



Achieving Nutrient and Sediment Reduction Goals in the Chesapeake Bay

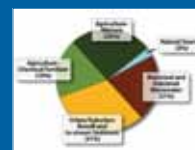
An Evaluation of Program Strategies and Implementation

Introduction



The NRC Study Tasks

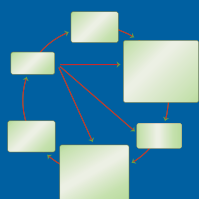
Tracking and Accounting



Two-Year Milestones



Adaptive Management



Strategies for Meeting Goals



Summary





Photo credit: Ben Schumin, Wikimedia Commons

Achieving Nutrient and Sediment Reduction Goals in the Chesapeake Bay

An Evaluation of Program Strategies and Implementation

Recovery of the Chesapeake Bay from the ecosystem disruption caused by excess nutrient and sediment inputs, primarily from agriculture, urban runoff, wastewater, and air pollution, will require profound changes in the management of resources in the Bay watershed.

In recent years, the Chesapeake Bay Program has taken important steps to enhance the accountability of its partner jurisdictions, for example by establishing two-year milestones for progress. However, numerous issues affect the consistency and accuracy of the tracking and accounting of nutrient reduction practices. Opportunities exist to improve tracking and accounting and to support applications of adaptive management. Because public support is vital for sustaining the program, it is important to help the public understand lag times and uncertainties associated with water quality improvements and to develop program strategies to better quantify them.

Introduction

In July 2009, the EPA requested that the National Research Council (NRC) evaluate and provide advice on the Chesapeake Bay Program's (CBP's) nutrient reduction program and strategy. The NRC formed a committee of nine volunteers that was charged to address the statement of task questions below. The committee met four times in 2009–2010 and released its report in May 2011. The conclusions highlighted here reflect the consensus findings of the committee.

Statement of Task

Tracking and Accountability

1. Does tracking of nutrient and sediment pollution best management practices appear to be reliable, accurate, and consistent?
2. What tracking and accounting efforts appear to be working, and not working, within each jurisdiction, including federal program implementation and funding? How can the system be strategically improved to address the gaps?
3. How do these gaps and inconsistencies appear to impact reported program results?

Milestones

4. Is the two-year milestone strategy, and its level of implementation, likely to result in achieving the CBP nutrient and sediment reduction goals for this milestone period?
5. Have each of the jurisdictions and the federal agencies developed appropriate adaptive management strategies to ensure that CBP nutrient and sediment reduction goals will be met?
6. What improvements can be made to the development, implementation, and accounting of the strategies to ensure achieving the goals?

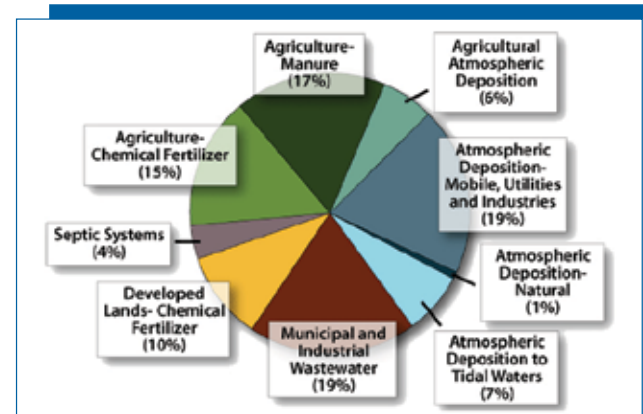
Tracking and Accounting

Summary

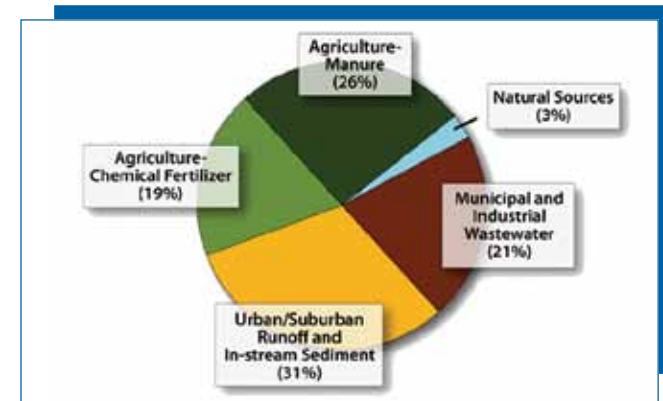
- Tracking nutrient and sediment control practices is of paramount importance because the CBP relies upon the data to estimate current and future loads.
- Numerous issues affect accuracy and consistency of tracking and accounting (e.g., not all practices tracked in all jurisdictions; limited verification, particularly for BMP maintenance; voluntary practices rarely tracked).
- Tracking and accounting approaches (and their associated accuracy) vary across the Bay jurisdictions. Third-party auditing would be necessary to ensure reliability and accuracy of the state and local data.
- The committee was unable to quantify the magnitude or likely direction of error caused by reporting issues because some tracking issues lead to under-accounting and others to over-accounting.
- CBP and the Bay jurisdictions are making strides toward improved reporting, but states and localities are struggling with the large task and limited resources.

Strategies to Improve Tracking and Accounting

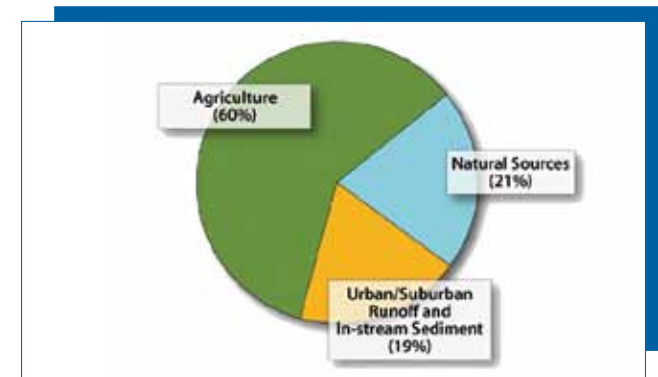
- A consolidated regional BMP program to increase geo-referencing and tracking voluntary practices.
- Targeted monitoring programs in subwatersheds to refine BMP efficiency estimates.
- Additional EPA guidance on the optimal extent of field verification in relation to expected benefits.
- More timely mechanisms for reporting and synthesizing progress. With electronic reporting, some states wait 9+ months for a summary of BMP implementation progress.



Sources of nitrogen to the Chesapeake Bay



Sources of phosphorus to the Chesapeake Bay



Sources of sediment to the Chesapeake Bay

NOTES: Based on model simulations using the Watershed Model Phase 4.3 and the Airshed Model, considering land use and pollution control measures in place as of 2007. The data reflects the average output when simulated over 14 years of hydrologic record and does not include loads from the ocean or tidal shoreline erosion. Wastewater loads are based on measured discharges.

SOURCE: CBP. 2010.

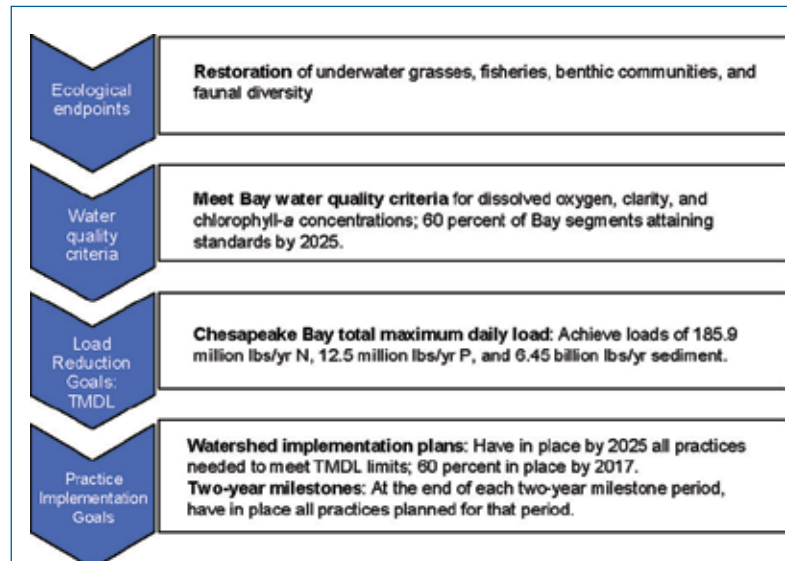
Two-Year Milestones

Strategy

- The two-year milestone strategy is an improvement on past strategies because it commits jurisdictions to tangible, near-term implementation goals and improves accountability. The milestone strategy also specifies contingencies for mid-course corrections.
- However, the strategy does not guarantee goals will be met, and the consequences for nonattainment are unclear.
- Without timely updates and synthesis of progress, most jurisdictions lack data necessary to make appropriate mid-course corrections.

Implementation

- The first milestone represents ~21–22% of total targeted N and P reductions, and jurisdictions reported mixed progress (based on July 2009+ reporting).
- However, the data were insufficient to meaningfully evaluate implementation progress, because N and P load reduction data associated with the practices implemented were not available.
- The first milestone will likely be the easiest to achieve because the jurisdictions are logically seizing the low-hanging fruit, and some jurisdictions are counting previously uncaptured practices.

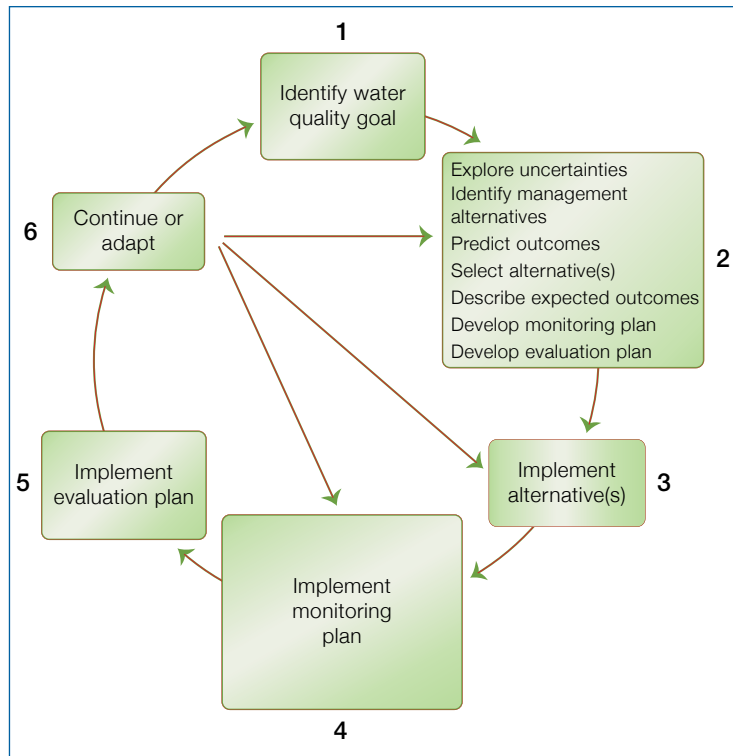


Integration of the goals and strategies used in the CBP, including two-year milestones and the TMDL accountability framework.



Photo credit (bottom): chelle, morgueFile.com

Adaptive Management



Stylized adaptive management strategy, with the size of the box proportional to the amount of effort required. The planning and monitoring steps (Steps 2 and 4) typically require the greatest attention for successful adaptive management.

Assessment

- Adaptive management represents a strategy for moving forward despite uncertainty through targeted management tests, deliberate monitoring programs, and mechanisms to incorporate learning to improve future decisions.
- Neither the EPA nor the jurisdictions exhibit a clear understanding of adaptive management and how it might be applied in pursuit of water quality goals. The two-year milestone strategy is best characterized as a trial-and-error process, in which learning is serendipitous rather than an explicit objective.

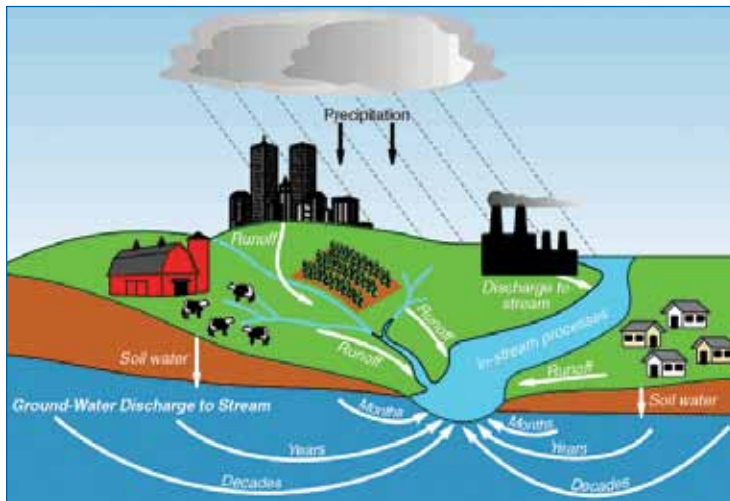
Elements for Successful Adaptive Management

- Careful assessment of uncertainties relevant to decision making. However, the CBP has not fully analyzed uncertainties inherent in nutrient and sediment reduction programs.
- Deliberate monitoring efforts designed to address key uncertainties associated with selected management alternatives.
- Additional federal actions that could support adaptive management in the CBP:
 - Federal adaptive management guidance and examples,
 - Modifications to the federal accountability framework, with explicit language that failures resulting from genuine adaptive management efforts will not be penalized, and
 - Flexibility in regulatory and organizational structure, including the TMDL.



Strategies for Meeting Goals

- Success in meeting CBP goals will require attention to the consequences of future population levels, development, agricultural production, and climate dynamics in the Bay watershed.
- Helping the public understand lag times and uncertainties associated with water quality improvements and developing program strategies to quantify them are vital to sustaining public support for the program, especially if near-term Bay response does not meet expectations.
- Establishing a Chesapeake Bay modeling laboratory would ensure that the CBP has access to a suite of models at the state of the art and could help build credibility with the scientific, engineering, and management communities and better integrate modeling and monitoring.



Age of groundwater draining to the Chesapeake Bay

SOURCE: Phillips and Lindsey (2003).

To reach the long-term (2025) nutrient and sediment load reduction goals, Bay jurisdictions and the federal government will need to consider a wide range of possible strategies, including some that are receiving little, if any, consideration today. The committee identified potential strategies that are not being implemented to their full potential or that may have substantial, unrealized potential in the Bay watershed. These include:

Agriculture

- Improved and innovative manure management
- Incentive-based approaches and alternative regulatory models

Urban

- Regulatory models that address stormwater, growth and development, and residential fertilizer use.
- Enhanced individual responsibility (e.g., low-impact design, residential stormwater controls, maintaining septic systems, changing diets).

Cross Cutting

- Additional air pollution controls on NO_x and agricultural ammonia emissions.

Summary

- Reaching long-term load reduction goals will require substantial commitment and some level of sacrifice from those who live and work in the watershed.
- The CBP has taken important steps toward improving the pace of implementation and accountability by establishing the two-year milestones.
- However, issues affect the consistency and accuracy of tracking and accounting of practices.
- Successful applications of adaptive management will benefit from additional guidance and flexibility.
- To reach the long-term CBP goals, Bay partners will likely need to consider innovative strategies, including some that are receiving little attention today.
- Quantifying and communicating lag times associated with nutrient legacy effects will be essential to sustain public support.

The full report is available for downloading from the National Academies Press, www.nap.edu.



SOURCE: CBP (2008)

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