National Water Quality Monitoring Council
Working together for clean water

Water Quality Monitoring:
A Guide for Informed Decision Making

Using the designs together

About

Protecting our Nation's water resources is increasingly challenging given diffuse pressures of population growth, development and changing climate. High quality water is essential to protecting human health and sustainable ecosystems. This heightened importance, is driving an increased need for data documenting the quality of water resources and how they are changing at national, regional and local levels.

What you need to know

One monitoring design will not fit all water quality management needs. This series of fact sheets details the strengths, limitations and products of common monitoring designs. This overview encourages use of a combination of designs to address multiple water quality questions. Begin with the identifying monitoring objectives, the questions needing answers, and then engage partners on design/implementation.

Integration of monitoring designs provides:

- Information on physical, chemical and biological integrity of waters
- Changes and trends in water quality integrity
- Extent of degradation and key stressors
- Location and characterization of impaired waters
- Input to plans to restore water quality (TMDLs and watershed plans)
- Effectiveness of protection and restoration actions locally and across the state and nation

Monitoring Design Summary

Monitoring Type	Strengths	Limitations	Products
Targeted Monitoring	In-depth collection of data for an area(s) of interest	Generates site specific data with limited ability to extrapolate to broader areas	Decisions about individual assessment units, local action plan like TMDL, effect of permitted discharges
Fixed-Site Monitoring	Long-term, routine water quality data supports site-specific trends like flow and flux at a basin outlet	Not designed to represent trends beyond specific monitoring locations	Historical record of water quality trends, loads of key parameters like nutrients
Statistical Surveys	Cost effective, statistically representative method for assessing condition of a broad population and tracking changes over time	Not designed for localized site assessments, except for the sites sampled	Broad, unbiased assessments of status and trends across multiple scales, analysis of patterns in stressor-response relationships
Remote Sensing	Obtaining estimates of condition over large areas in a low-cost manner	Requires a data management strategy and monitoring data to ground truth algorithms	Early indication of emerging problems to inform on-the-ground action and follow up monitoring

Table 1: The above table outlines 4 types of monitoring designs and is intended to provide an overview of each design. To get a more comprehensive overview of each survey design, please see its' corresponding fact sheet.

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Integrating Monitoring Designs to Support Program Needs

Each monitoring design has strengths and limitations. When used in combination, we advance our understanding of water quality and increase monitoring efficiency. Given resource constraints and competing priorities, leveraging across programs and coordinating among monitoring activities increases the ability of the monitoring investment to meet the needs of multiple regulatory and water quality management programs.

Figure 1 provides a conceptual illustration of leveraging or combining monitoring approaches to inform multiple water quality decisions. Most states have long-term fixed monitoring sites sampled for decades that provide historical record of trends at those sites. Statistical surveys are a newer approach that balance the constraints of funding with the need for unbiased state or regional estimates of water quality conditions. Survey data support analysis of patterns among stressors to focus priorities. Remote sensing ground-truthed with field monitoring predicts occurrence of key parameters like algal blooms. Both surveys and remote sensing inform follow up monitoring. Targeted sampling is key to confirm impairments and generate detailed data to guide local restoration actions. Together these designs track change.

Streamlined Monitoring—Using the Designs Together

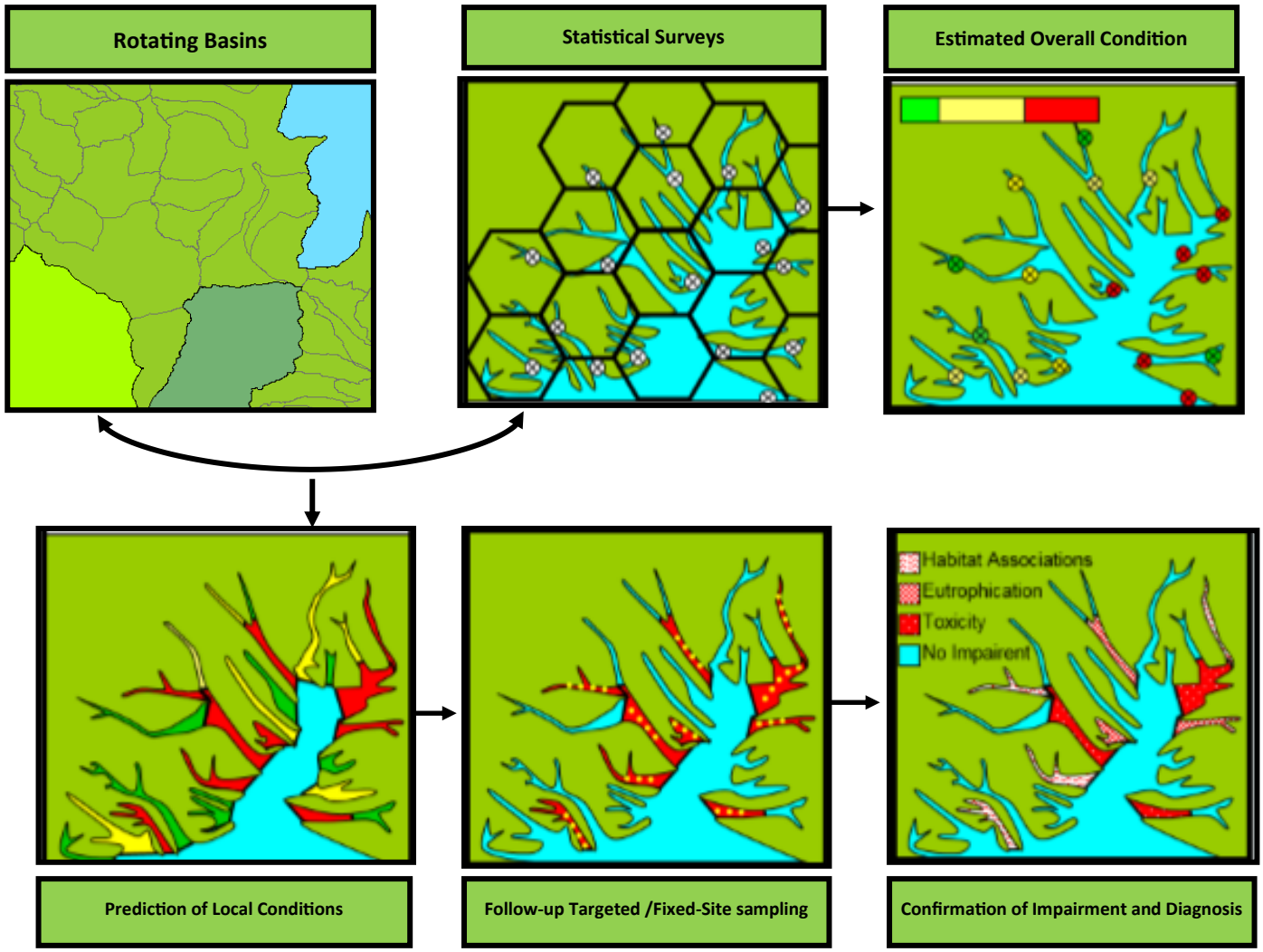

Figure 1: An example of how multiple monitoring designs can be used to inform water quality protection and restoration.