



# Water Quality Monitoring: A Guide for Informed Decision Making

## Fixed-Site, Trend Monitoring Network

### About

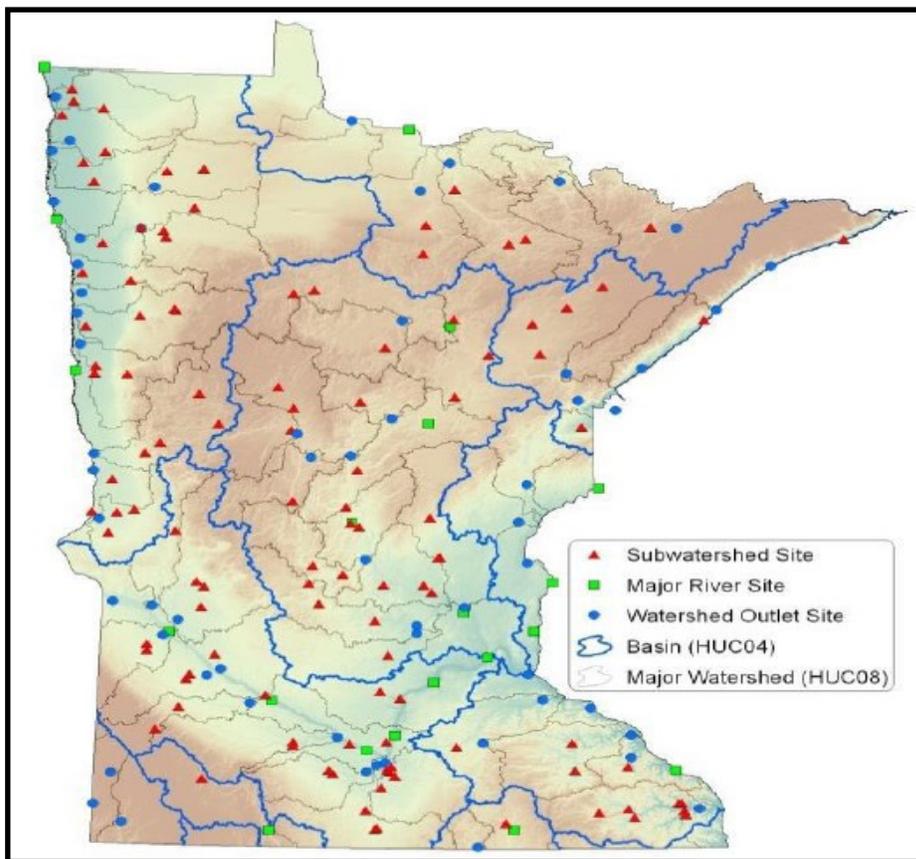
A fixed-site, trend monitoring network is a water monitoring approach that uses a set of monitoring sites that remain in place and are monitored over the course of many years. Such a network is important for describing long-term water quality conditions. Depend-

ing on the frequency of water chemistry monitoring and environmental conditions, statistical trends in water quality can begin to be seen after about a decade of monitoring. Even before statistical trends can be determined, fixed station monitoring yields useful information on on-going water quality conditions.

Biological monitoring can also be performed repeatedly at fixed sites to compare changes in biological health over time.

### What you need to know

Seeing changes in water quality over time through fixed site monitoring can give an indication of positive or negative changes in water quality resulting from land use changes, best management practices implementation, regulations, extreme weather events, or other influences. Quantifying success of implementation efforts can be a major benefit of this type of monitoring. Data from fixed station monitoring, while specific to the site(s) where the data are collected, can be used to create and improve water quality models that can predict water quality conditions in other non-monitored locations.



**Figure 1:** Minnesota's Watershed Pollutant Load Monitoring Network - each site is permanent, has water samples taken regularly, and includes a flow gage to record water quantity measurements:

## Fixed-Site, Trend Monitoring Summary

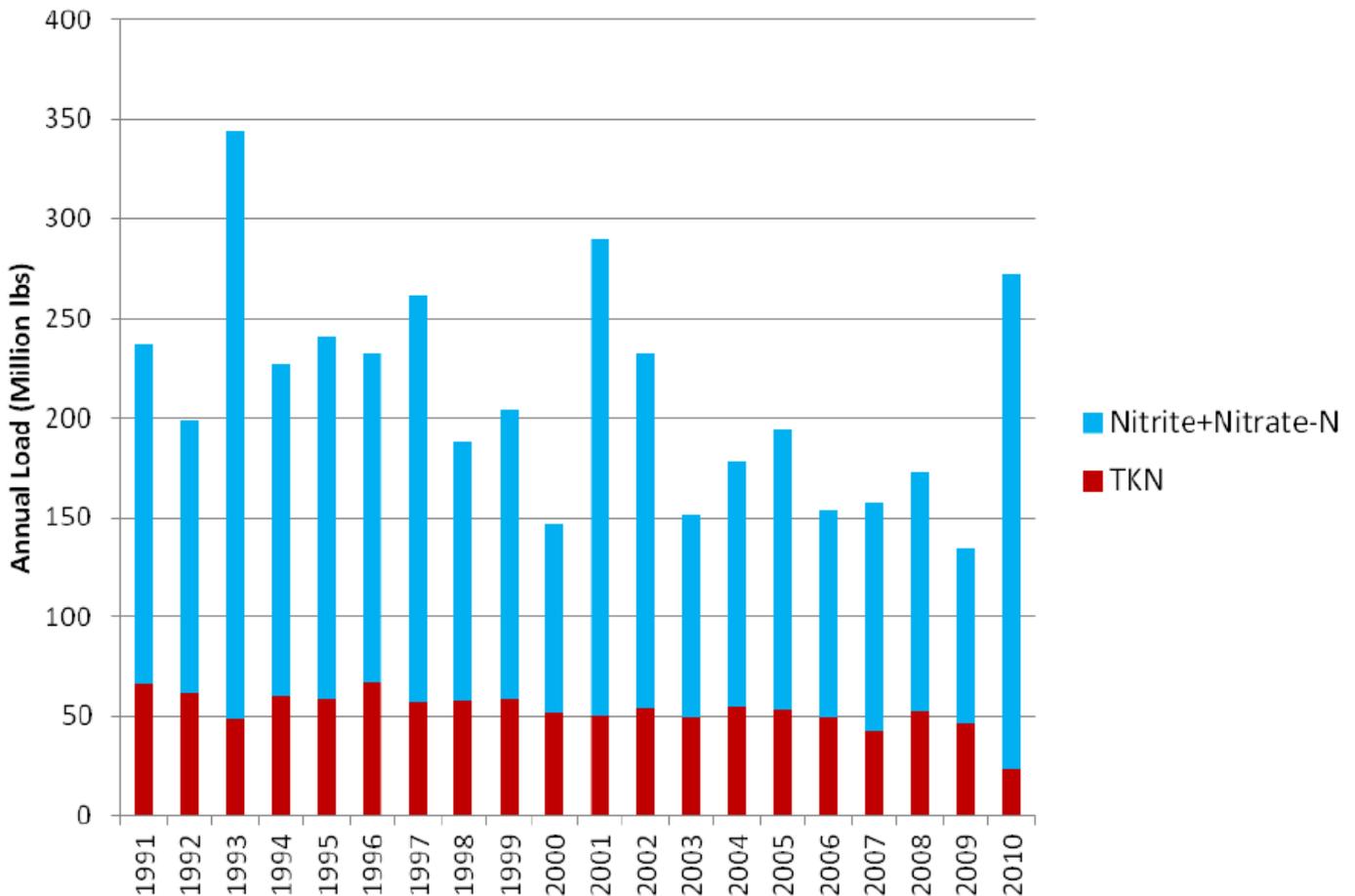
Strengths	Limitations	Questions Addressed
Provides long-term, emergency, or seasonal in-depth water quality information	Usually biased sites that provide waterbody specific information	Status and trends of water quality that can be used to make assessment decisions Status of water quality at the waterbody scale Trends in water quality site-specifically Provides information that can be used to make assessment decisions.

**Table 1:** The above table outlines the strengths, limitation, and products produced by fixed-site, trend monitoring networks.

## Fixed-Site, Trend Monitoring Network Results

Sampling a waterbody once gives a snapshot of the current condition at a moment in time, but sampling in the same fixed location repeatedly over the course of many years gives a picture of how water quality changes over time. The more frequently samples are taken and the longer the site is monitored, the better the shorter term effects of weather on data quality are understood and accounted for. Very high (flood) and very low water levels (drought) will result in very different water quality results, from each other, and from average flow conditions. Frequent, long term sampling in a fixed site network helps describe water quality conditions under all flow conditions.

### TN Loads at Lock and Dam #8



**Figure 2:** Annual Total Nitrogen (TN) loads in the Mississippi River at Lock and Dam #8 (near Iowa border), showing year to year variability between 1991 and 2010 and the proportion of TN which is in the nitrite plus nitrate and TKN (ammonium plus organic-N) form

Whereas water quality samples alone can be analyzed to determine pollutant concentrations in a waterbody at a given time, pairing regular water quality sampling with water quantity monitoring, or flow gaging, yields much better information. Combining concentration data with flow data can allow for calculation of average concentrations of pollutants in the water over various flow levels (flow-weighted mean concentrations), pollutant loads (the total mass of pollutants in the water over time), and pollutant yields (the mass of pollution generated per acre over time).

See the Minnesota Pollution Control Agency website for maps displaying this type of information on a watershed basis: <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/streams-and-rivers/watershed-pollutant-load-monitoring-network.html#products-data>.