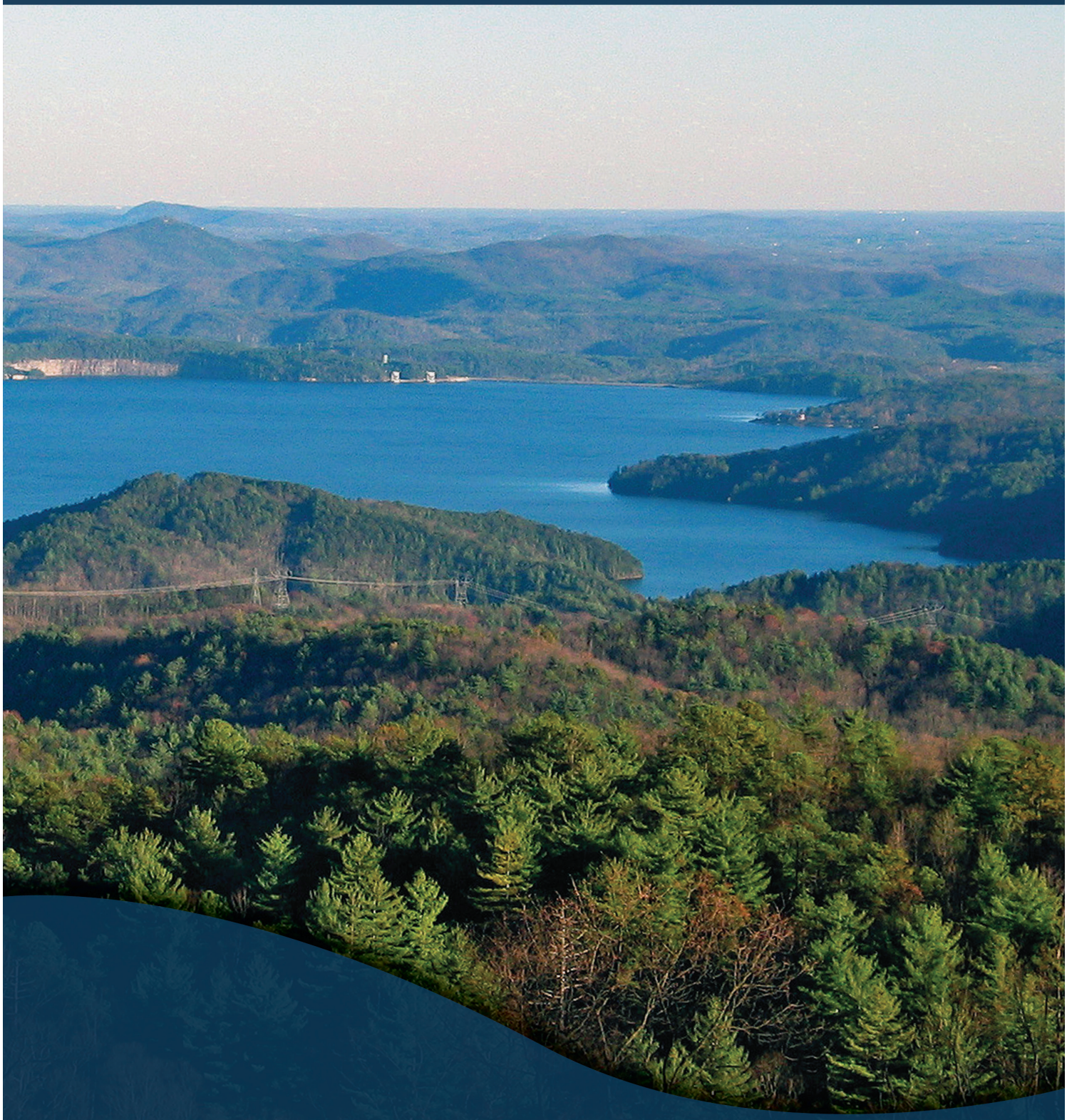
SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL



South Carolina Simplified Guide to Developing Watershed-Based Plans

Purpose

This guide has been created to assist those interested in developing watershed-based plans in South Carolina. It serves as a simplified overview of the watershed planning process. For a more in-depth discussion of specific plan elements, the US Environmental Protection Agency has created a comprehensive handbook for watershed plan creation. In addition to reviewing this guide, organizations are encouraged to contact their Watershed Manager for help and feedback as they develop watershed-based plans.

Watershed-Based Planning

Effectively improving water quality requires addressing whole watersheds or drainage basins, including all sources of water quality problems. A watershed-based plan is a roadmap for communities to systematically define and address water quality problems within a given watershed. Effective watershed plans typically include active participation from stakeholders, analysis and quantification of the specific causes and sources of water quality problems, identification of measurable water quality goals and implementation of specific actions needed to solve those problems.

Specifically, EPA has outlined 9 elements that should be included in all watershed-based plans:

Abbreviated Element	Full Element Text from EPA Guidance
1. Identification of pollutant sources and their causes.	1. An identification of all of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan (and to achieve any other watershed goals identified in the watershed-based plan), as discussed in item (b) immediately below. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X acres of row crops needing improved nutrient management or sediment control; or X linear miles of eroded streambank needing remediation).
2. Estimated load reductions from management measures identified in (c). (May also include overall pollutant reduction needed as found in a TMDL document.)	2. An estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time). Estimates should be provided at the same level as in item (a) above (e.g., the total load reduction expected for row crops or eroded streambanks).
3. Management measures (Best Management Practices, or BMPs) needed in order to eliminate or control pollutant(s)	3. A description of the management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.

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Abbreviated Element	Full Element Text from EPA Guidance
4. Identification of funding and technical ssistance needs as well as potential sources. Example: Watersheds with agricultural sources would most likely require the expertise of USDA Natural Resources Conservation Service staff and could potentially utilize Environmental Quality Incentive Program funds for implementation.	4. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA's Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.
5. Outreach strategy that is targeted towards members of the public that are impacted by the project and the management measures from (c).	5. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.
6. Timeline of implementation events that proceeds in a logical and efficient manner.	6. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.
7. List of milestones for keeping plan implementation progress on track.	7. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.
8. Criteria to determine if pollutants are being reduced and progress is being made toward attaining water quality standards, or if plan requires revision.	8. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.
9. Monitoring strategy to determine effectiveness of plan implementation.	9. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

The Need for Watershed-Based Plans

A watershed plan helps accurately identify pollutants and pollution sources so that appropriate and effective solutions can be carried out. Currently, most watersheds in South Carolina do not have plans in place to correct water quality problems. Local knowledge and planning is needed to improve and protect the quality of water in our streams, rivers, lakes and estuaries.

In addition, watersheds with approved plans are eligible for 319 nonpoint source pollution reduction funds. Although these funds are not guaranteed to communities with watershed-based plans, having a plan in place will save groups time when submitting an application.

What Does a Watershed-Based Plan Look Like?

The sections that follow will help groups think through each of EPA's nine required plan elements. In general though, most watershed-based plans

- Are developed for one or more 12-digit HUCs and, occasionally, a 10-digit HUC
- Are an average of 20 pages long, although there are no maximum or minimum page lengths
- Include maps, tables, pictures and other visual aids
- Need to be regularly evaluated and updated based on changing conditions, data, and goals

Preparing a Plan: The Nine Required Elements

Identifying Pollutant Sources

A watershed plan should be based on data, which may not be practical or feasible to collect during the planning stages. In these cases, you should make the best evaluation based on the information available. Potential data sources include:

- SC 303(d) list of impaired waters
- Existing Total Maximum Daily Loads
- EPA STORET
- Local Municipal Separate Storm Sewer Systems (MS4s)
- Universities
- Watershed organizations that conduct water quality monitoring

Watershed plans should include the impairment being addressed along with the cause or sources of the impairment and what use or watershed function is affected by the impairment. Impairments are important because they indicate that a waterbody currently does not meet state water quality standards based on the intended use of the waterbody. South Carolina designates four uses for fresh and salt waters:

1. Aquatic life (AL)
2. Recreation (REC)
3. Fish consumption (FISH)
4. Shellfish harvesting (SHELLFISH)

Other uses that could be affected by water quality impairments include those such as drinking water supply, wastewater treatment or navigation.

Most water quality monitoring programs use indicators to designate an impairment. For example, South Carolina uses E. coli bacteria to indicate the presence of other pathogens in the water that may be harmful to swimmers. Common impairments or indicators used in South Carolina include:

- Chlorophyll a
- Bacteria (fecal coliform, E. coli, enterococcus)
- Dissolved oxygen
- Metals (chromium, copper, cadmium, lead, nickel, zinc)
- Nutrients (nitrogen, phosphorus)
- Macroinvertebrates
- Turbidity

In order to correct water quality problems, knowing the problem is not enough. It is also important to list potential sources of the impairment, which can later be targeted for improvements. Potential sources may include livestock in streams, failing septic systems, land disturbance activity, increased impervious surface, over-fertilization of crops or lawns, illicit discharges or sewer pipe overflows.

It may be useful to compile an initial list of impairments, designated uses and sources in a table, such as in the example below.

Impairment	Potential Sources	Watershed Use
Phosphorus	Livestock in streams, excess fertilizer, failing septic systems	Aquatic life, water supply, wastewater treatment
Turbidity	Construction activities, cropland, increased impervious cover	Aquatic life, recreation, water supply
Fecal Coliform Bacteria	Pet waste, wildlife, failing septic systems, livestock in streams	Recreation, water supply, wastewater treatment

Once the impairments, causes and sources of those impairments are known for the watershed, the plan should establish targets or goals for the watershed. These goals, in turn, can be used to create milestones and measure success. Typically, the goal of watershed-based plans is to improve an indicator so that it meets State water quality standards and/or allows for a particular use. For example, the goal may be to lower bacteria levels in Noname Creek so that people can safely swim there.

Output: a description of the water quality impairment(s) in the watershed and the causes of each impairment; also the overall goal or purpose of the plan based on the impairment(s) listed.

Management Measures

A watershed-based plan should describe the management measures needed in order to achieve the goals discussed in the previous section. This includes measures that are currently in place as well as additional measures that are needed. Measures can control pollutant loads to waterways by:

- Reducing the availability of pollutants (e.g. fixing a failing septic system)
- Slowing the transport of the pollutant to the waterbody (e.g. detention pond) and/or
- Treating the pollutant before it reaches the waterbody (e.g. riparian buffer)

Keep in mind that measures can be *structural,* such as building a fence to keep cattle out of a stream, or *nonstructural,* such as educating homeowners on picking up their pet's waste. Educational management measures can be described separately as part of a larger education and outreach program. In addition to determining the type of management measures needed, the best plans will also include the identification of target areas for management practice installation. Certain areas of the watershed may be more important to target to protect valued resources, take advantage of stakeholder cooperation or reduce costs. For example, management measures could be concentrated on property closest to the stream of interest, near monitoring stations with the most standards violations or around heavily used recreation areas.

There are numerous resources on best management practice design. A few examples are listed below. Please contact your Watershed Manager for additional assistance in choosing management practices.

- **NRCS National Conservation Practice Standards**
  This website includes a general list of agricultural and conservation management practices. Contact your local NRCS office for assistance with design and installation.
- **DHEC Stormwater Best Management Practice Handbook**
  This manual includes practices for erosion and sediment control, runoff control and low impact development.
- **National Menu of Stormwater Best Management Practices**
  This searchable database includes education, construction, post-construction and pollution prevention measures.

Output: a description of the management measures needed for each source of pollution; if feasible, a map of critical areas and/or potential management measure location.

Load Reductions

Load reductions provide a snapshot of the impact a project will have on reducing pollution in a watershed. Watershed-based plans should include the current pollutant loading in the watershed and the acceptable loading required to meet water quality standards. If a Total Maximum Daily Load calculation has been established for a pollutant in the watershed, it will include the quantifiable amount of pollution that must be reduced in a watershed in order to meet water quality standards.

In addition, each management measure should be accompanied by estimated pollutant load reductions expected from each measure. These reductions can then be compared to the total amount of pollution that needs to be eliminated from the watershed.

Load Reductions Continued

Load reductions are typically estimated by either using standard literature values or by running a model. There are many studies that report the amount of pollutants that certain practices either contribute (i.e. cattle, dogs or failing septic systems) or reduce (i.e. rain gardens, wetlands or riparian buffers). These standard numbers can then be applied to any watershed based on the number of people, livestock or practices in that watershed.

The best estimates usually come from studies conducted locally or regionally. When possible, use data from studies that have been conducted in South Carolina, in nearby states or in areas with similar soils and/or land-use. When using literature values, remember to cite data sources so that readers will understand the assumptions and limitations behind the data used to develop the plan.

Beyond literature values, several tools are also available to determine pollutant loadings and reductions:

- **Spreadsheet Tool for the Elimination of Pollutant Load (STEPL)**
  This modified spreadsheet tool calculates the amount of nutrients, biological oxygen demand and sediment generation in a watershed based on land use, soils and management practices. It also estimates load reductions for specific management practices.
- **North Carolina Agricultural Nutrient Assessment Tool (NCANAT)**
  This series of tools estimates nitrogen and phosphorus loss due to agricultural activities in a watershed.
- **Revised Universal Soil Loss Equation 2 (RUSLE2)**

  This model predicts average annual erosion or soil loss based on local climate, topography, soils and land use.

Watershed Managers have experience calculating load reductions and are available to assist organizations with their load reduction estimates.

Output: for each pollutant of interest, the amount of pollution currently in the watershed, the total amount of pollution removal in order to meet water quality standards and the amount of pollution expected to be removed by each type of management measure.

Financial and Technical Assistance

Financial and technical assistance are critical to implementing a watershed-based plan. Cost estimates for management measures including salaries, regulatory fees, supplies, equipment and contractual work, should be established during the planning process. Knowing generally how much a plan will cost to implement makes applying for funding quicker and easier. Sources of financial assistance to implement management measures can include:

- 319 grants for nonpoint source implementation projects
- SC Clean Water State Revolving Fund
- USDA's Environmental Quality Incentives Program and Conservation Reserve Programs
- Local government stormwater fees and capital improvement funds
- Federal grants
- In-kind donations of labor, equipment, supplies or cash

It is also important to consider what kind of technical assistance will be needed to implement the watershed-based plan. For example, specific expertise may be needed for best management practice design, siting or implementation or for developing monitoring or outreach programs.

Output: an estimated budget for plan implementation, a list of realistic funding sources and a list of the type of technical assistance needed to implement the plan along with specific people or organizations that could provide the assistance

Education and Outreach

In the planning stages, it is important to engage community members in identifying water quality problems and solutions and to solicit partners for executing the plan. Education and outreach is also an important component of a watershed-based plan. Outreach can be viewed as a nonstructural best management practice in which the goal is to change people's behavior that contributes to a water quality problem. For examplea watershed-based plan may recommend educating residents and visitors about picking up pet waste so that it does not run off into nearby streams.

Effective outreach aimed at changing behavior typically follows these 5 steps:

1. **Identify the problem.** In watershed-based plans, this is usually the pollutant of concern the plan is targeting.
2. **Set goals.** This includes the overall vision or outcome of an outreach campaign.
3. **Identify undesirable behaviors contributing to the problem.** Outline what people are doing that needs to be changed.
4. **Identify good behaviors to reduce contributions to the problem.** Outline what people in the watershed should be doing (but keep it simple!).
5. **Get to know your audience.** Find out who specifically is doing the undesirable behavior in order to teach them good practices.

This process should be repeated for each target audience, based on what behavior should be encouraged or changed. It often takes multiple outreach efforts before people will adopt a new practice. Having partners who know people in the watershed is therefore essential to establishing those relationships needed to encourage adoption of management measures.

Output: a description of the target audiences to be educated, the goal for each audience (i.e. what behavior should they be doing) and the methods that will be used to reach out to each audience.

Implementation Schedule and Milestones

Watershed plans should include the measurable tasks or milestones necessary in order to meet the plan's goals, realizing that goals and milestones may therefore change over time. Groups should prioritize goals and tasks and assign a time-frame to each. For example, will a task take months to implement or years? The tasks should be included in the watershed plan in chronological order.

It may also be useful to include costs, monitoring needs, additional resources required and who will be responsible for implementing each element. While this information may be included elsewhere in the plan, it can be helpful to have a master chart of activities, as in the example table below.

Goal: Reduce bacteria levels in No Name Stream by 50%

Objective	Milestone	Resources Required	Responsible Party	Time- Frame
Work with farmers in the watershed to fence 500 cattle out of the stream	Hold a meeting with 25 local farmers to encourage them to install BMPs	Meeting location, food, speakers, staff time	No Name County	2-3 months
	Write conservation plans for 10 farms	Staff time, travel expenses	NRCS	6-15 months
	Install 5,000 feet of livestock exclusion fencing along the stream	Labor, fencing materials	NRCS, Farmers	12-36 months

Output: a list of measurable milestones in chronological order along with the estimated time-frame for completing each.

Evaluation Criteria

All watershed plans should include a way to track plan progress and determine if plan goals are being met or if they need revision. Criteria should be established for each management measure as well as for the overall success of the watershed plan. Evaluation criteria should be measurable and quantifiable, if possible. For example, a plan might include tracking the number of management practices installed or the percentage of samples meeting water quality standards. A plan could also include criteria that compares response rates before and after an educational campaign.

Output: an explanation of the criteria that will be used to measure successful plan implementation.

Monitoring

As water quality improvements are the ultimate goal of watershed-based plans, it is critical to outline the type of monitoring necessary to measure this goal. Watershed-based plans will likely include DHEC monitoring information but plans should outline an ideal monitoring strategy, which may go above and beyond DHEC monitoring. This section should reflect what what type of monitoring a group believes is necessary to fully identify and measure progress towards water quality goals.

The monitoring component of a watershed-based plan may include answers to the following questions:

- What is the purpose or goal of the water quality monitoring plan?
- What type of monitoring is needed? What parameters should be monitored?
- Who is currently conducting monitoring in the watershed? What partners could provide help with monitoring in the future?
- Where are existing monitoring stations?
- Where should additional monitoring stations be established? Are the potential monitoring sites accessible (i.e. Does a group have permission to cross the property? Are there physical barriers to reaching the waterbody?)?
- What quality of data is needed to meet plan goals (i.e. is regulatory data needed or would screening tests be sufficient?)?

As with other plan elements, visuals are useful for strategically assessing monitoring needs in a watershed. Watershed plans should include a map with the key waterbodies, existing monitoring stations and potential monitoring locations to clearly communicate the monitoring strategy.

Some resources for monitoring data in South Carolina include:

- DHEC Surface Water Monitoring Program
- USGS Water Quality Information
- Universities
- Municipalities including those with MS4 programs

In addition, for groups interested in establishing new monitoring sites, DHEC has created an introductory monitoring guide, which may be useful in thinking about the best monitoring approach.

Output: a description of the type, frequency and location of monitoring activities needed to determine plan success; a discussion of who will implement the monitoring strategy; a map with current and needed monitoring sites

Putting It All Together

Once you have written all of the componants of you watershed-based plan, you'll need to decide how to organize it. There is no right or wrong way to struture a watershed plan, but looking at other completed plans may be helpful. View example watershed-based plans from Connecticut, Pennsylvannia, Virginia or Ohio.

A watershed plan provides an excellent opportunity to educate community members about key water quality issues and to get them involved in restoration activities. After you have completed your plan, contact your Watershed Manager to get started implementing your pollution reduction stategies.

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