

A BRIEF INTRODUCTION TO LOADING ESTIMATION APPROACHES

Averaging approaches are used in various ways. The simplest approach is to multiply the average pollutant concentration over a given period of time by the average daily discharge for each day in the time period to produce a series of estimated daily loads. Another approach is to multiply the average concentration for a given time period, such as a year, by the average of the daily discharges for that period to produce an average daily load. That average is then summed over all days of the year to produce an estimated total load for the year. The same approach can be used to estimate average monthly load (a product of the average concentration and average discharge for a particular month), or average seasonal load (a product of the average concentration and the average discharge for a particular season).

Ratio estimators use a known relationship with a parameter (often stream discharge) that is sampled more frequently to adjust the average daily load for the days with concentration observations. Daily load is calculated as the product of concentration and discharge for days on which samples are taken, and the average of these daily loads is also calculated. A discharge ratio is then calculated by dividing the average discharge for all days in the year by the average discharge for the days on which samples were collected. The average daily load is adjusted by multiplying it by the discharge ratio. A total load is calculated by multiplying the adjusted daily load by 365 days. In most cases, calculations using ratio estimators are stratified by flow and/or season.

Regression approaches involve the development of an empirical relationship between concentration, which is usually measured infrequently, and a measure that is more easily obtained at high frequency (typically stream discharge, but it could be another parameter, such as turbidity). That relationship is then used to estimate concentrations for times when discharge was measured, but concentrations were not. A log transformation of the data is often required, as is typical for many environmental parameters. Multivariate regression has sometimes been used to predict concentration based on more than one variable (*e.g.*, discharge and turbidity). There are several software packages that automate regression procedures, provide variations on the types of regression used, and provide statistics to evaluate goodness of fit.