CHAPTER 4 – QUESTIONS VOLUNTEER WATERSHED MONITORING CAN ADDRESS

In This Chapter . . .

List of Questions

Deciding on a monitoring purpose helps you focus your monitoring by clarifying how you want your results to be used. Questions help you focus even further by clarifying the type of information you want to collect. A good monitoring question addresses the issues facing your watershed and should be as specific as possible.

In this chapter, we suggest a number of generic questions that you can tailor to your own watershed. These questions are all inter-related and blend into each other. You may start out with one and find that you really need to answer one or more of the others. However, the following questions offer a reasonable starting point.

1. Is the water meeting or exceeding state Water Quality Standards?

This question relates to the basics of the PA Water Quality Standards.[1] The standards contain *designated uses, protected uses, critical uses,* and *criteria.* In order to understand the following, it will be helpful for you to be looking at a copy of the Standards.

Protected water uses (section 93.3): The uses of the water that are to be achieved and protected. There are four general categories of uses: water supply, aquatic life, recreation and special protection. For each protected use, there is a list of specific uses (e.g. cold water fishes and warm water fishes under aquatic life).

Designated uses: Protected water uses assigned to each segment of water in the state.

Critical uses (section 93.7c): The most sensitive general category of protected water use that the criteria are intended to protect. Table 3 in section 93.7c of the Pennsylvania Code lists the parameter (indicator), symbol for the parameter, criteria and the critical use for each parameter. Critical uses are coded as follows:

1 = aquatic life

2 = water supply

3 = recreation (including esthetics)

4 = special protection

DRBC = criteria adopted by agreement with the Delaware River Basin Commission that apply only to selected portions of the Delaware River Basin.

Within each of these critical uses, there are subcategories ("water uses protected") of protected uses. These subcategories are assigned to each drainage area listed in section 93.9 ("drainage lists" a-z).

Criteria: For each critical use, water quality criteria describe the conditions that need to be achieved in order to support that use. For example, to support recreation during the swimming season, the "maximum fecal coliform level shall be a geometric mean of 200 per 100 ml . . .". These

[1] (Chapter 93 of Title 25 of the Pennsylvania Code).

conditions are described for various water quality indicators such as bacteria, temperature, dissolved oxygen, pH, etc. Note that the criteria only address physical and chemical characteristics in the water column. There are no criteria that directly address the health of aquatic life communities or habitat quality.

So, answering this question would involve monitoring indicators for which there are criteria in the standards, and comparing the results to those criteria that are relevant to the uses assigned to specific stream reaches in your watershed.

Waters that do not meet the standards are considered "impaired." Refer to one of the "B" survey options (Advanced Stream Assessment) in Chapter 5 (pages 5-39 to 5-79).

2. Where are the impaired waters that should be a high priority for restoration? What is causing these impairments?

Impaired waters are those waters that do not support, or only partially support, their designated uses. This is determined either by the type of monitoring that would answer questions in this section, or by directly monitoring aquatic life, water supply or recreational use. In its unassessed waters strategy (see Appendix 3 A3-3), DEP uses benthic macroinvertebrate monitoring to determine aquatic life impairment in waters that are not routinely monitored. You can use this tool as well.

Although your monitoring may show impairment, DEP may or may not designate those waters as impaired. That depends on the type and rigor of your monitoring and DEP's willingness to use your data. At the very least, your monitoring may prompt DEP to conduct its own monitoring.

In your watershed, finding impaired waters might involve large scale monitoring throughout the watershed. Or, if you suspect problems, you might monitor those waters you suspect are impaired and waters that you know are not impaired as a reference. Refer to one of the "B" options (Advanced Stream Assessment) in Chapter 5 (pages 5-39 to 5-79).

Determining the cause of impairment involves a more focused type of monitoring. First, you locate land and/or water activities that you suspect are causing the impairment. For this, we suggest the watershed inventory (see survey A1 page 5-6). Then, you monitor relevant indicators above and below these activities and compare the results. This is also known as an Impact Assessment. Refer to the B5 (page 5-66) or B6 (page 5-73) surveys options in Chapter 5.

3. Where are the threatened waters that should be a high priority for protection? What's causing these threats?

This question relates to waters that are currently of high quality, but are threatened by some sort of activity that may degrade them. These waters may need some sort of special protection in order to maintain this condition.

DEP has an Aquatic Life Special Water Quality Protection Survey to assess the need for special protection and, if needed, to revise the water quality standards to maintain existing high quality. These surveys are triggered by a petition to the Environmental Quality Board, or upon request from the Fish and Boat Commission. The protocol for these surveys is currently under revision by DEP.

We suggest a combination of a watershed inventory (see survey A1 in Chapter 5 on page 5-6) to identify threats, and either a basic condition and trend assessment (see surveys A2-A4 on page 5-9 to 5-22 in Chapter 5) or advanced stream or lake assessment (see surveys B2 on page 5-46, or B3 on page 5-54, or C2 on page 5-85 in Chapter 5) to identify and document high quality waters.

4. What are the present ecological conditions? How do they change over time?

This question is perhaps the most difficult one to answer, because it relates to the overall ecological health of a watershed. Ecological health is a complex thing to get a handle on, because it requires monitoring for many things, in many places, at regular and frequent intervals.

This is an important question, however, because it looks at establishing a benchmark against which future changes can be compared. It requires a long-term view. It requires monitoring things that will respond to change within a reasonable time frame so that action can be taken if the trend turns negative. It requires sorting out changes caused by human activities from those caused by natural cycles.

This question relates to all the other questions in this section. However, unlike the other questions (except possibly question 6), it leads to work that is inherently long-term, as opposed to determining conditions at one particular time or in particular places.

We suggest a combination of the watershed inventory (see survey A1 in Chapter 5 on page 5-6) and either the basic condition and trend assessment (see surveys A2-A4 on pages 5-9 to 5-22 in Chapter 5) designed to be carried out over a minimum of a 10-20 year period and, to the extent possible, in perpetuity or the advanced trends assessment (see surveys D1-D2 on pages 5-96 to 5-114 in Chapter 5).

5. What is the impact of various types of land and water use activities on ecological conditions and human uses? (e.g. various types of point and nonpoint source pollution).

This question is specific to particular human activities that have the potential to cause pollution and degradation. It relates to the actual impacts of these activities on the aquatic ecosystem and human uses. It's very similar to question 2, except it has a slightly different twist. Instead of merely documenting change as a result of human activities, it specifies in more detail the nature of the change and the implications for ecological health and human uses.

The focus of the monitoring is somewhat broader than the answer to question 2. Question 2 requires one or more good response indicators that will document the difference above and below a suspected impairment causing activity. This question requires a more comprehensive approach that looks at stress, exposure and response indicators (see Chapter 2, step 3 on page 2-9 for a description of these) over time to relate ecosystem and human use impacts to these activities.

We suggest the watershed inventory (see survey A1 on page 5-6) to identify the land and water use activities. Then, you monitor relevant indicators above and below these activities and compare the results. This is also known as an Impact Assessment. Refer to the surveys A5-A6 (on pages 5-23 to 5-35) or B5-B6 (on pages 5-66 to 5-79) options in Chapter 5.

6. How effective are various strategies (e.g. wastewater treatment, best management practices) in protecting and restoring ecological integrity and human uses? Where are the success stories we should celebrate?

This is related to questions 2 and 5, but is longer term. Once you have established impairments or impacts, and someone has developed control, protection or restoration strategies, monitoring focuses on seeing whether these strategies result in healthier ecosystems and / or restoration / maintenance of human uses.

For this question, we suggest the Basic Condition and Trend Assessments or Advanced Trend Assessment (see surveys A2-A4 on pages 5-9 to 5-22 and D1-D2 on pages 5-96 to 5-115 in Chapter 5).

7. Where are the special places with unique ecological, social and economic values that should be protected?

This question relates to places that are important to residents in a watershed, because they have special significance. These places might be waterfalls, historic places, scenic views, special habitats, great fishing spots or any other places that are important to the quality of life.

We suggest that this sort of information be gathered as part of the watershed inventory, (see survey A1 in Chapter 5 on page 5-6).