



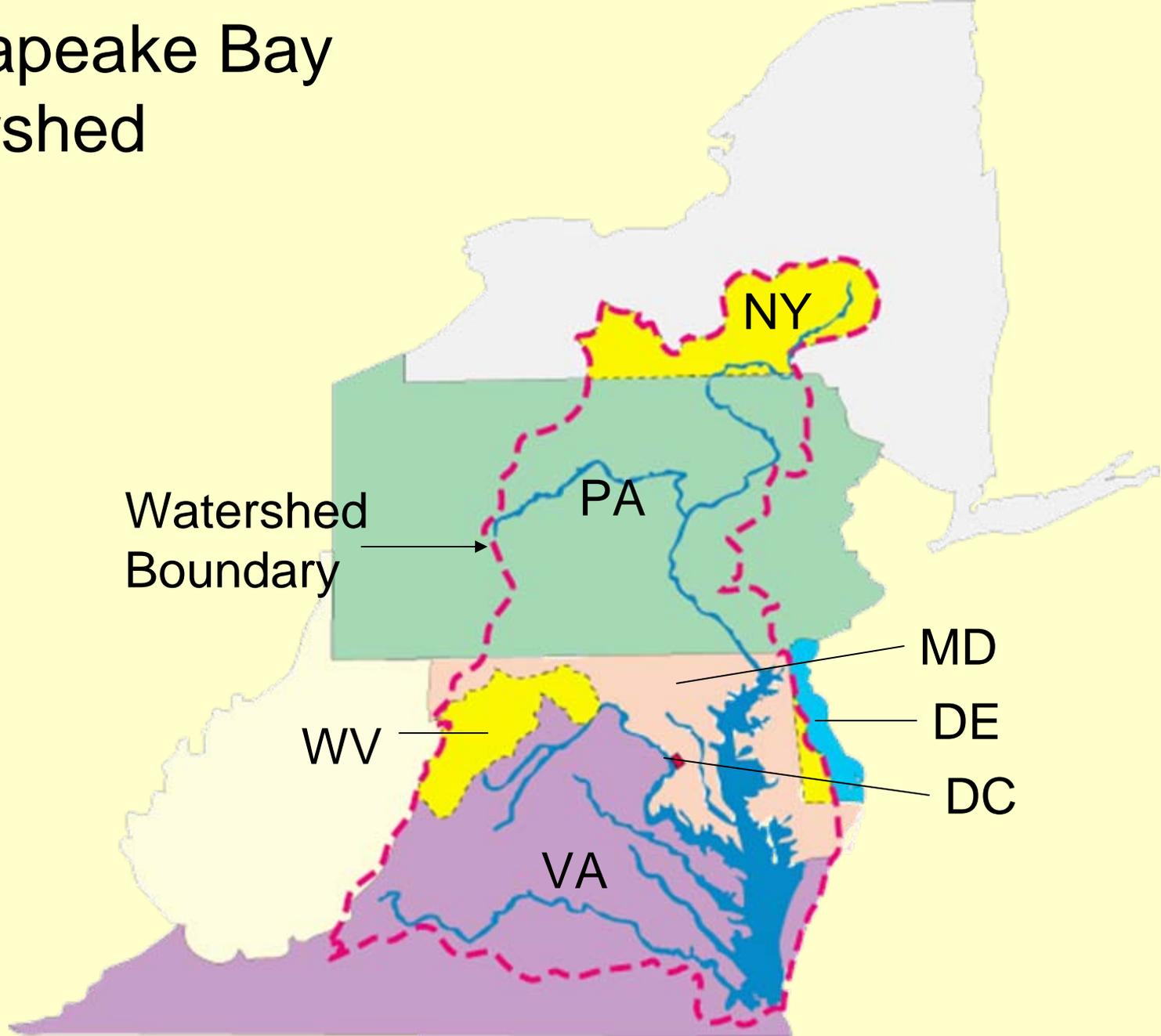
Developing BMP Effectiveness Estimates Reflective of Operational Conditions

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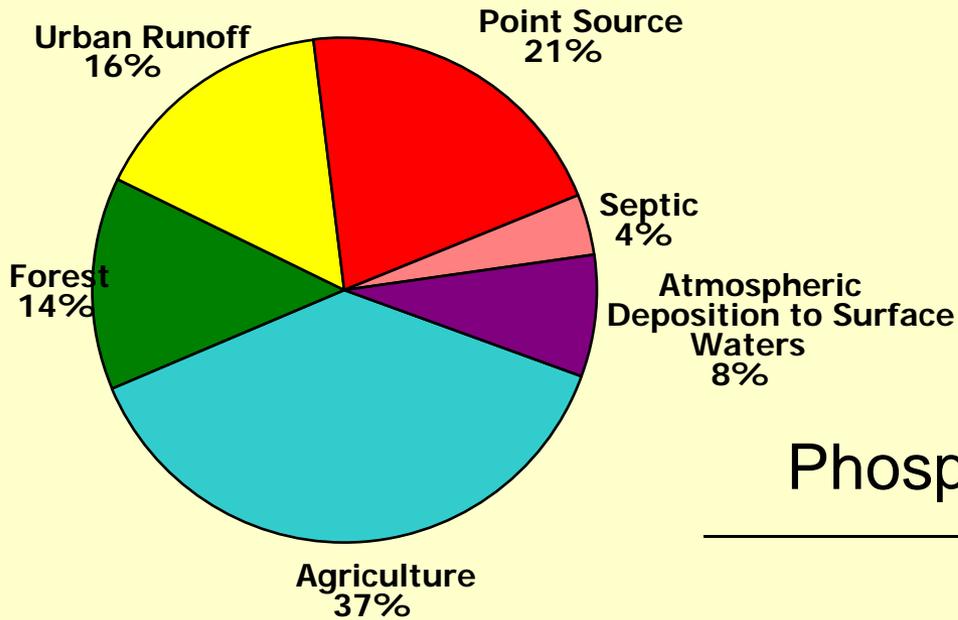
Chesapeake Bay Watershed



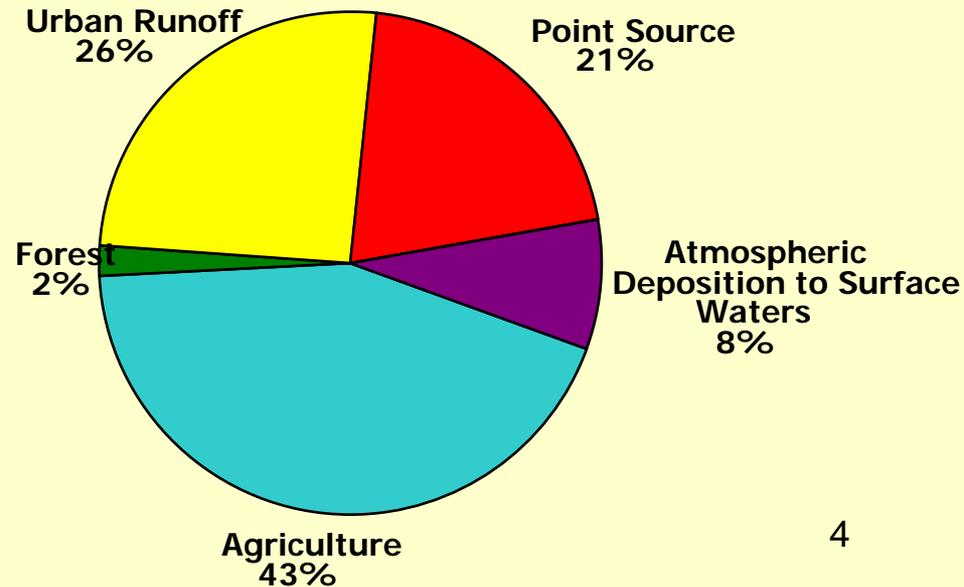
Eutrophication of Chesapeake Bay

- Nitrogen and phosphorus over enrichment causing excessive algal growth
- Limiting nutrient changes with location and season
- Hypoxic/anoxic conditions in deep water
- Limited clarity/loss of subaqueous grasses

Nitrogen Sources



Phosphorous Sources



Source: US EPA, Chesapeake Bay Watershed Model, 2004

Chesapeake Bay Program : Agreements

- 1983 - General agreement to work together to restore Bay
- 1987 –Set 40% nutrient reduction goal by 2000
- 1992 – Agreed to write tributary specific nutrient reduction strategies
- 1995 – Tributary Strategies created

Evolution of Bay Program Use of BMP Effectiveness Estimates

- In 1995, Tributary Strategy WG of Nutrient Subcommittee, adapted MD efficiencies for W/S wide use in strategy development and as a planning tool
- A few new BMPs added and revisions to definitions and efficiencies in 1997, 2000 and 2003
- BMP implementation reported annually by states and used with efficiencies to model estimated “progress”
- These progress runs evolved into the policy proclamation of progress in Bay restoration

Events Leading to BMP Review

- Realization of optimistic estimates of impacts – STAC white paper in Feb 2004
- Washington Post Article August 2004
- 5 Governmental Reviews
 - GOA
 - IG
 - EPA Internal Review
 - Two special congressional reviews

Year One BMPs

Agricultural Practices

- Field and Pasture Erosion Control Practices
- Conservation Tillage
- Off-stream Watering Practices
- Buffers
- Cover Crops

Other Practices

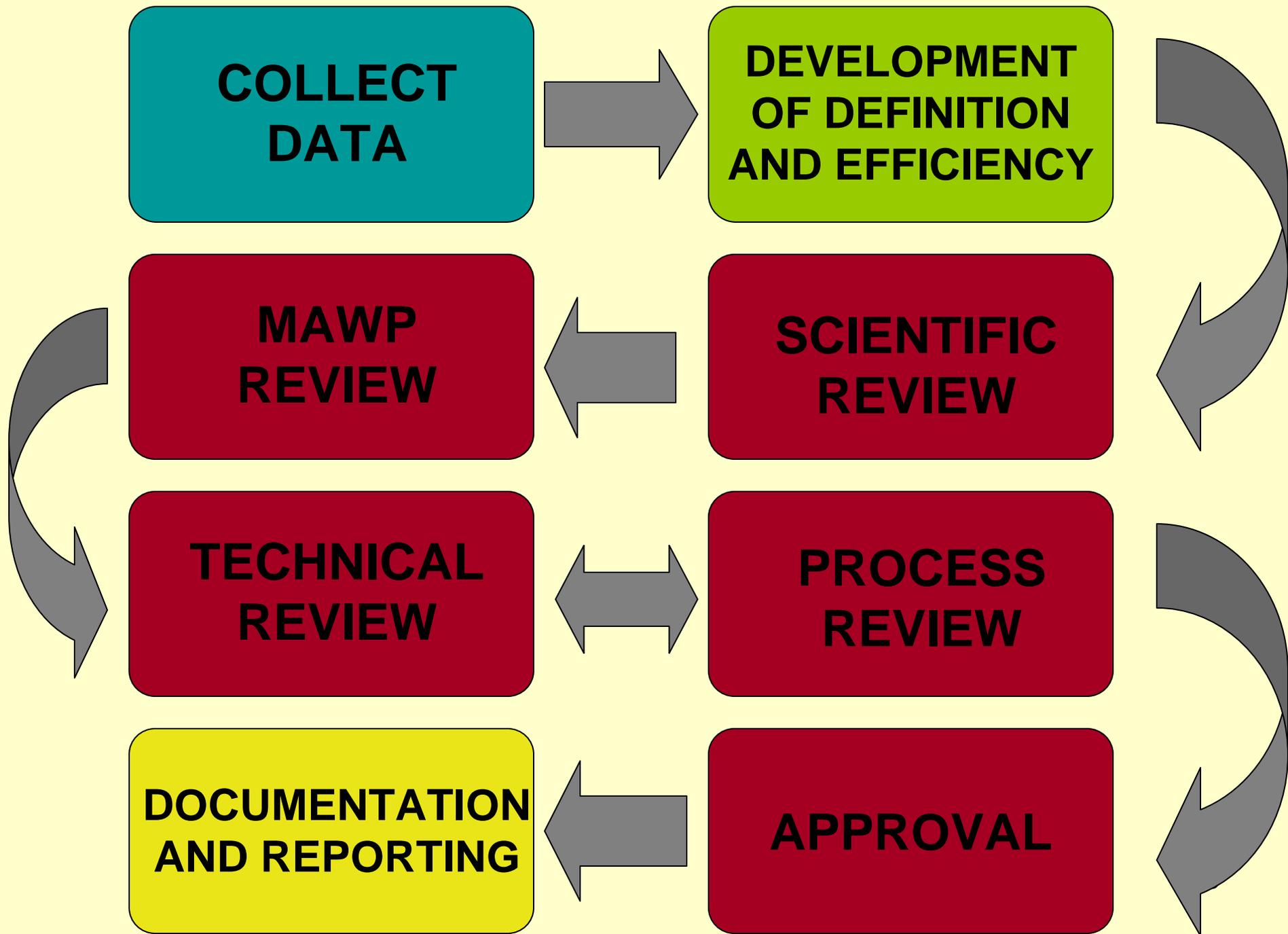
- Forest Harvesting Practices
- Wetland Restoration and Creation

Urban Stormwater Practices

- Urban wet ponds and wetlands
- Urban erosion and sediment control
- Dry detention ponds and hydrodynamic structures
- Dry extended detention basins
- Urban stream restoration

Project Objectives

- Provide thorough documentation of all literature and decisions used in definition and effectiveness development
- To estimate the effectiveness of practices representative of average operational watershed wide pollution reduction benefits
- To implement an adaptive management approach



Data – Scientific Literature Search

- Scientific literature abstracting services
- Topic specific databases
- Journal archives
- Mississippi River Basin Advisory Panel bibliography
- Managing agricultural landscapes for environmental quality conference
- Gray literature – State stormwater manuals
- Any materials provided by experts, advisors or reviewers
- Literature or other data submitted by Workgroups
- NRCS Data

Articles were reviewed and screened for applicability, usefulness and quality.

Collect Information on Adjustment Factors

Searched for data on following factors that affect efficiencies:

- Research vs operational scale
- Spatial and temporal variability
- Soils, surface and subsurface flow patterns, and other natural site characteristics
- Size (width, length)
- Upland land use changes
- Species composition
- BMP age and time to maturity; phased in implementation
- Climate, seasonal changes
- BMP management level

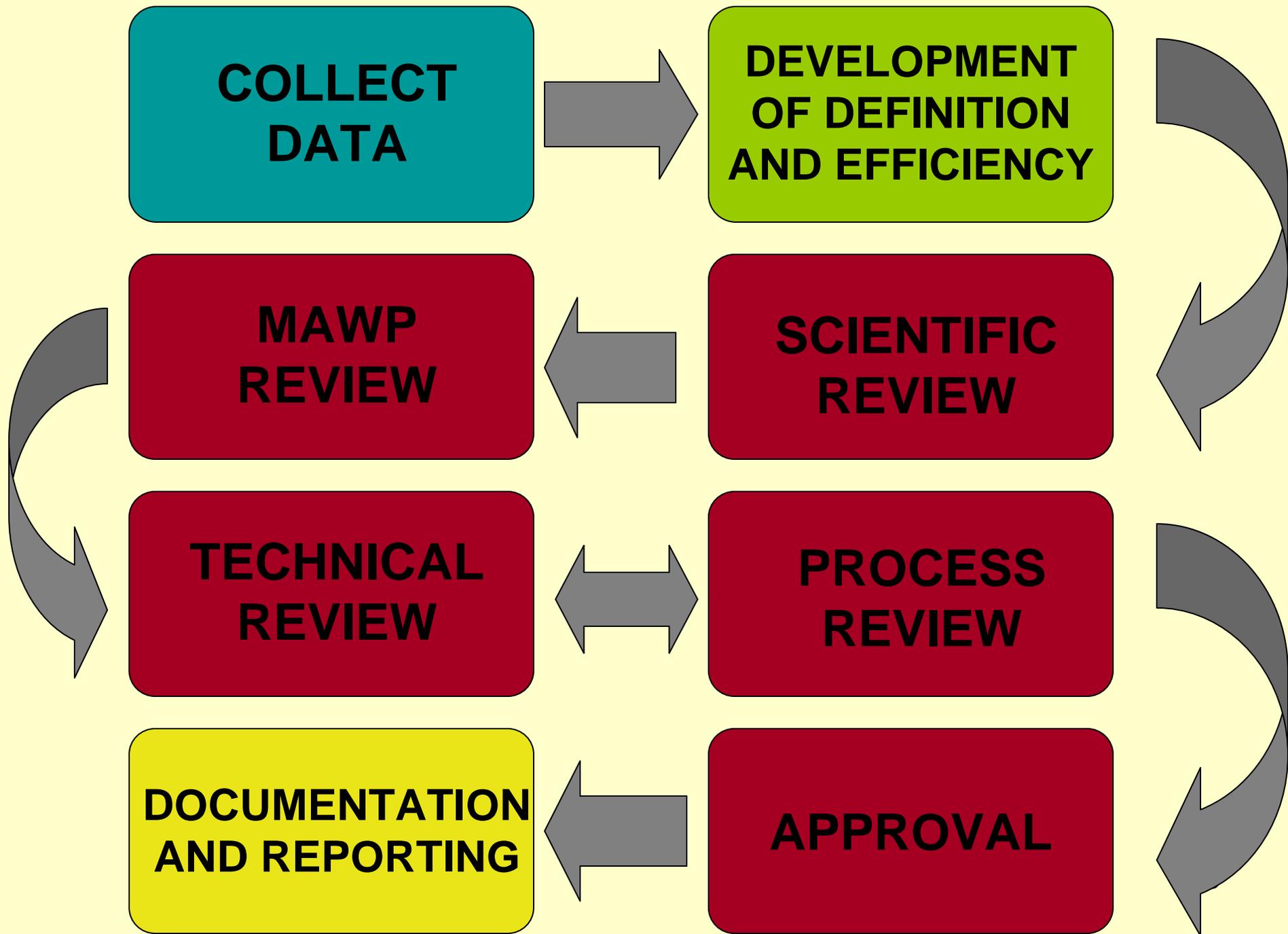
Did not try to assess implementation (level or degree), replacement or tracking and reporting (needs to be done)

Development of BMP by Expert

- Scientists with expertise on specific BMPs took the lead in drafting practice definitions and proposing efficiencies.
- Template provided to experts
 - Picture
 - Definition(s)
 - Effectiveness Estimates for TN, TP and TSS
 - Adjustments for watershed wide implementation
 - Statement of Conservatism
 - References
 - Future Research Needs

Scientific Review

- Utilized scientists to review reports developed by experts
- Reviewed reports for:
 - Applicability of data used in development
 - Accuracy of definition and effectiveness estimates
 - Usefulness of approach used by expert (one estimate versus regional breakouts)



MAWQ/UMD- Criteria for Developing Effectiveness Estimates

- Efficiency recommendations should reflect operational conditions
- Studies with negative efficiencies were included in the efficiency development process
- Peer reviewed literature given more weight than literature that has not undergone the same review process
- Data from individual BMP project sites were utilized over median or average values calculated from multi-site analysis

Chesapeake Bay Program Review

- Source Area Workgroup Review: Determine if tracking and reporting data needed to receive credit was available in each jurisdiction. Reviewed report to ensure all pollution reduction mechanisms the BMP provides was captured by the definition and effectiveness estimate
- Tributary Strategy Workgroup Review: Analyzed reports for modeling components
- Nutrient Subcommittee Review: Conducted ranking exercise across sectors
- Water Quality Steering Committee Review: Ensured consensus among all parties and then approved BMP definitions and estimates

During CBP review meet resistance to criteria

- Eliminate negative efficiencies from estimation
- Use multi-site analysis over single site/Rely on design standards/manuals for estimation
- Utilize research scale numbers for operational conditions
- Match effectiveness estimates with program implementation dollars

Scientific and Technical Advisory Committee (STAC) Process Review

- The Chesapeake Bay model must be calibrated to function with operational rather than research BMP efficiencies.
- Hence, if reported negative efficiencies reflect operational conditions, they should be considered in an assessment of the BMP efficiency literature.
- Peer-reviewed literature has more credibility than design standards/manuals which have not been subjected to independent examination.

Lessons Learned and Refinements to Year Two Process

- Technical issues should be identified in the beginning of the development process
- Include a detailed data applicability section
- More scientists are needed during the review process
- Decision Matrix - Justification of the magnitude of adjustments during oversight of experts recommendations

Conclusions

- Have much better understanding of BMPs, definitions and efficiencies
- Review was needed for a long time
- Proposed definitions and effectiveness estimates are more accurate, realistic and defensible than current ones
- Many BMP specific experts involved
- Adjustments may cause some reduction in modeled BMP implementation progress

This is a working adaptive management approach and should be repeated in 3 to 5 years