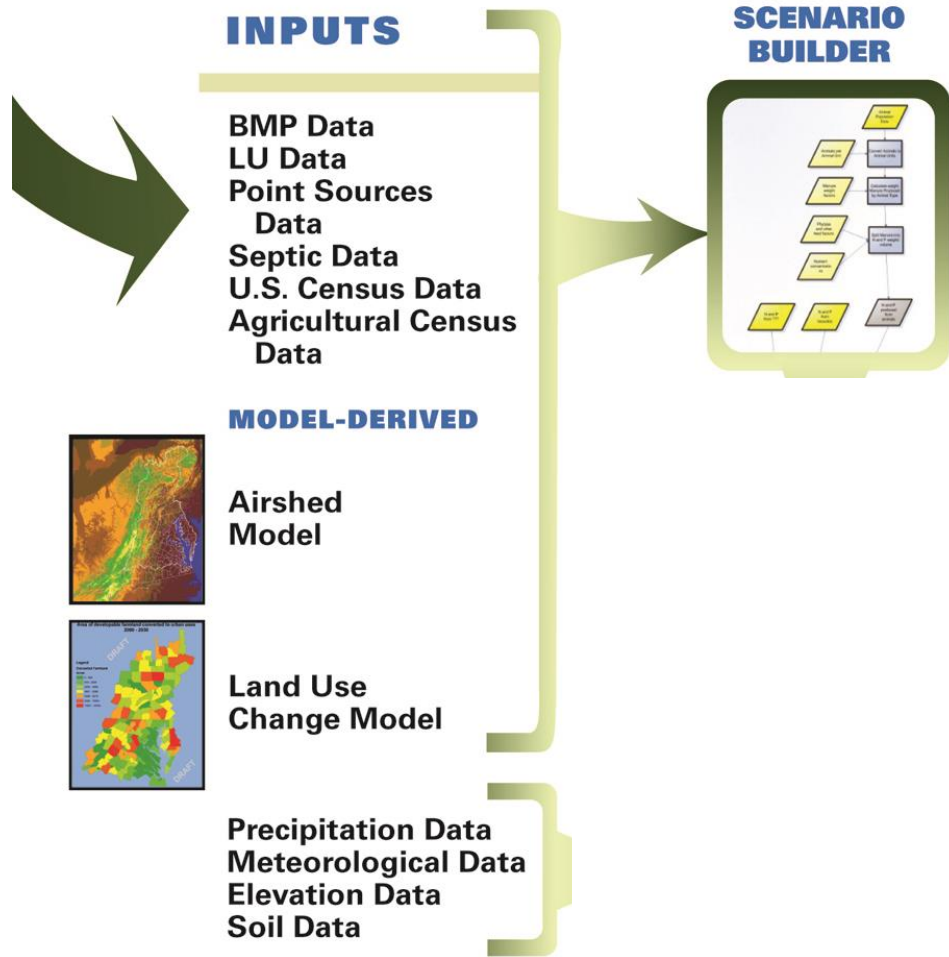
Research
Case Studies
Statistical Models

Statistical
Modeling

Case Studies



CBP Scenario Builder, land use modeling and other data systems – Tool for estimating changes to the watershed



- Land Use
- Point Sources
- Septic Loads
- Human Population
- Animal Population
- Atmospheric Deposition
- Fertilizer application
- Manure application
- Legume fixation
- Crop uptake
- Vegetative cover
- Plowing disturbance
- BMP implementation
- Physical setting information

New Insights

Christina Lyerly

- Case Studies where WQ changes have been observed
- Wastewater is rapid improvement
- Air Quality broad improvement
- Targeted Ag practices
- Multiple Urban Practices

- But...
 - Lags exist
 - Swimming upstream



 New Insights




Integration and Application Network - 73 videos

59 views

Anthropogenic Drivers

Jeff Sweeney


- Resources available from CBPO

- Atmospheric Deposition 

- Manure 

- Fertilizer 

- BMPs 



The video player shows a presentation slide with the following content:

Anthropogenic Drivers: Pollution Sources
Atmospheric Deposition of Nitrogen

- Atmospheric deposition data back to 1985
 - Monitored and Modeled
 - Wet and Dry
 - Oxidized and Reduced forms of nitrogen

The video player interface includes a progress bar at 4:57 / 18:21 and standard playback controls.

 Anthropogenic Drivers: Pollution Sources and BMPs



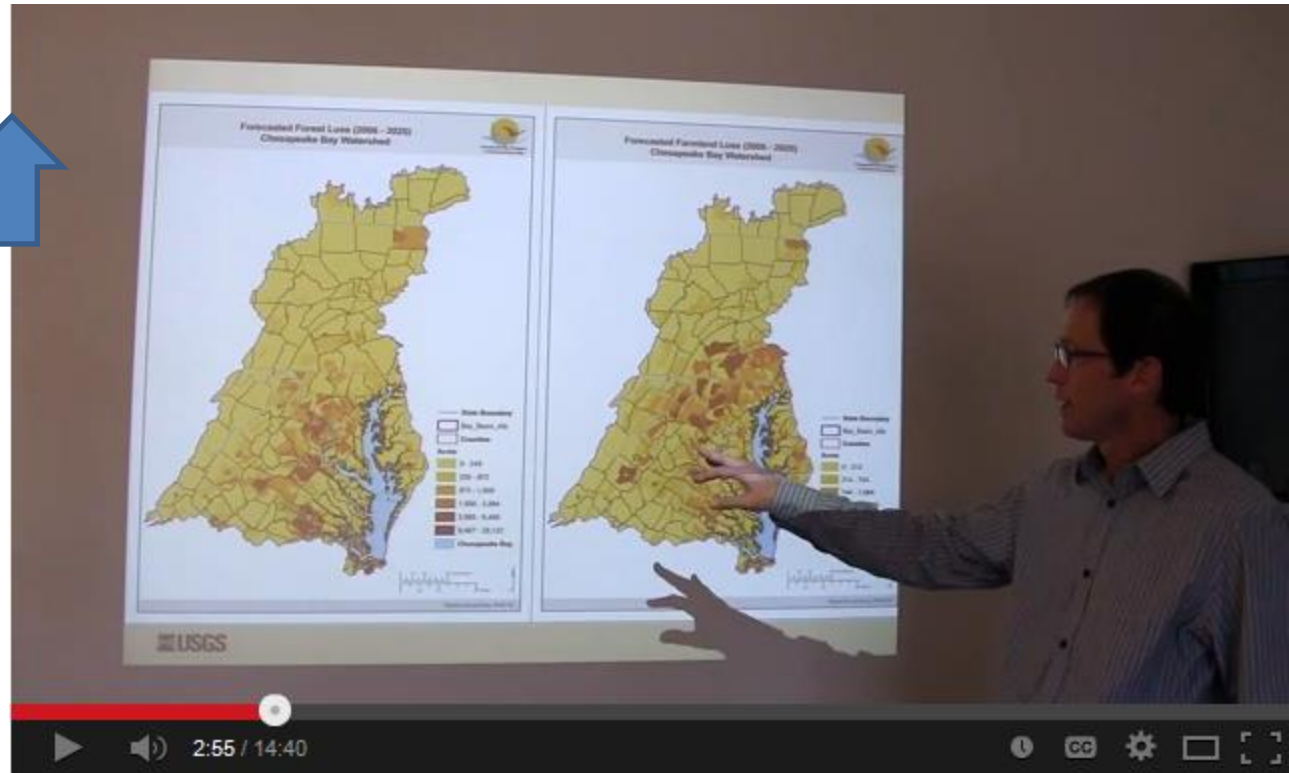
Integration and Application Network - 73 videos

57 views

Land Use

Peter Claggett

- Resources available from CBPO
- Population
- Development
- Density
- Ag
- Forest



Land Use/Land Cover Trends&Data



Integration and Application Network - 73 videos

55 views

Bay Health

Peter Tango

- Baywide trends are rare, but small areas have large changes
- DO up, then down
- Secchi down
- SAV up, then variable

Regional and Seasonal Patterns of Change
May Inform Trend Explanations

- Quantile regression application to water clarity trends
- *Region X* Season X Time dimensions of trends expressed with water clarity

Quantile Regression illustrated

Rate of Decline in the Seasonal Trend of Secchi Depth

Quantile Regression applied. C. Buchanan 2008.

Months per year

- No Change
- 100% - 14.00
- 14.00 - 18.00
- 18.00 - 22.00
- 22.00 - 26.00
- 26.00 - 30.00
- 30.00 - 34.00
- 34.00 - 38.00
- 38.00 - 42.00
- 42.00 - 46.00
- 46.00 - 50.00
- 50.00 - 54.00
- 54.00 - 58.00
- 58.00 - 62.00
- 62.00 - 66.00
- 66.00 - 70.00
- 70.00 - 74.00
- 74.00 - 78.00
- 78.00 - 82.00
- 82.00 - 86.00
- 86.00 - 90.00
- 90.00 - 94.00
- 94.00 - 98.00
- 98.00 - 100.00

SPRING SUMMER AUTUMN WINTER

3:28 / 12:02

Chesapeake Bay: Bay Health Patterns and Trends



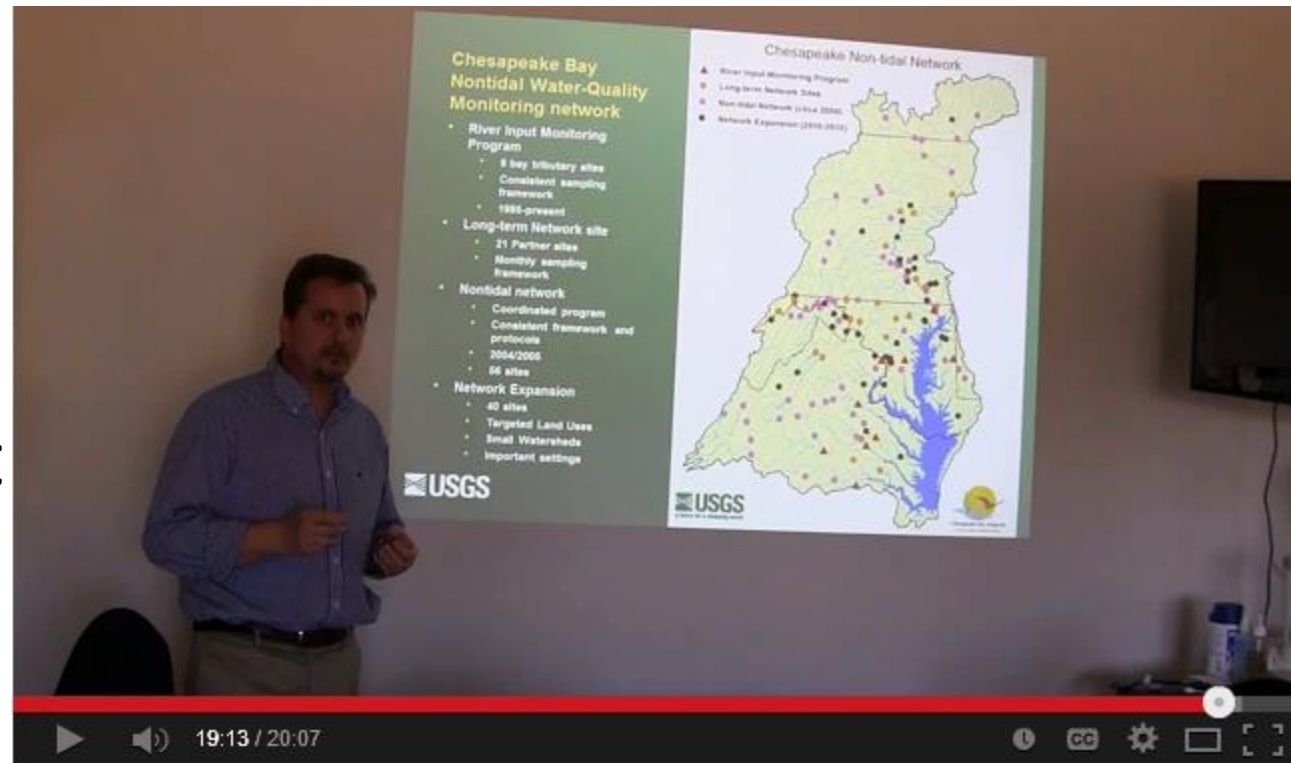
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Bay Health

Joel Blomquist

- Natural factors include
- Climate
- Geomorphology
- Lag times
- Building data at 123 sites



Introduction to the Environmental Setting and Climate Variab...



Integration and Application Network - 73 videos

28 views