



OFFICE OF WATER PROGRAMS
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WATER QUALITY NETWORK OBJECTIVES
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OBJECTIVES OF THE WATER QUALITY NETWORK

The Pennsylvania Water Quality Network (WQN) is a statewide, fixed-station sampling network that has been gathering important surface water quality data across the Commonwealth for decades. The design of the network, the design of sampling plans in the network, and the decades of data available at some stations have allowed WQN data to be used for many purposes by the Pennsylvania Department of Environmental Protection (DEP), other state and federal agencies, and other interested parties. This document describes the key uses of WQN water chemistry and macroinvertebrate data. For more information on this sampling network, please visit the WQN webpage at [DEP Water Quality Network](#).

Trend Analysis

Trend analysis is one of the core functions of the WQN. The WQN's fixed-station monitoring strategy is uniquely suited for measuring changes in water quality through time. Trend data collected in the WQN is used to monitor incremental progress in water quality, to calibrate Total Maximum Daily Load (TMDL) models, and to track sources and timing of potential impacts to water quality. Analyses of trend data are also one of the most efficient and accessible ways to communicate vast amounts of water quality data to a variety of stakeholders, including the public, which promotes transparency.

Example

As part of a joint effort, DEP partners with the Susquehanna River Basin Commission (SRBC), the United States Geological Survey (USGS), and the Chesapeake Bay Program (CBP) in a rigorous sampling program to measure nutrient and sediment concentrations at strategic locations within the Susquehanna River basin to better understand nutrient and sediment inputs to the Chesapeake Bay. This monitoring network is incorporated into the WQN and consists of six mainstem river stations and thirty tributary stations. From this extended WQN program, SRBC reports on trends in nutrient and suspended sediment concentrations, loads, and yields in the Susquehanna River basin. Information from these reports helps managers from multiple agencies create and adapt appropriate action plans.

Permitting

Data from the WQN informs the evaluation and development of water quality-based effluent limitations (WQBEL) in National Pollutant Discharge Elimination System (NPDES) permits which control the discharge of pollutants from point sources into surface waters. WQBELs, as defined in 25 Pa. Code section 96.1, are effluent limitations based on the need to maintain or attain the water quality criteria and to assure protection of existing and designated uses. DEP often uses WQN data as background data for naturally occurring pollutants when determining whether a stream has assimilative capacity to accept a pollutant limit and in developing WQBELs where there is reasonable potential to exceed water quality criteria.

WQN data also provide important background data when permitting discharges in High Quality Waters (HQ) and Exceptional Value Waters (EV) where existing water quality is protected and maintained. In permitting discharges to these special protection waters, data from a WQN station near the proposed or existing discharge site, or from a WQN station that is representative of the proposed or existing discharge site, can be used to develop non-degrading effluent limitations.

Additionally, since the toxicity of several pollutants vary with hardness (e.g., copper, lead, nickel, silver, and other metals) or pH (e.g., ammonia), many Chapter 93 water quality criteria require background hardness or pH to use in calculating criteria values. In these situations, WQN data can be used to eliminate the use of default hardness or pH values, or the need for additional data collection to calculate appropriate water quality criteria values.

Example

DEP permit writers can use WQN data to develop non-degrading effluent permit limits for discharges to HQ and EV streams. A DEP permit writer used water chemistry data collected at WQN station 195 on Rock Run to calculate the non-degrading effluent limitations for an Exceptional Value tributary to French Creek in Chester County. The WQN station allowed the permit writer to use data that is representative of the watershed containing the permitted discharge, instead of default data values or requiring the need to collect additional data.

Water Quality Assessments for Federal Clean Water Act Sections 303(d) and 305(b)

The WQN is crucial for Pennsylvania to meet federal mandates to monitor water quality and to assess monitored water quality against water quality standards. Depending on the type of WQN station, certain chemical parameters are collected frequently enough to determine if water quality criteria are being met. This information is one part of the overall surface water monitoring program that helps build the Pennsylvania Integrated Water Quality Monitoring and Assessment Report, which is required by the federal Clean Water Act on a biennial basis. In addition, biological assessment determinations can also be made at WQN stations where biological data is collected using current assessment methodologies.

Example

Historical and current data for nitrates collected at the WQN station on Connoquenessing Creek located downstream of an industrial discharge in Butler County was instrumental in documenting the impairment and subsequent restoration of the creek's Potable Water Supply (PWS) use. The PWS use of Connoquenessing Creek downstream of the discharge was listed as impaired on the 303(d) list for violating the nitrite plus nitrate PWS criterion in 25 Pa. Code § 93.7 as documented in historical WQN data. After the industrial discharger discontinued nitric acid pickling,

WQN data documented water quality in Connoquenessing Creek downstream of the discharge as no longer violating the nitrite plus nitrate PWS criterion. In this instance, WQN data was central to both the listing and subsequent delisting of Connoquenessing Creek.

Data to Inform Permits

The WQN is specifically designed to evaluate both the quality of Pennsylvania's surface waters and the effectiveness of DEP's water quality management program. Identifying changes in water quality at certain locations over time helps ensure permits are written accurately and are protective of water quality standards. Additionally, the WQN serves not only to help inform permitting, but also help operators describe in permit applications how they are able to comply with water quality standards.

Example

The WQN data was essential in helping show compliance with water quality standards as discussed in the industrial discharge example above. Although the WQN data initially documented the impairment, WQN data also helped the operator demonstrate compliance with water quality standards after the process change at the plant.

Threatened and Endangered Species Protection

Threatened and endangered species are an ongoing concern related to NPDES discharges. The United States Fish and Wildlife Service (USFWS) has recommended stringent criteria for multiple pollutants including ammonia-nitrogen, chloride, TDS, and nickel to protect threatened and endangered mussel species. As noted in the permitting discussion above, WQN data is essential in accurately evaluating appropriate criteria for some of these pollutants since the availability of background data can have a significant impact on these evaluations. Not only is it critical to have accurate background data of the pollutants of concern but it is also critical to have accurate hardness and pH background data to calculate appropriate pollutant criteria and associated potential impact areas.

Example

Endangered mussels are of special concern in the Allegheny River, French Creek, Shenango River, and many tributaries to these surface waters. Segments of all three main streams have been designated as "critical habitat" for the rabbitsfoot mussel, and many other threatened and endangered mussel species. Numerous NPDES permits in this region of Pennsylvania have been issued with concurrence by USFWS as protective of endangered species, using a permitting strategy that includes a robust evaluation of WQN data.

Emerging Science

Due to the years- to decades-long historical records of physical, chemical, and biological data collected at many stations, WQN sites often serve as prime locations to collect new data (e.g., contaminants of emerging concern) and to develop new

collection protocols (e.g., periphyton monitoring methods). The ability to contextualize new kinds of data in robust historical records characterizing particular sites across a range of parameters and assemblages can greatly reduce the cost and time needed to expand monitoring approaches when novel environmental concerns arise.

Example

During an intensive study of the Susquehanna River, WQN stations were almost exclusively used when selecting locations to place passive chemical samplers designed to detect hundreds of contaminants of emerging concern. The combination of this new data and the existing WQN data substantially reduced the overall cost of the project, compared with project costs if the passive samplers were deployed in locations without robust water quality network data.