

Surface Water Quality Monitoring: Program Design for Data Analysis.

Sergei G. Touchinski
AMEC Earth & Environmental

Monitoring represents a system of measurements, observations, evaluations and reporting of the aquatic environment conditions. It is well known that water quality data collection and analysis is important element in any environmental project. However, very often we have to deal with datasets and even databases, where data are randomly collected spatially and/or temporally. The other issue is incomplete list of parameters, which may satisfy with project goals but not provide data for proper description of waterbodies (e.g. surface-groundwater interaction, seasonality). This issue can cause further difficulties in description of aquatic settings and effects modeling.

A typical inadequate monitoring and assessment program had the following deficiencies: the objectives of the assessment were not properly defined; the program was developed with insufficient knowledge of the waterbody; there was inadequate planning of sampling frequency and analysis; and finally, data were improperly interpreted and reported.

In a number of hands on examples we demonstrate a solution to a network design and program justifications. The examples were obtained over the last ten years with focus on monitoring programs, surveys, and surveillance locally and internationally.

We discuss temporal variability and spatial heterogeneity of water quality and cause – effects relationships following recommendations to sampling frequencies and site location – spatial discreteness. A potential cause of data misinterpretation due to insufficient or incorrect observations frequencies will be presented as well. Spatial network design also includes watershed delineation and consideration of a project location within streams and tributary pattern.

A discussion on water quality parameters includes selection of constituents other than contaminants and how they are used to describe aquatic conditions. A number of parameters and their combinations are included as indicators of potential contamination or other irregularities in a water quality data.

The data interpretation includes assessment of variations in surface water quality over time and spatially. Several techniques are used to determine trends in water quality, specifically for short-term data sets. Water quality data traditionally are presented in concentration units. However in some cases and focused monitoring programs a combination with water quantity data analysis is important. This comes to analysis of loadings, which in return provides indication of water quality effects from changes in flows of land-use pattern.

Data interpretation and presentation to stakeholders audience is an important element in monitoring programs. This includes different methods in data visualization, such as plots, diagrams, as well as data mapping using some GIS capabilities.

Biography: Sergei G. Touchinski

Dr. Touchinski has over thirty years experience on environmental and water resources projects. He has extensive experience in hydrology, limnology, including, lakes hydrodynamics, pollutant transport and dispersion, watershed management and water supply optimization. Dr. Touchinski has many years of experience in environmental monitoring design, including observation networks and analytical equipment. He provided water quality impact assessment for mining and oil and gas industries as well as for municipalities including watershed management projects. This experience was gained in Russia, Estonia, and during last nine years in western and northern Canada. In addition to his interdisciplinary experience Dr. Touchinski has extensive teaching experience in the Europe and North America delivering lectures and seminars. Dr. Touchinski holds a Ph.D. degree specializing in hydrology and water resources and D.Sc. degree in Environmental Science in recognition of his original contributions to the understanding and solution of significant problems in environmental science and applied water quality issues.