# MORE THAN DOABLE: AN EXAMINATION OF STATISTICAL METHODS USED TO ANALYZE TIME TRENDS IN CONTAMINANT DATA CONTAINING NONDETECTS

Douglas B. McLaughlin

National Council for Air and Stream Improvement, Inc.
Western Michigan University
A-114 Parkview Campus
Kalamazoo, MI 49008

## ABSTRACT

The assessment of trends over time in the concentrations of hydrophobic organic contaminants (HOCs) is important in order to minimize the environmental and human health risks associated with these compounds. Obtaining an accurate indication of the presence or absence of a time trend, its rate, and its trajectory can be critical to setting priorities among competing environmental management needs or selecting among several remedial alternatives. HOC concentration data sets commonly have "nondetect" observations occurring at multiple analytical detection limits. To evaluate these data, it has been common practice to replace nondetects with a selected value such as zero, the detection limit, or one-half the detection limit prior to statistical analysis. This practice is often referred to as "nondetect substitution", and can present problems for data analysts and users since the choice of the substituted values is generally arbitrary, can be difficult to defend, and can influence the outcome of the analysis. Recently, alternative “non-substitution” data analysis methods have become increasingly available to environmental practitioners. There has also been a call for greater use of these methods to support a range of environmental decisions, including those informed by time trend analysis. In this presentation, several non-substitution methods presented in the literature and available in common statistical software are used to investigate and characterize a decline in fish tissue HOC concentrations that include some nondetect observations. Results are compared to those obtained by substituting one half the detection limit and using more traditional data analysis techniques.

## KEYWORDS
Fish, contaminant, temporal trend, statistical analysis, nondetects, regression, first order exponential decay.