$$\ln(C) = \beta_0 + \beta_1[\ln(Q - Q')] + \beta_2[\ln(Q - Q')]^2 + \beta_3(t - t') + \beta_4(t - t')^2 + \beta_5 \sin(2\pi t) + \beta_6 \cos(2\pi t) + \varepsilon \,, \quad (1)$$

where

- ln = natural logarithm function,
- C = concentration (in milligrams per liter),
- Q = instantaneous discharge (in cubic feet per second),
- t = time (in decimal years),
- sin = sine function,
- cos = cosine function,
- π = 3.14169,
- β_0 to β_6 = coefficients of the regression model,
- ε = model errors,
- Q' = centering variable defined so that β_1 and β_2 are statistically independent, and
- t' = centering variable defined so that β_3 and β_4 are statistically independent.

The regression analysis assumes that model errors (ε) are independent and normally distributed, with zero mean and variance. The minimum variance unbiased estimator (MVUE; Bradu and Mundlak, 1970) was included in the model to correct for the retransformation bias associated with log-linear regression models; the model also employs the adjusted maximum likelihood estimator (AMLE; Cohn, 1988), which statistically adjusts for censored data and multiple reporting limits.

Equation 1 results in an estimate of the daily logarithmic constituent concentrations. The estimated daily constituent concentrations are then multiplied by the daily mean discharge to produce a daily mean load by using the following equation:

$$\ln[L_i] = Q_i \times \ln[C_i] \times K, \quad (2)$$

where

- ln = the natural logarithm function,
- L_i = the daily mean load (in tons per year),
- i = any interval,
- Q_i = the daily mean discharge for that interval (in cubic feet per second),
- C_i = the mean concentration (in milligrams per liter), and
- K = 0.984, the correction factor for unit conversion to tons per year.

Yields, which allow for easy comparison among sites with different drainage areas, were computed by dividing the estimated load by the drainage area of the basin.

Quality-Control Methods and Results

Quality-assurance and quality-control measures were practiced throughout the study according to established USGS guidelines (Mueller and others, 1997). Laboratory and field blank samples were processed by using water certified to contain undetectable concentrations of constituents to be analyzed. Data from blank samples were used to determine the extent of contamination introduced during sampling, sample processing, shipping, or laboratory analysis. Blank water used for the inorganic constituent sample was distilled, deionized water obtained from the USGS Ocala Water Quality Research Laboratory in Ocala, Fla. Blank water used for the organic constituent sample was either pesticide-grade or volatile-organic-compound-grade blank water obtained from the NWQL.

Eighteen blank samples were analyzed for nutrients. Nitrogen species were detected in 10 of the blanks, and 4 of these detections were greater than the corresponding LRL. Concentrations of dissolved ammonia and dissolved ammonia plus organic nitrogen were detected in one blank sample each in amounts that exceeded the 75th percentile for environmental samples for these two constituents. All other nitrogen detections were lower than the 10th percentile of environmental samples. There were no detections of nitrite or nitrite plus nitrate in the blank samples. Phosphorus species were detected in four blank samples, and two of these detections were greater than the corresponding LRL. Two estimated detections of dissolved phosphorus were equal to or less than the 5th percentile for this constituent in all environmental samples. Orthophosphate and total phosphorus were detected once—concentrations were estimated and less than the corresponding LRL.

Dissolved organic carbon was detected in 3 of 18 blank samples—two of the detections were estimated and less than the LRL. All dissolved organic carbon detections were less than the minimum concentration for environmental samples. Suspended organic carbon was detected in 2 of 14 blank samples, and concentrations were equal to or less than the median concentration of this constituent in all environmental samples. Fourteen blank samples were