Measuring Progress for Continued Improvement

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Corresponding EPA Manual Chapter(s): 12 & 13
12. Design Implementation Program and Assemble Watershed Plan

Chapter Highlights

- Information/education component
- Schedule for implementation
- Milestones
- Criteria to measure progress
- Monitoring component
- Financial and technical resources needed
- Evaluation framework
- Assembling watershed plan
12.2 Information/Education Component

• Gets the public involved
• Allows voluntary management measures
• Sustains use of plan
• Educates and changes behavior
12.2 Information/Education Component

Awareness, Education, Action

Six Steps to an I/E Program:

1. Define I/E goals and objectives.
2. Identify and analyze the target audiences.
3. Create the messages for each audience.
4. Package the message to various audiences.
5. Distribute the messages.
6. Evaluate the I/E program.
12.3 Establish an Implementation Schedule

- Turn goals and objectives into specific tasks
- Include a timeline of each phase of the step
- Identify the responsible agency/organization
- Break schedule into increments to track and review
- Obtain the input of those with previous experience
- Note sequence or timing issues that must be coordinated to keep tasks on track.
12.4 Develop Interim Measurable Milestones

What do you want to accomplish by when?

- Short-term (1 to 2 years)
- Mid-term (2 to 5 years)
- Long-term (5 to 10 years or longer)

Consider your priorities, staffing, costs – in NJ, always be aware of permitting issues!
12.5 Establish Criteria to Measure Progress toward Meeting Water Quality Standards and Other Goals

Table 12-1. Example Indicators to Measure Progress in Reducing Pollutant Loads

<table>
<thead>
<tr>
<th>Issue</th>
<th>Suite of Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eutrophication</td>
<td>• Phosphorus load&lt;br&gt;• Number of nuisance algae blooms&lt;br&gt;• Transparency of waterbody or secchi depth&lt;br&gt;• Frequency of taste and odor problems in water supply&lt;br&gt;• Hypolimnetic dissolved oxygen in a lake or reservoir&lt;br&gt;• Soil test phosphorus in agricultural fields</td>
</tr>
<tr>
<td>Pathogens (related to recreational use)</td>
<td>• Bacteria counts&lt;br&gt;• Compliance with water quality standards (single sample or geometric mean)&lt;br&gt;• Number and duration of beach closings&lt;br&gt;• Number of shellfish bed openings&lt;br&gt;• Incidence of illness reported during recreation season</td>
</tr>
<tr>
<td>Sediment</td>
<td>• Total suspended solids concentration and load&lt;br&gt;• Raw water quality at drinking water intake&lt;br&gt;• Frequency and degree of dredging of agricultural ditches, impoundments, and water supply intake structures</td>
</tr>
</tbody>
</table>
12.6 Develop a Monitoring Component

- Track and evaluate the effectiveness of your implementation
- Provide the data necessary to satisfy all relevant management objectives
- Monitoring objectives drive designs, sites, parameters, and sampling frequencies
- Consult a statistician!
- Data must be directly relevant to the problems or objectives – surrogate measures might not work.
- **Measurable progress** is critical
A Sample Monitoring Design
DRBC’s Control Point Approach

• Linked to Objectives and WQ Criteria
• Fixed Sites to evaluate longitudinal patterns and water quality changes
• Developed for antidegradation of high quality waters
• Designed statistically
• Measurable indicators to track results
Wild and Scenic Reaches in the Delaware Basin

Lower Delaware River:
DA 4165 Sq Mi at Portland
DA 6780 Sq Mi at Trenton

Lehigh, Bushkill Urbanized
Agriculture Declining
Suburbs Growing Fast
Water Supply to 2.9 M

Wide, shallow, cobble-gravel

Primary production:
Periphyton dominates
Macrophytes seasonally high
Phytoplankton minor

High Quality, Antidegradation,
but pH violations increasing
DO super-saturation common
Nuisance Algae and
White Sucker kills reported
Water Resources Plan for the Delaware River Basin (DRBC 2004): Objectives

**Objective 1.2B:** Where water quality is better than standards … implement anti-degradation regulations, policies and/or other mechanisms to maintain or improve existing water quality

**Objective 1.2C:** Where water quality is not sufficient … employ strategies to provide protection through the implementation of TMDLs and other regulatory and non-regulatory means
Control Point Approach

- Interstate Control Points are placed above, between and below major tributaries to the Delaware River: 10 Delaware River fixed locations, biweekly sampling, up to 50 samples per site.

- Boundary Control Points: 15 fixed tributary locations near confluence with river, biweekly sampling, up to 50 samples per site.

- Linkage of Results: longitudinal comparisons, concentration and loadings by river mile.
Longitudinal Change in 2000-2004 Average Summer Delaware River Phosphorus Loadings, River vs. Tributary Loadings

**TP Load Difference, LBS/DAY**

<table>
<thead>
<tr>
<th>Site and River Mile</th>
<th>TRIBLOAD</th>
<th>LODIFMN</th>
</tr>
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<tbody>
<tr>
<td>2074</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>2070</td>
<td>155</td>
<td></td>
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<tr>
<td>PAU</td>
<td>2794</td>
<td>506</td>
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<tr>
<td>BEL</td>
<td>134</td>
<td>134</td>
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<td>MAR</td>
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<td>21</td>
</tr>
<tr>
<td>BUS</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>EAS</td>
<td>1748</td>
<td>-929</td>
</tr>
<tr>
<td>LEH</td>
<td>1737</td>
<td>-835</td>
</tr>
<tr>
<td>POH</td>
<td>1677</td>
<td>-39</td>
</tr>
<tr>
<td>RIE</td>
<td>1641</td>
<td></td>
</tr>
<tr>
<td>MUS</td>
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</tr>
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<tr>
<td>NIS</td>
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</tr>
<tr>
<td>TOH</td>
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<td></td>
</tr>
<tr>
<td>CAL</td>
<td>1343</td>
<td></td>
</tr>
</tbody>
</table>

IN from Upper Basin: 2,102 lbs/day

OUT to Estuary: 5,327 lbs/day

Flow
12.6.1 Directly Relate Monitoring Efforts to the Management Objectives

Potential Objectives

- Analyze long-term trends
- Document changes in management and pollutant source activities in the watershed
- Measure performance of specific management practices or implementation sites.
- Calibrate or validate models.
- Fill data gaps in watershed characterization.
- Track compliance and enforcement in point sources.
- Provide data for educating and informing stakeholders.
Data Quality Objectives (DQO)

• What questions are we trying to answer?
• What assessment techniques will be used?
• What statistical power and precision are needed?
• Can we control for the effects of weather and other sources of variation?
• Will our monitoring design allow us to attribute changes in water quality to the implementation program?
For Monitoring Efficiency…

- 12.6.2 Incorporate Previous Sampling Designs

- 12.6.3 Monitor Land Use Changes in Conjunction with Water Quality Monitoring

- 12.6.4 Use an Appropriate Experimental Design (e.g. paired watershed, upstream/downstream monitoring before, during, and after land treatment; targeted multiple watershed monitoring; or randomized reference approach)

- 12.6.5 Conduct Monitoring for Several Years Before and After Implementation

- 12.6.6 Build In an Evaluation Process
12.7 Estimate Financial and Technical Assistance Needed and the Authorities that Will Be Relied on for Implementation

- Administration and management services, including salaries, regulatory fees, and supplies, as well as in-kind services such as volunteer work and donation of facilities
- Information/Education efforts
- The installation, operation, and maintenance of management measures
- Monitoring, data analysis, and data management activities

EPA HANDBOOK DETAILS EACH OF THE ABOVE
12.8 Develop Implementation Plan Basics

Develop Matrices Showing the Following:

- Actions that need to be taken (including any special coordination, education, or public outreach needed to improve the chances of implementation.)
- The responsible party(ies) for the action/education
- Time frame for implementing the actions
- Time frame for operation and maintenance requirements
- Estimated total cost and annual cost for each action
- Funding mechanism(s) for each action
- Measures or tracking indicator
12.9 Develop an Evaluation Framework

1. **Inputs**: the process used to implement your program.

2. **Outputs**: the tasks conducted and the products developed.

3. **Outcomes**: the results or outcomes seen from implementation efforts.

Start with desired Outcomes and work backward to develop evaluation framework.
Evaluation Framework Logic Model

**INPUTS**
- Program Investments

**OUTPUTS**
- Activities
- Participation

**OUTCOMES**
- Short
- Medium
- Long-term

**Situation**
- What we invest
  - Staff, $$
- What we do
  - Audiences reached
  - Activities held
  - Materials developed
- Whom we reach

**Evaluation**
- What results we get
  - Practice adopted
  - Knowledge gained
  - Attitude changes
  - Evidence the knowledge is used
  - Policies implemented
  - Water quality improvement
  - Resource changes

Figure 12-1. Logic model components.
12.9.4 Timing of Evaluation

Typically four times to evaluate:

1. Once you’ve completed the plan but have not yet begun to implement it.
2. During the implementation of project activities; the purpose of this evaluation is to provide feedback on the activities so that changes can be made if needed to increase their effectiveness.
3. After the project activities have been completed; the purpose of this evaluation is to provide some measures of project effectiveness.
4. After the project has been completed to observe its effects. This last step is tough, and may require (unlikely) long term monitoring funds.
12.10 Devise a Method for Tracking Progress

- Computer based? Whatever works best for you…
- Match data to appropriate format – statistical programs, spreadsheets, models, GIS…
- Communication needs – email, listserves, newsletters, websites
- Staff experience, training, ease of use – may need water quality experts, DBA’s, web designers…
13. Implement Watershed Plan and Measure Progress

Chapter Highlights

• Creating an organizational structure
• Implementing activities
• Preparing work plans
• Sharing results
• Evaluating your program
• Making adjustments
The Plan is NOT the Endpoint

• Information and Education Implementation
• On-the-Ground Implementation

Those who did the plan usually are not those who implement the plan…

Identify key partners and form a watershed implementation team in an organizational structure. All should be committed to the plan and its goals.
13.3 Implementation Activities

Team Members Required Skill Set:

- Technical assistance in design and installation of management measures
- Training and follow-up support to landowners and other responsible parties
- Managing the funding mechanisms and tracking expenditures for each action and for the project as a whole
- Conducting the land treatment and water quality monitoring activities and interpreting and reporting the data
- Measuring progress against schedules and milestones
- Communicating status and results to stakeholders and the public
- Coordinating implementation activities among stakeholders, multiple jurisdictions, and within the implementation team.
13.4 Prepare Work Plans

- Watershed plan as long term foundation
- 2-3 year time frame for work plan
- Break into annual work plan with quarterly reporting
- See Table 13-1 for work plan matrix
- Document what cannot be done this year, so you make sure to do it later…
- Document other work not part of your organization, but aiding implementation
13.5 Share Results

• Builds credibility, trust, transparency, and keeps people engaged
• Is the plan making a difference? Are interim goals being met?
• What kind of resources were used? What information gaps remain? Identify deficiencies and ways to resolve them.
13.6 Evaluate Your Program

Use Adaptive Management

INPUTS
- Watershed Management Plan
- Secure Funding & Resources
- Depending on results, continue implementation or revise WMP

OUTPUTS
- Install BMPs
- Conduct I/E
- Monitor
- Identified why not meeting targets/milestones
- Conduct Further Analyses
- Review types of BMPs, rates at which they were installed, maintenance practices
- Review I/E activities, target audiences, messages, formats, distribution methods
- Review monitoring parameters, sampling locations
- Review budget expenditures, administrative functions

SHORT-TERM OUTCOMES
- Meet financial targets
- Meet interim milestones
- Change behaviors
- Meet interim load reduction targets

LONG-TERM OUTCOMES
- YES
- Performed within budget
- Met milestones
- Met load reduction targets
- Changed behaviors
- Met WQS

YES

NO

NO
Keep Up With The Work Plan

- 13.6.1 Track Progress Against Work Plans
  Your monitoring design will dictate how often reporting is necessary, but try for an annual report.

- 13.6.2 Routinely Analyze Monitoring Data
  This step may require statistical expertise and qualified reviewers of your data.
13.7 Make Adjustments
(Nobody’s Perfect)

13.7.1 Not Meeting Implementation Milestones

• *Did weather-related causes postpone implementation?*
• *Was there a shortfall in anticipated funding for implementation of management measures?*
• *Was there a shortage of technical assistance?*
• *Did we misjudge the amount of time needed to install some of the practices?*
• *Did we fail to account for cultural barriers to adoption?*
13.7 Make Adjustments
(Nobody’s Perfect)

13.7.2 Not Making Progress Reducing Pollutant Loads

• Are we implementing and using the management measures correctly?
• Has the weather been unusual?
• Have there been unusual events or surprises in the watershed?
• Are we doing the right things?
• Are our targets reasonable?
• Are we monitoring the right parameters?
• Do we need to wait longer before we can reasonably expect to see results?
If You Cannot Account for Lack of Progress, Revisit the Watershed Plan
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