

Nonpoint Source Monitoring Objectives and Basic Designs

U.S. Environmental Protection Agency

An Interactive Guide

Session 7, National Training workshop on
Water Quality Data Assessment and Plans
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Why Do We Need Nonpoint Source (NPS) Monitoring?

- Identify water quality problems, designated use impairments and causes, and pollutant sources.
- Develop total maximum daily loads (TMDLs), including load and waste load allocations.
- Analyze trends.
- Assess the effectiveness of best management practices (BMPs) or watershed projects.
- Assess permit compliance.
- Validate or calibrate models.
- Conduct research.



Collecting samples (photo by NRCS)

Fundamentals of Good Monitoring

Good monitoring can:

- Provide fundamental information about the water resource and its impairments.
- Document changes through time.
- Show response to NPS pollution reduction practices and programs.
- Confirm achievement of management objectives.
- Provide basis for evaluation of progress (adaptive management).

Poor monitoring can:

- Fail to meet objectives.
- Create confusion.
- Leave critical questions unanswered.
- Waste time and money.
- Lead to bad decisions.

NPS monitoring

EPA's NPS monitoring guidebook, [Monitoring and Evaluating Nonpoint Source Watershed Projects](#) is a 500 page resource on effective approaches to evaluate NPS projects.

Balancing the importance of good monitoring design with limited staff and time.

Monitoring and Evaluating Nonpoint Source Watershed Projects

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This document is available at: <https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/monitoring-and-evaluating-nonpoint-source-watershed>



PREVIOUS



NEXT



RETURN



GO TO MAP

Why build a “Pocket Guide” Approach

- This “pocket guide” offers a high-level overview of EPA’s NPS monitoring guidebook, primarily focuses on Chapters 2 and 3.
- By using the map users may easily navigate directly to the details that are most pertinent to their monitoring objectives.
- Allows user to direct connection fuller information in the NPS monitoring guidebook.

<https://www.epa.gov/nps/nonpoint-source-monitoring-interactive-guide>



Who is this Pocket Guide For?

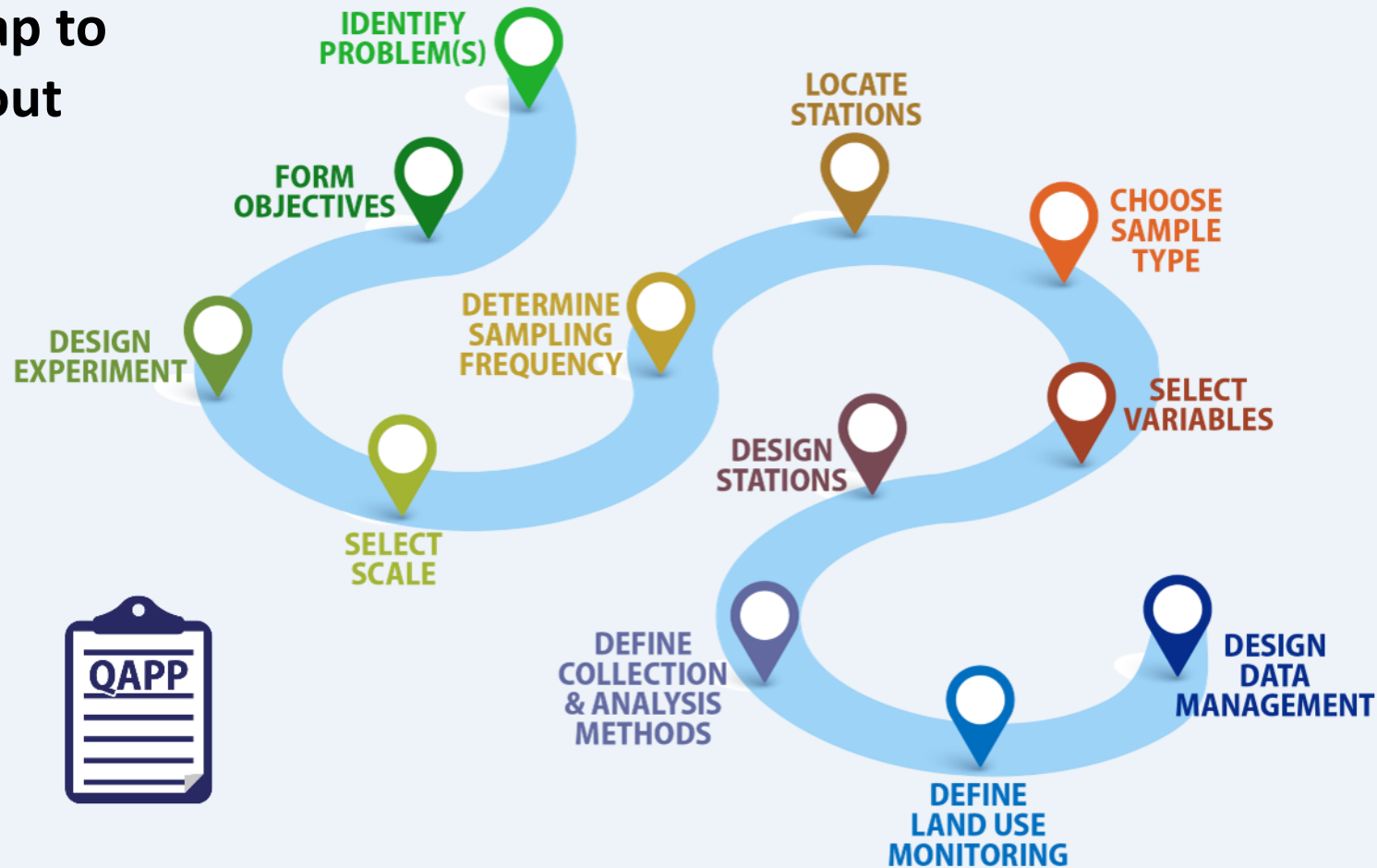
Those who:

- **develop** and implement monitoring plans for watershed projects,
- **evaluate** the technical merits of monitoring proposals they might sponsor.

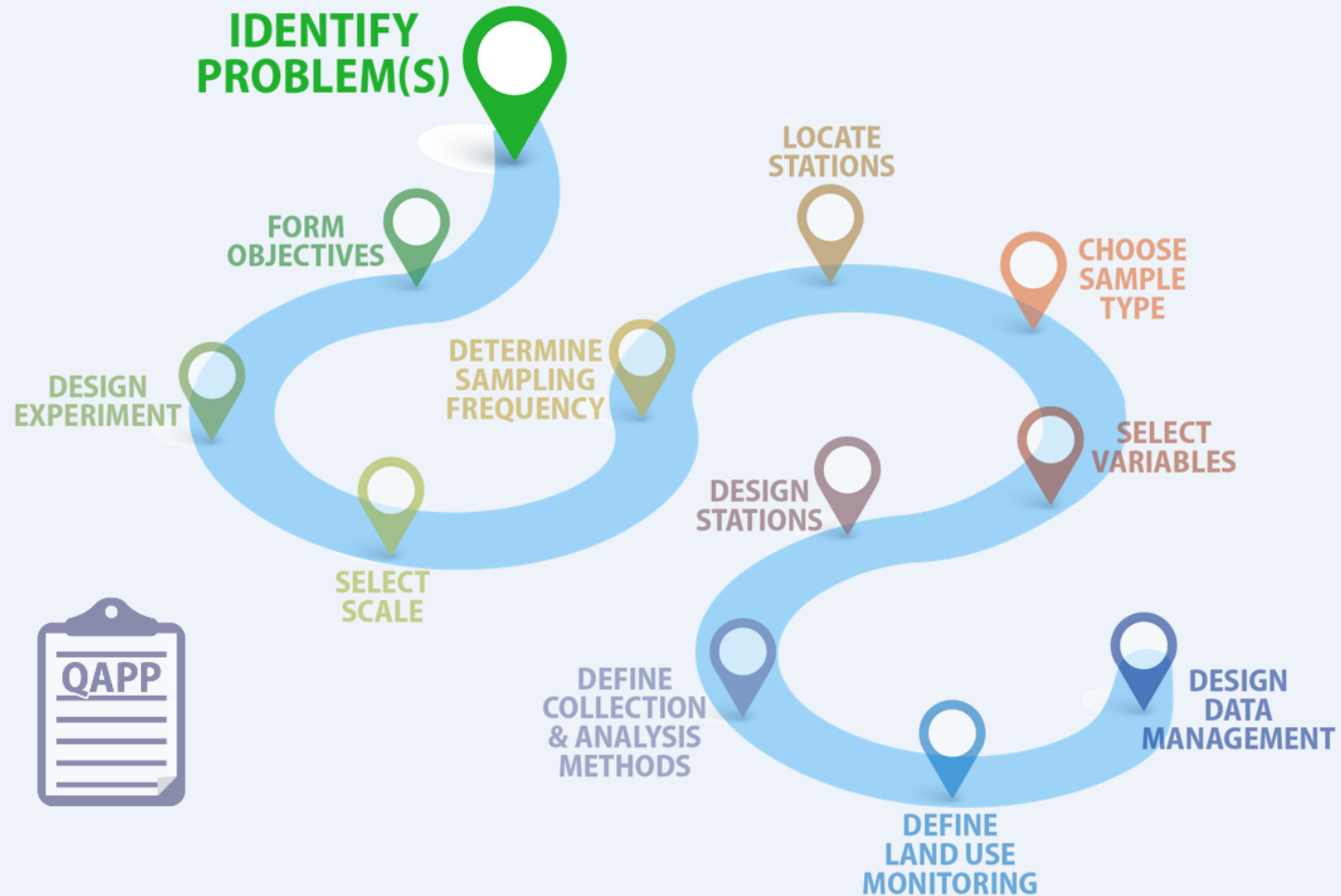


Monitoring Plan Design Elements

Click on the map to learn more about each design element



Initial Design Element: Identify Problem(s)



Identify problems

Identify the causes of impairment and the pollutant sources that need to be controlled.

Considerations:

- How might the characteristics of your watershed affect water quality?
- How would you identify specific pollution problems?

Overview

- Designing a monitoring program to assess response to NPS control programs requires a thorough understanding of the system.
- Questions that should be addressed during this step:
 - What are the critical water quality impairments or threats?
 - What are the key pollutants involved?
 - What are the sources of these pollutants?
 - How are pollutants transported through the watershed?
 - What are the most important drivers of pollutant generation and delivery?
 - What are the areas that are ecologically or culturally significant, or critical, to your community?

Causes and Sources of Pollution

- What, where and when should you sample?
- Knowing the pollution source(s) allows you to apply the correct pollution control measures and to monitor the watershed's response.



Pollutant Transport Considerations (1 of 2)

- How are pollutants transported from the source to the receiving water?
 - Particulate pollutants (e.g., sediment) generally move in surface waters.
 - Dissolved pollutants (e.g., nitrate-nitrogen) can be transported in both surface and ground waters.
- The distinct pollutant pathways need to be understood to decide where and when to sample. (There might be pollutant sources upstream of your watershed.)
- The timing of sampling during storm events can also be informed by knowledge of pollutant pathways.



Agricultural runoff (photo by NRCS)



Field irrigation (photo by NRCS)

Identify Problem(s)—Summary

- Have you completed the following?
 - Identified the critical water quality impairments or threats
 - Identified the key pollutants
 - Identified the sources of the key pollutants
 - Identified methods of pollutant transport
 - Identified the most important drivers of pollutant generation and delivery



The mouth of the Connecticut River as it enters Long Island Sound (photo by NRCS)

Form objectives

Formulating clear monitoring objectives is an essential first step in developing an efficient and effective monitoring plan.

Considerations:

- What questions do you want to answer?
- How do your objectives fit into your overall program?

Monitoring Design as a Function of Objective



Go to p. 2-44
of Guidebook

Design options <i>(Click on a specific design option to skip ahead)</i>	Short description	Objectives			
		Problem assessment	TMDL loads	Trends	BMP effectiveness
Reconnaissance/synoptic	Multiple sites distributed across study area, monitored for short duration (<12 months)	X			
Plot	Traditional research study design, BMPs replicated in randomized block design				X
Paired	Treatment and control watersheds monitored during control, treatment periods		X		X
Single watershed before/after	Single station at study area outlet monitored before and after BMP implementation		X	X	
Single-station long-term trend	Single station at study area outlet monitored before and after BMP implementation		X	X	
Above/below	Stations, paired sampling, upstream and downstream of BMP	X	X		X
Side-by-side	Same as single watershed since there are no calibrating paired samples		X	X	
Multiple	Multiple watersheds monitored in two or more groups: treatment and control				X
Input/output	Stations located at input and output of BMP				X

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- Pete Monahan
- Cyd Curtis
- Tetra Tech

Next Steps

[NPS Monitoring Interactive Guide](#) is available for use

- Questions and feedback welcome
- Potential expansion/connection to technical resources.

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Thank you!

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