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## **DETECTION AND ANALYSIS OF CHANGES IN WATER QUALITY: BASIC MONITORING DESIGNS**

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Detection of differences or trends in water quality data requires organization and analysis of data collected from the field. Three monitoring designs common to water quality studies are paired watershed, upstream/downstream, and before/after. Two parametric statistical tests, the t-test and regression analysis, are presented for use with the water quality monitoring designs. A paired watershed design comprises two watersheds of similar location and land use (control and treatment) and two time periods of study (calibration and treatment).

The goal is to establish a relationship between the watersheds for both periods of study. Based on those relationships, the changes can be quantified. An upstream/downstream-(before/after) design also requires calibration and treatment periods (before and after BMP implementation); however, unlike the paired watershed design, only one watershed is monitored, with sampling stations positioned upstream and downstream of the treatment area. With a before/after monitoring design, water quality data from one downstream station is collected for a period of time before and after BMP implementation.

Two statistical tests are presented which may be used to detect water quality changes - a t-test and regression analysis. A t-test is used to detect a statistically significant change in the mean of the water quality parameter of interest before and after BMP implementation.

Regression analysis, however, usually presents a more powerful way of detecting and evaluating change, particularly when covariates, or explanatory variable and water quality variable (in a before/after design) exhibit a strong relationship.

This methodology offers an efficient way to detect changes in water quality. Potentially, the methods can be applied in detecting the long-term trends in water quality as well as the extent of the accidental environmental pollution in Yugoslavia.