U.S. Department of the Interior
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Summary of Trends and Status Analysis for Flow, Nutrients, and Sediments at Selected Nontidal Sites, Chesapeake Bay Basin, 1985-99

Open-File Report 01-73

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by Michael J. Langland, Robert E. Edwards, Lori A. Sprague, and Steve Yochum

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New Cumberland, Pennsylvania
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U.S. DEPARTMENT OF THE INTERIOR

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by Michael J. Langland, U.S. Geological Survey, Robert E. Edwards, Susquehanna River Basin Commission, Lori A. Sprague, and Steve Yochum, U.S. Geological Survey

ABSTRACT

Water-quality and flow data from 31 sites in nontidal portions of the Chesapeake Bay Basin were analyzed to document annual nutrient and sediment loads and trends for the period 1985 through 1999 as part of an annual reevaluation and reporting for the Chesapeake Bay Program. Annual loads were estimated by use of the U.S. Geological Survey ESTIMATOR model. Trends were estimated using linear regression. Trends were reported for monthly mean flow, monthly load, flow-adjusted concentration, and flow-weighted concentration. Median yields and concentrations were calculated to help facilitate comparisons between basins. The drought of 1999 had pronounced effects on trend results. The trend in flow increased at 4 of the 31 sites, 8 fewer sites than in 1998. Ten less significant trends were estimated for nutrient and sediment loads compared to 1985-98. Trends in flow-weighted and flow-adjusted concentrations varied little by nutrient species and geographic location. Trends were generally downward or not significant for both the nitrogen and phosphorus species throughout the Chesapeake Bay Basin. Trends in flow-adjusted concentration indicated downward trends at most sites for nutrients and about half the sites for sediments, an indication that management actions are reducing nutrient and sediment concentrations.

INTRODUCTION

In 1987, the governors of Pennsylvania, Maryland, and Virginia and the mayor of the District of Columbia signed the Chesapeake Bay Agreement. One of the commitments in this agreement called for a 40-percent reduction in the controllable loads of nutrients reaching the Chesapeake Bay by the year 2000. Results from the Chesapeake Bay Watershed and Estuarine models predicted that improvements in dissolved oxygen sufficient to support living resources could be achieved if the 40-percent nutrient-reduction goal was met. Individual nutrient-reduction goals and strategies were established for the major river basins delivering nutrients to the Bay. Progress toward these nutrient-reduction goals have been evaluated by use of the Watershed and Estuarine water-quality model. Additionally, water-quality and living-resource data are compiled annually and analyzed to assess the response of the watershed and the Bay to nutrient-reduction strategies. The 1999 evaluation of monitoring data provides an assessment of changes in water-quality conditions that are the result of nutrient-reduction strategies and changes in hydrology caused by climatic variability and watershed characteristics. Results are summarized and presented with similar data for tidal portions of the Bay and presented in the "State of the Bay" report, an annual Chesapeake Bay Program report.

Recently, the nontidal sites have been organized into two data sets for analysis, the River Input Program sites and upstream sites where data are collected by multiple agencies, both providing information from the nontidal areas of the Bay. As part of the River Input Program, a cooperative program between the U.S. Geological Survey (USGS), Maryland Department of Natural Resources (MdDNR), Virginia Department of Environmental Quality (VaDEQ), and Washington D.C. Council of Governments (WashCOG), water-quality and flow data are collected by the USGS at eight sites near the most downstream nontidal areas, known as the Fall Line, and the eastern shore of Maryland (fig. 1). At the upstream sites, long-term water-quality data are collected by several agencies at approximately 100 sites in the nontidal parts of the watershed. A subset of sites with long-term (10-15 years) water-quality and flow data are used to determine trends in flow, concentration, and load (fig. 1). Trend calculations were completed at 16 sites by the USGS in cooperation with MdDNR, VaDEQ, and WashCOG, and at 6 sites by the Susquehanna River Basin Commission (SRBC) as part of the Susquehanna Nutrient Assessment Program (fig. 1).

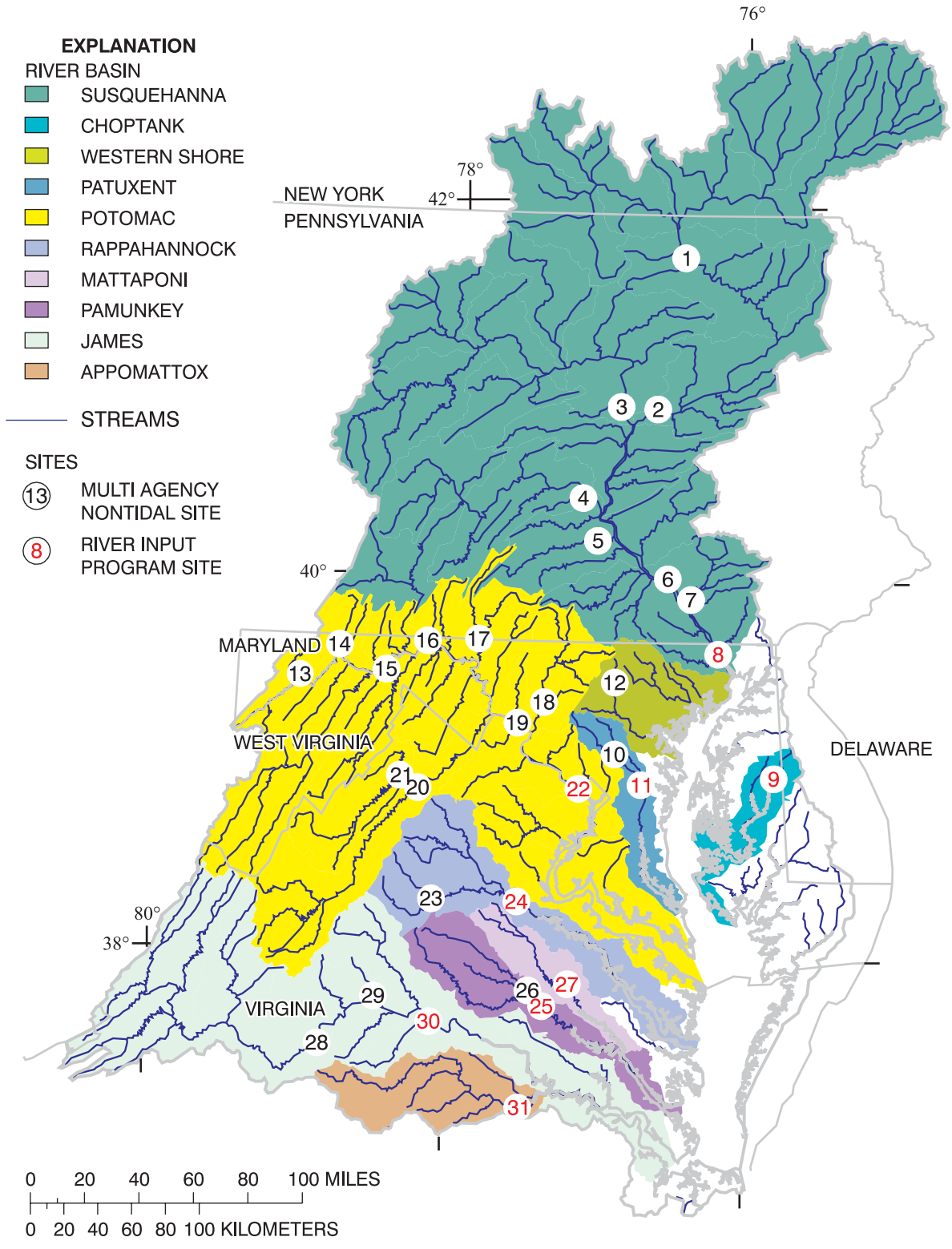

Figure 1. Location and site number of the 31 sites used in this study.

This report presents the results of trends computations in flow and nutrient and sediment data collected during 1985-99. Results include graphical examination of spatial and temporal trends and statistical tables included in the appendixes.

METHODS

The methods section briefly discusses how the data sets were constructed and analyzed. A more detailed description of the methods is provided in Langland and others (1998).

Data Set Construction

The following section describes the sources of the water-quality and flow data, selection of constituents, record length, and estimation of missing constituents used in calculations of annual loads and trends.

Water-quality concentration and flow data were retrieved and compiled from the following agencies: the USGS, U.S. Environmental Protection Agency (USEPA), Pennsylvania Department of Environmental Protection (PaDEP), MdDNR, VaDEQ, SRBC, the Interstate Commission on the Potomac River Basin (ICPRB), and the WashCOG. This effort was undertaken to update and extend the time period of the non-tidal water-quality database at the 31 sites to 1999. The 31 sites analyzed as part of the 1999 annual Chesapeake Bay Program monitoring update are listed in table 1.

A total of 36 physical, biological, and chemical water-quality constituents (table 2) were retrieved if available and updated for the 31 sites in table 1. These constituents include 14 nutrient species, suspended sediment, and total suspended solids. Continuous daily streamflows were retrieved from the USGS National Water Information System (NWIS) database. The updated water-quality database and the USGS streamflow database provided the input data files to estimate annual loads and trends. Concentration data were quality assured using a statistical program that identified suspect remark codes (such as less than detection), missing dates, and/or missing times associated with the sample before they were added to the database. In addition, statistical tests and visual examination of the raw and residual data were made before and during their use in the various trend and load programs.

The following nitrogen, phosphorus, and sediment/solids were tested for trends and have estimated annual loads where applicable. Because of analytical differences between SED and TSS determinations, SED concentrations tend to be higher and more variable than TSS concentrations (Kammerer and others, 1998). Therefore, caution should be used when comparing the two.

Nitrogen Species:	
Total nitrogen	TN
Dissolved Kjeldahl nitrogen	DKN
Total Kjeldahl nitrogen	TKN
Total ammonia	TNH_3
Dissolved ammonia	DNH_3
Total or dissolved nitrate, or total or dissolved nitrite plus nitrate	NOx
Phosphorus Species:	
Total phosphorus	TP
Dissolved phosphorus	DP
Dissolved inorganic phosphorus	DIP
Suspended sediment	SED
Total suspended solids	TSS

In some data sets, water-quality records for some constituents were missing. Where possible, missing constituents are calculated from the reported species of the constituent. Missing constituents were estimated ONLY for input data files used to calculate loads and trends and not populated in the original SAS database. If more than one of the nitrogen species used in calculating total nitrogen was below the detection limit, the estimated value was not determined or reported as less than the combined minimum report limit. In some data sets, total nitrogen and total phosphorus are calculated as the sum of the particulate and dissolved constituents.

The optimum time for trend results would ideally begin in January 1985 and end in December 1999. Shorter time-series data are acceptable if they meet certain criteria. For both the load model and any trend test, the data set must contain a minimum of 10 years and 100 “monthly” samples, 10 years and 40 quarterly samples, or a mixture of both types with at least 10 years and 75 samples. Ideally, there would be a mixture of samples collected over the full range of the hydrograph. Loads and trends were estimated on data sets for any 10-year or greater time period starting between January 1985 and January 1989 and continuing through December 1999.

Table 1. *Streamflow and water-quality station numbers for the 9 River Input Program and 22 Nontidal Program sites*
[mi^2, square miles]

Flow station	Water-quality station	Latitude	Longitude	Map identification number	Drainage area (mi^2)	Station name
				River Input Program Sites		
01491000	01491000	385950	754710	9	113	Choptank River near Greensboro, Md.
01578310	01578310	393928	761029	8	27,100	Susquehanna River at Conowingo, Md.
01594440	01594440	385721	764136	11	348	Patuxent River near Bowie, Md.
01646580	PR01	385546	770701	22	11,600	Potomac River at Chain Bridge, Md.
01668000	01668000	381920	773105	24	1,596	Rappahannock River near Fredericksburg, Va.
01673000	01673000	374603	771957	25	1,081	Pamunkey River near Hanover, Va.
01674500	01674500	375316	770948	27	601	Mattaponi River near Beulahville, Va.
02035000	02035000	374015	780510	30	6,257	James River at Cartersville, Va.
02041650	02041650	371330	772832	31	1,344	Appomattox River at Matoaca, Va.
				Multi-Agency Program Sites		
01531500	01531500	414555	762628	1	7,797	Susquehanna River at Towanda, Pa.
01540500	01540500	405729	763710	2	11,220	Susquehanna River at Danville, Pa.
01553500	01553500	405803	765236	3	6,859	West Branch Susquehanna River at Lewisburg, Pa.
01567000	01567000	402842	770746	4	3,354	Juniata River at Newport, Pa.
01570000	01570000	401508	770117	5	470	Conodoguinet Creek near Hogestown, Pa.
01576000	01576000	400316	763152	6	25,990	Susquehanna River at Marietta, Pa.
01576754	01576754	395647	762205	7	470	Conestoga River at Conestoga, Pa.
01586000	NPA0165	393000	765300	12	56.6	Patapsco River at Hollofield, Md.
01592500	PXT0809	390700	765231	10	132	Patuxent River at Laurel, Md.
01599000	GEO0009	392936	790242	13	47	Georges Creek near Franklin, Md.
01601500	WIL0013	393941	784650	14	247	Will Creek near Cumberland, Md.
01610000	POT2766	393218	782717	15	3,109	Potomac River at Paw, W. Va.
01613000	POT2386	394149	781036	16	4,073	Potomac River at Hancock, Md.
01614500	CON0180	394256	774931	17	501	Conococheague Creek at Fairview, Md.
01643000	MON0155	392313	772158	18	817	Monocacy River at Reels Mill Rd, Md.
01638500	POT1595	391624	773238	19	9,651	Potomac River at Point of Rocks, Md.
01631000	1BSSF003.56	385449	781240	20	1,642	S F Shenandoah River at Front Royal, Va.
01634000	1BNFS010.34	385836	782011	21	768	N F Shenandoah River near Strasburg, Va.
01666500	3-ROB001.90	381930	780545	23	179	Robinson River near Locast Dale, Va.
01671020	8-NAR005.42	375100	772541	26	463	North Anna River at Hart Corner near Doswell, Va.
02026000	2-JMS229.14	373211	784939	28	3,680	James River at Bent Creek, Va.
02029000	2-JMS189.31	374751	782747	29	4,584	James River at Scottsville, Va.

Table 2. *List of constituents updated and contained in USGS nontidal water-quality database*

[ft^3/s, cubic feet per second; mg/L, milligrams per liter; µg/L, micrograms per liter]

Constituent code	Data description	Constituent code	Data description
STAID	Station number	00671	Dissolved inorganic phosphorus as P, in mg/L
SNAME	Station name	00680	Total organic carbon as C
AGENCY	Collection agency code	00681	Dissolved organic carbon as C
DATE	Date of sample collection	00900	Hardness as $CaCO_3$, in mg/L
TIME	Time of sample collection	00915	Calcium as Ca, in mg/L
LAT	Latitude	00925	Dissolved magnesium as Mg, in mg/L
LONG	Longitude	00930	Dissolved sodium as Na, in mg/L
HUC	Hydrologic unit code	00935	Dissolved potassium as K, in mg/L
00010	Water temperature, in degrees Celsius	00940	Dissolved chlorine as Cl, in mg/L
00060	Daily mean discharge, in ft^3/s	00945	Dissolved sulfate as SO_4, in mg/L
00061	Instantaneous discharge, in ft^3/s	00955	Silica as SiO_2, in mg/L
00065	Stream stage, in feet	32211	Chlorophyll *a,* in µg/L
00076	Turbidity, in NTU	32231	Chlorophyll *b,* in µg/L
00095	Specific conductance, in micromhos per centimeter	32232	Chlorophyll *c,* in µg/L
00300	Dissolved oxygen, in mg/L	49954	Algal dry mass
00400	pH, in units	80154	Total suspended sediment, in mg/L
00410	Total alkalinity as $CaCO_3$, in mg/L		
00530	Total suspended solids at 105 degrees Celsius, in mg/L		
00600	Total nitrogen as N, in mg/L		
00608	Dissolved ammonia as N, in mg/L		
00610	Total ammonia N, in mg/L		
00613	Dissolved nitrite as N, in mg/L		
00615	Total nitrite as N, in mg/L		
00618	Dissolved nitrate as N, in mg/L		
00620	Total nitrate N, in mg/L		
00623	Dissolved ammonia plus organic nitrogen as N, in mg/L		
00625	Total ammonia plus organic nitrogen as N, in mg/L		
00630	Total nitrate plus nitrite as N, in mg/L		
00631	Dissolved nitrate plus nitrite as N, in mg/L		
00665	Total phosphorus as P, in mg/L		

Data Analysis

A brief description of the model used to estimate loads (ESTIMATOR), the statistical tests used to compute trends (linear regression, ESTIMATOR output), and procedures used with censored data are presented below. More detail about the data-analysis procedures is contained in Langland and others (1999) and in Darrell and others (1998).

ESTIMATOR Model

Nutrient and TSS / SED loads were estimated using the USGS 7-parameter, log-linear regression model (ESTIMATOR) developed by Cohn and others (1989). The model uses the Minimum Variance Unbiased Estimator (MVUE) developed by Bradu and Mundlak (1970) to correct for bias when transforming data from "log" to "real" space. The adjusted maximum likelihood estimator (AMLE) (Cohn, 1988) is used to assign concentration values to censored data, which are data below a detectable limit. A discussion of the model, the regression parameters, and some interpretations of the significance of the parameters is presented in Darrell and others (1998).

Linear Regression

Linear regression is a parametric test that approximates the relation between two continuous variables (Montgomery and Peck, 1982). A linear trend is estimated by regressing a response variable (flow, load) as a function of an explanatory variable (time). It is important that residual statistics and plots meet the assumptions of normality, constant variance, and linearity. In most cases, data must be log-transformed in order to improve linearity. If this transformation is used, the residual statistics and plots again must be checked for normality, constant variance, and linearity; the residuals must be independent. For this report, a residual normality of 0.92 or greater was used.

A null hypothesis of zero slope over time is tested. If the slope is significantly greater than zero, the null hypothesis is rejected and the conclusion is that a linear trend over time has occurred. Because the regression model does not account for the error in the estimates, a conservative p-value of 0.01 or less was considered significant for this study. The magnitude (percentage change over time) was estimated from the equation $[e^{(b*t)}-1] *100$ where b is the slope and t is the time, in years. The 95-percent confidence interval around the magnitude (upper and lower bounds) also was calculated. Helsel and Hirsch (1992) provide additional discussion for applying regression techniques to water-quality data.

Censored Data

The presence of a large number of censored values (values reported below the detection limit) in a data set can adversely affect the estimation of load and trend slope by not allowing for corrections due to variations in flow. In the ESTIMATOR model, values were assigned to the censored data using the AMLE (Cohn and others, 1989). The AMLE procedure will produce a statistically valid trend up to about 50 percent censoring. Therefore, if data were greater than 50 percent censored, trend results using the ESTIMATOR model were not reported. The following decisions were used to determine the appropriate level of data reporting, based on current USGS computer programs (Shertz and others, 1991) and work by Helsel and Hirsh (1992). In all cases below, if the residuals were not normally distributed, trend results were not reported. For the linear regression trends, censoring is always 0 percent.

- <50 percent censored data—ESTIMATOR trend test, the p-value, the slope estimate, direction and magnitude (percentage change over time) of the trend will be reported.
- >50 percent censored data—trend results will not be reported (using ESTIMATOR).
- <0.92 residual normality—report only p-value and slope. The range in the magnitude of the trend will NOT be reported.

TRENDS

Trends in water quality were estimated using the parametric methods described above. The parametric test involved a regression of non-transformed and transformed data with time. Analysis for trend was performed on the following:

- monthly mean flow
- monthly load
- flow-weighted concentrations (FWC), and
- flow-adjusted concentrations (FAC)

Each of the above trends provides a unique perspective on the changes in water quality within the Chesapeake Bay Basin and can be used as indicators of improvement or lack of improvement within a subbasin, the Bay Watershed, and individual estuaries.

Monthly Mean Flow

Trends in monthly mean flows indicate the natural changes in hydrology over time. Natural fluctuations in flow affect the observed concentrations and the average load and concentration delivered to the tidal estuaries. The trend in flow was calculated using a regression log (flow) with time. Trends were reported only for those sites for which the residuals of the model met the assumptions of normality, constant variance, and linearity.

The majority of the sites did not have a significant trend in flow (fig. 2, Appendix 1). Four flow sites had a significant upward trend; none of the sites had a significant downward trend. These results are in contrast to trends computed last year (1985-98) where 12 sites had an upward trend in flow. The drought of 1999 was the primary factor in changing the trends and also resulted in large decreases of flow into the Bay from the major rivers (fig. 4) between 1998 and 1999. At many of the 31 sites, annual mean flow has fluctuated between record maximums and record minimums in 4 of the last 15 years. Upward trends in flow (fig. 2 and Appendix 1) were significant at four sites, all in the state of Maryland. However, as a result of the drought in 1999, eight sites that previously indicated significantly increasing flow results became nonsignificant. Nearly all of the flow gaging stations in the Potomac River Basin used in this report recorded reductions in flow ranging from 32 to 77 percent. The average decrease in flow was about 53 percent.

Monthly Load

The constituent load is highly related to and dependent on flow. The load represents the amount of a given constituent transported and delivered downstream, a part of which will eventually reach the tidal estuaries. A trend in load will aid in explaining water-quality and living-resource changes in the tidal estuaries and assessing the effectiveness of Nutrient-Reduction Strategies. Monthly loads estimated from the ESTIMATOR model were tested for trend using a linear regression of log (load) with time. In most cases, the regression produced normally distributed residuals.

In general, the majority of the loads for TN and TP from sites within the watershed had no significant trends for 1985-99 (fig. 3). The River Input sites indicated nonsignificant trends at seven sites and downward trends for TP in the James River and TN and TP in the Patuxent River. Trends in loads were significantly affected by the drought and reduction in flow in a large area of the Bay Basin during the late spring and summer of 1999. There were 10 less significant trends in loads in 1985-99 than in 1985-98. Trends for TN were significantly upward at two sites and downward at two sites (fig. 3A and Appendix 1). Results for TP indicate significant downward trends at five sites and upward trends at one site (fig. 3B). Three of the four sites where TP trends are no longer significant are in the Susquehanna River Basin. Trend results increased significantly at 2 of the 31 sites for TSS/SED.

Average annual flow for 1985-99 from the three largest rivers (Susquehanna, Potomac, and James, about 21 trillion gallons per year) has exceeded the long-term average (1968-99, about 19 trillion gallons per year) (fig. 4) by approximately 5 percent. The maximum and minimum combined annual flow from the three rivers has occurred in 2 of the last 4 years, emphasizing the variability in the flow record and resultant affect on nutrient and sediment loads (fig. 4). In an average flow year, these three rivers deliver about 87 percent of the streamflow and about 96 percent of the nitrogen, 91 percent of the phosphorus, and 93 percent of the TSS/SED loads into the Chesapeake Bay (Langland and others, 1995). Because of the

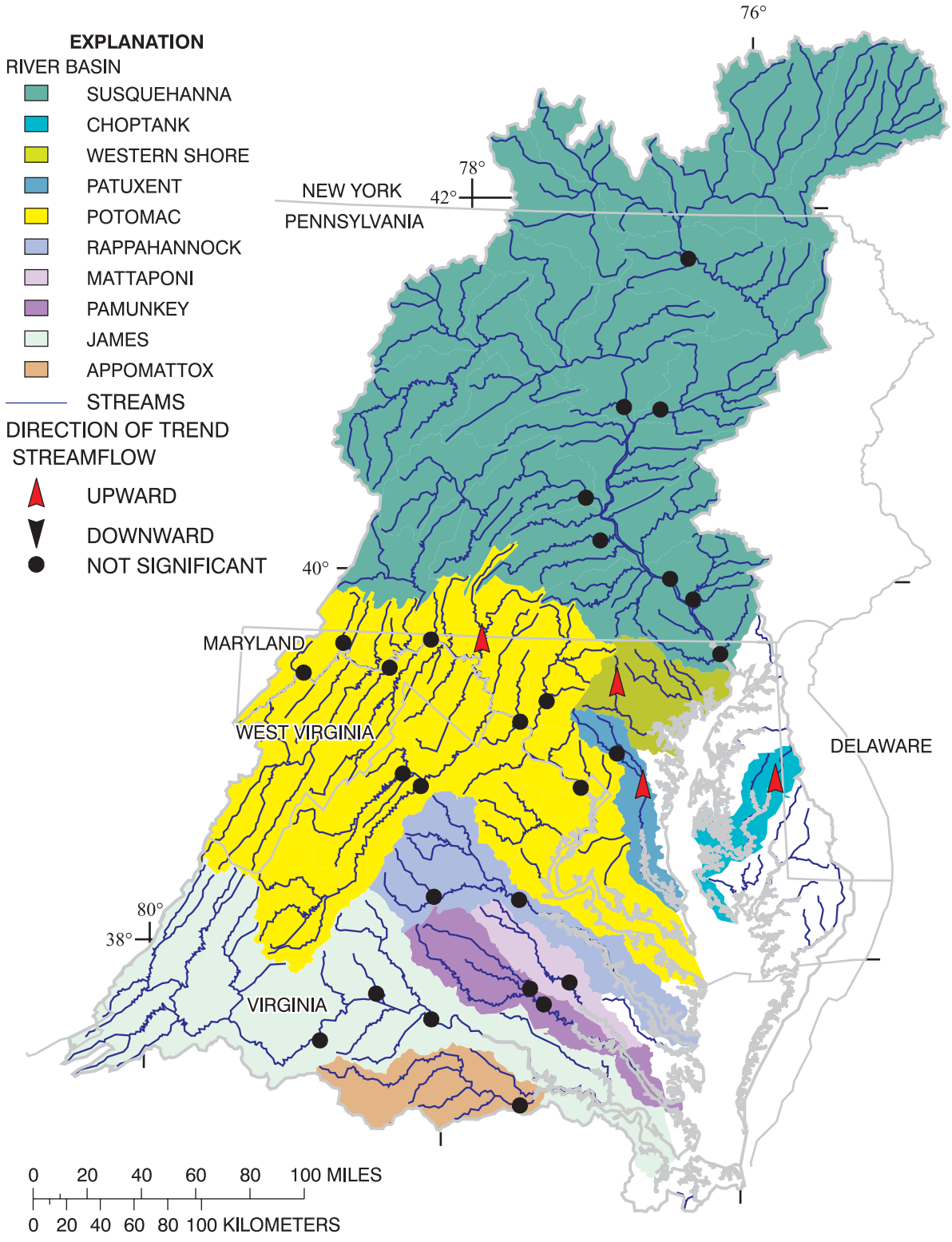

Figure 2. Trends in streamflow, 1985-99.

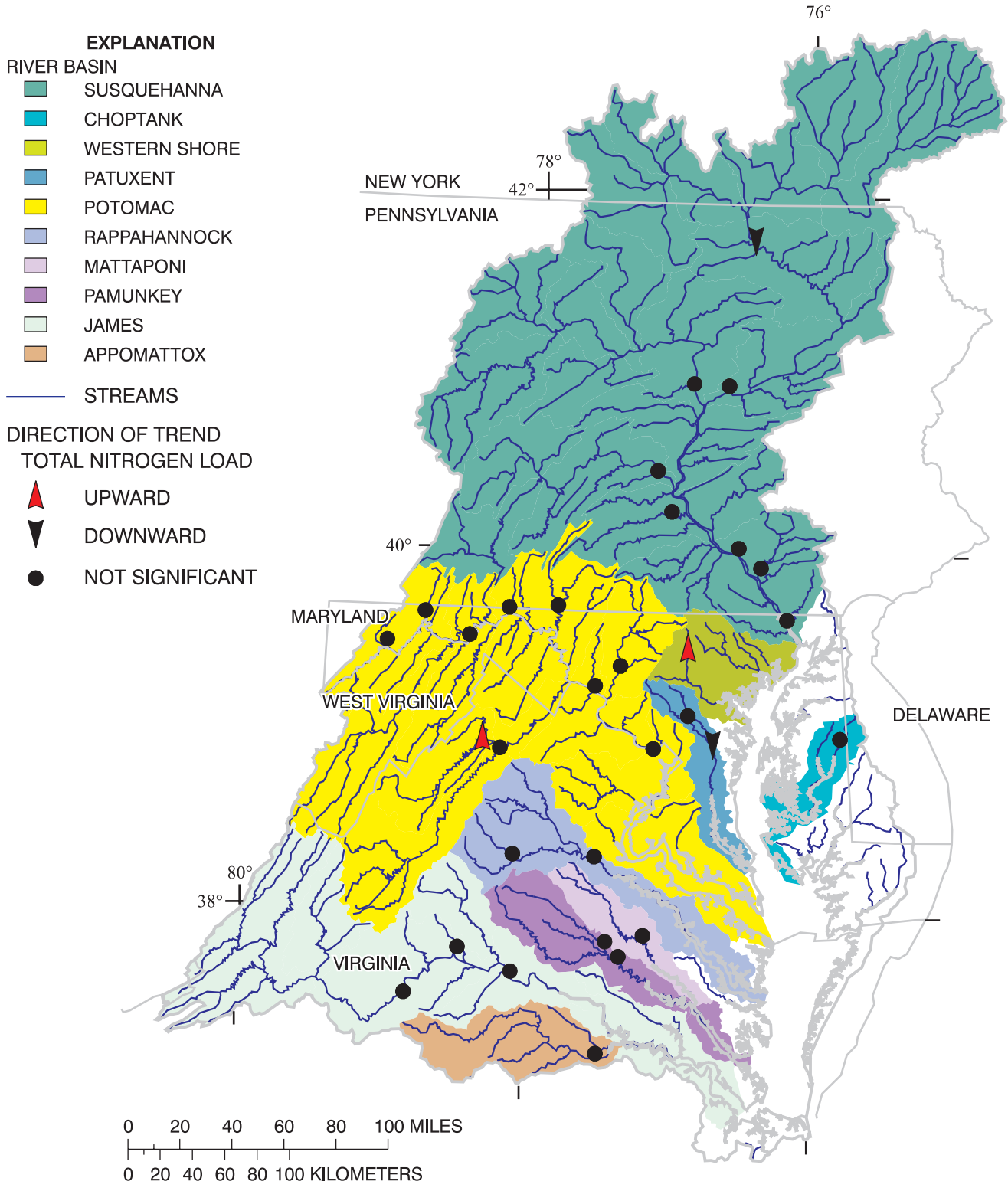

Figure 3A. Trends in load for total nitrogen.

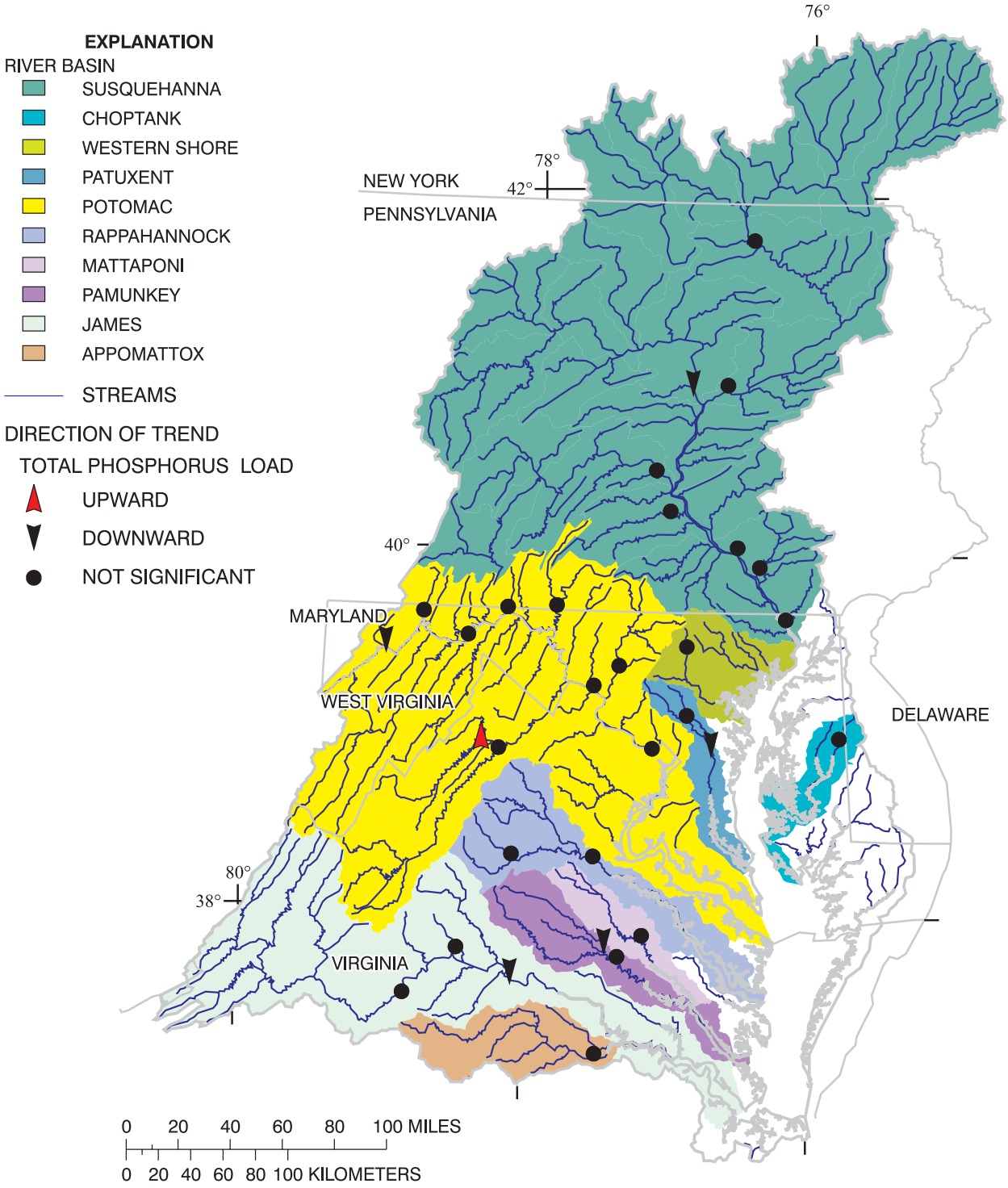

Figure 3B. Trends in load for total phosphorus.

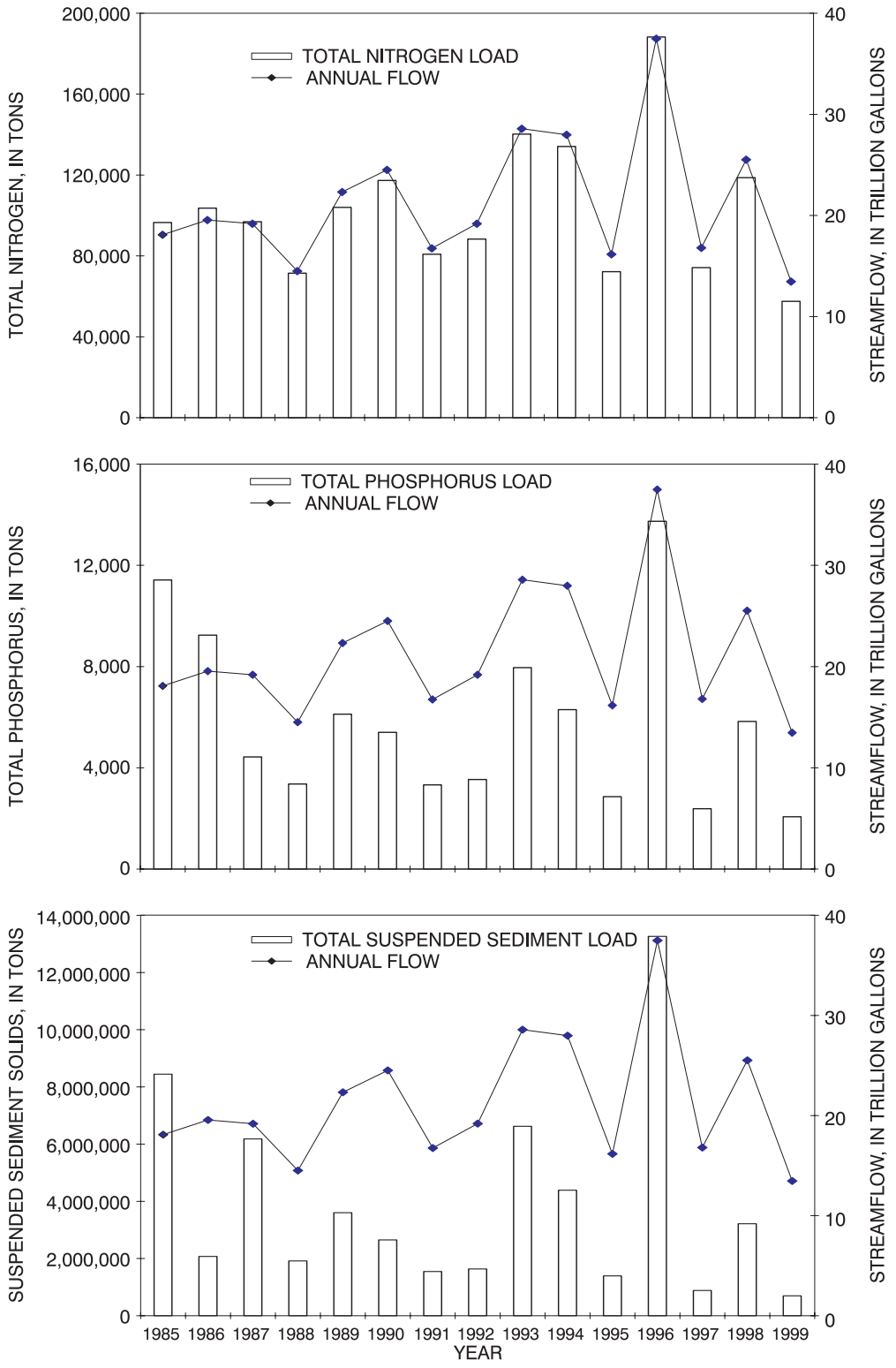

Figure 4. Combined daily mean annual flows and loads from the three largest rivers (Susquehanna, Potomac, and James) draining into the Chesapeake Bay Watershed for 1985-99.

limited number of data points, no trend test was performed.

Flow-Weighted Concentration

A trend in monthly flow-weighted concentration represents a trend not adjusted for flow. This trend can be useful in comparing trends in nontidal areas to those in the tidal estuaries. Monthly flow-weighted concentrations are calculated by dividing the average monthly load (from ESTIMATOR) by the average monthly streamflow. Because ESTIMATOR uses the daily flow between sampling dates, the resultant "flow-weighted" monthly concentration should approximate the actual monthly concentration. It is important to account for flow variability because the volume of flow occurring in short time periods between sample intervals is likely to have a more pronounced and long-lived effect on average concentrations in the tidal estuaries and other mixed receiving areas. Therefore, a flow-weighted concentration should provide a more accurate estimate of the monthly concentration and trends in flow-weighted concentrations and may correlate better with trends in estuarine concentrations. Monthly flow-weighted concentrations were tested for trend using a linear regression. In most cases, the regression produced normally distributed residuals. In some cases, the trend was significant with non-normal residuals.

Downward trends for flow-weighted TN concentrations occurred at 14 of the 31 sites, occurred in nearly all major drainage basins, and occurred at one more than reported from 1985 to 1998 (fig. 5A, Appendix 2). Upward trends for TN concentrations occurred at one Maryland site and three Virginia sites. Just over half (16) of the sites had downward trends for NOx for 1985-99, an addition of 11 sites compared to 1985-98 (Appendix 2). Both TN and NOx trends were downward at 10 sites. Upward NOx trends were estimated at five sites. Trends in TP were downward at 12 sites, and no upward trends were reported (fig. 5B). For TSS/SED, downward trends occurred at four sites (fig. 6A). There were no downward trends reported previously (1985-98). One upward trend in TSS/SED was in the James River Basin (Appendix 2).

Flow-Adjusted Concentration

Concentrations of water-quality constituents commonly are correlated with streamflow. The cause of this relation varies between the constituent and the individual basin. For example, in point-source dominated basins, the input of constituent sources is relatively constant. Increases in basin streamflow will most likely result in decreasing concentrations as a result of dilution. In contrast, in nonpoint-source-dominated basins, constituent concentrations entering the stream from overland flow will most likely increase as flow increases (Shertz and others, 1991). This flow-related variability must be removed to obtain water-quality concentrations independent of flow that help to explain changes in water quality resulting from human activities. Therefore, flow-adjusted trends are the best indicator of human-induced changes and management actions affecting water quality within a watershed. To determine the trend in flow-adjusted concentration, observed concentration data were adjusted for season and flow using the ESTIMATOR.

Results from ESTIMATOR indicate nearly 75 percent (22) of the sites had downward trends for TN (fig. 7A and Appendix 3), a good indication that management actions are working in reducing nitrogen concentrations. The 23 sites represent an increase of 10 sites computed for trend in 1985-98. Trends for TN were downward at seven of the nine River Input Program sites. Upward trends for TN were reported at four sites (sites 10, 12, 21 and 25), two sites in Maryland and two sites in Virginia (fig. 7A). NOx trends in concentration adjusted for flow were downward at 15 and upward at 5 of the 31 sites, occurring in nearly all major Chesapeake Bay drainage basins. Downward trends for TN and NOx coincided at 13 sites; upward trends in NOx occurred at 7 sites. TP declined at 23 of the sites, occurring in all the major Bay drainage basins, indicating management actions are reducing TP concentrations (fig. 7B and Appendix 3). Upward trends were detected at sites 21 and 25. Significant downward trends for TSS/SED were detected at 12 sites, 1 less than reported last year; an upward trend was reported at only 1 site (site 28) (fig. 6B).

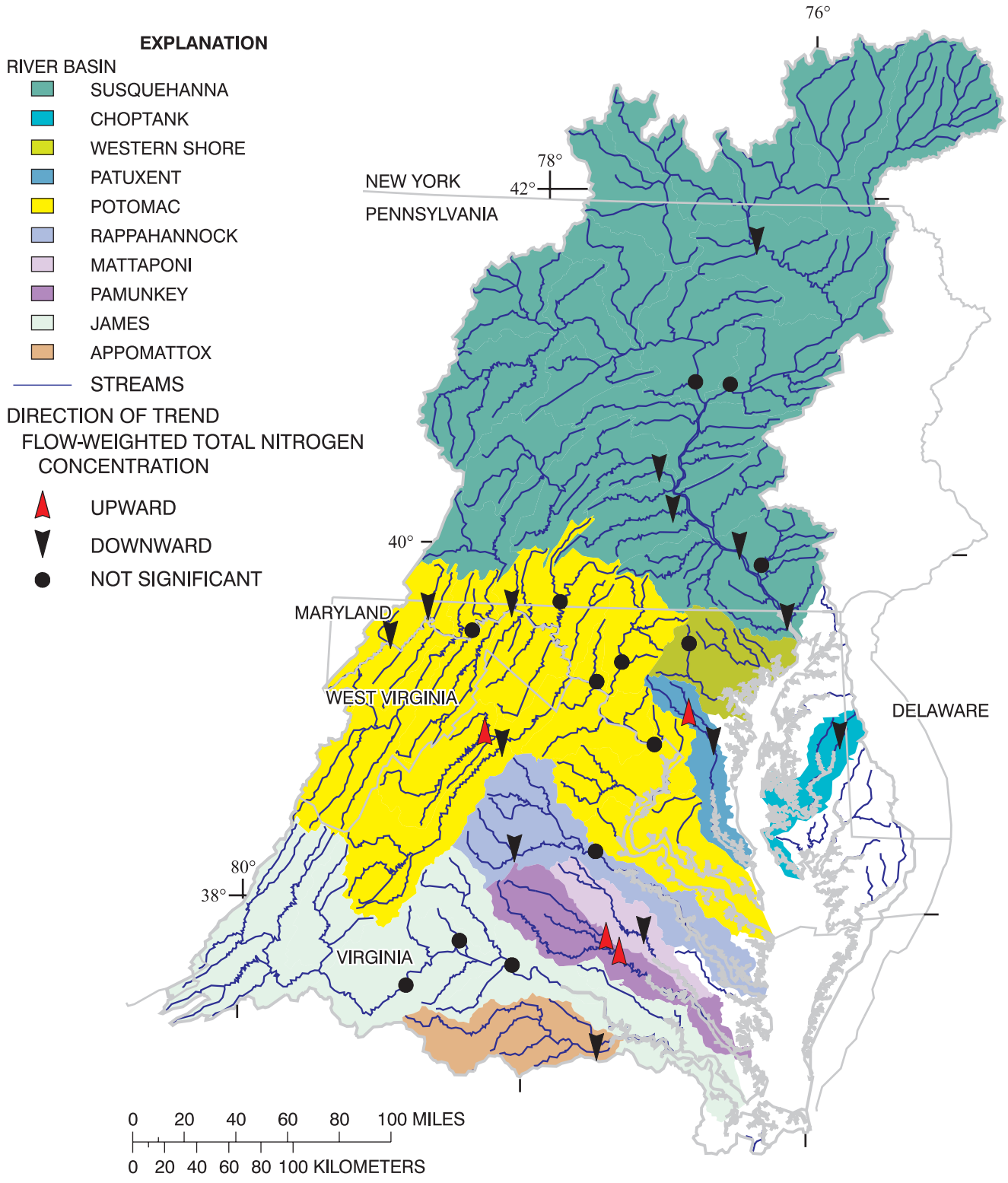

Figure 5A. Trends in flow-weighted concentrations for total nitrogen.

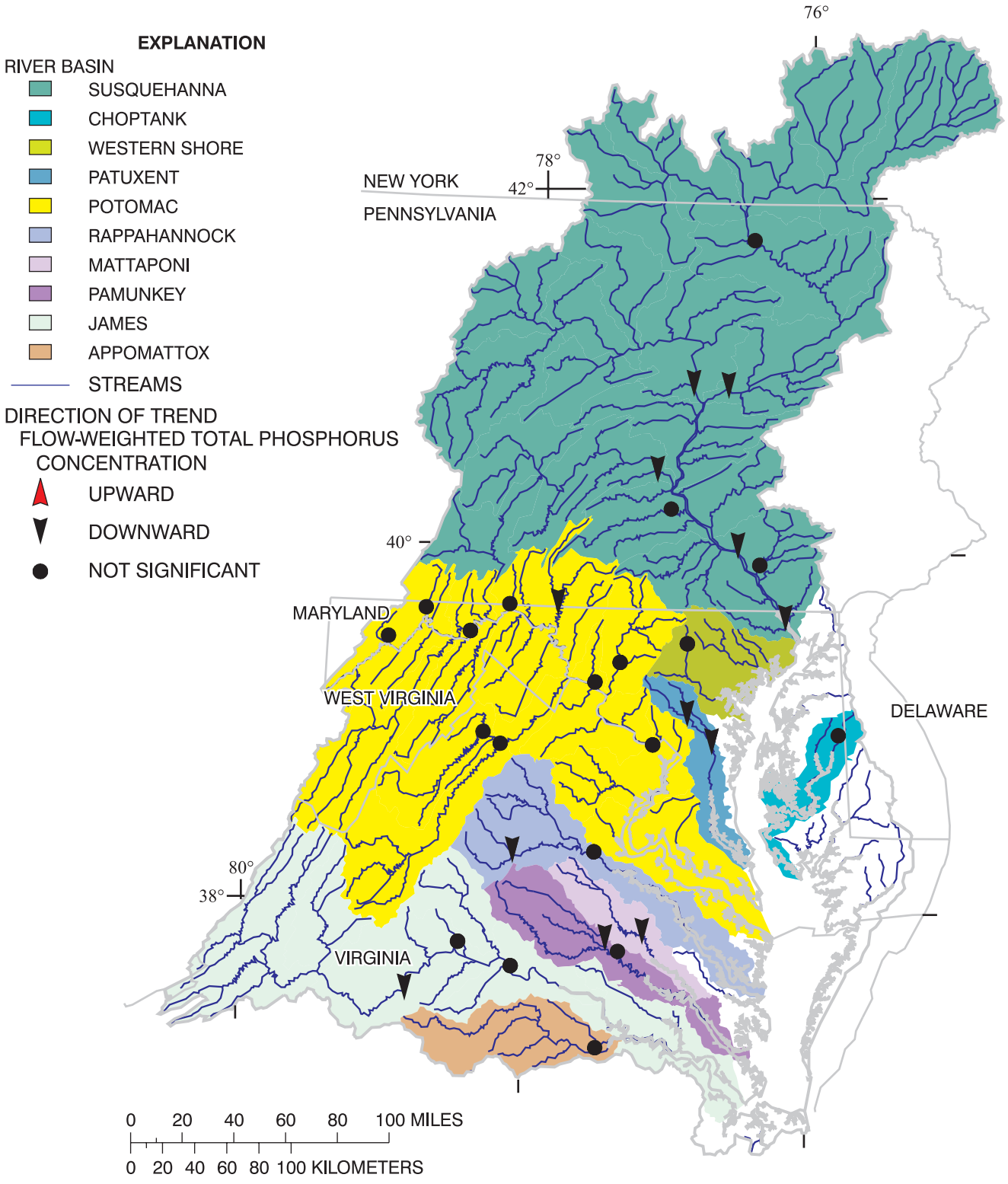

Figure 5B. Trends in flow-weighted concentrations for total phosphorus.

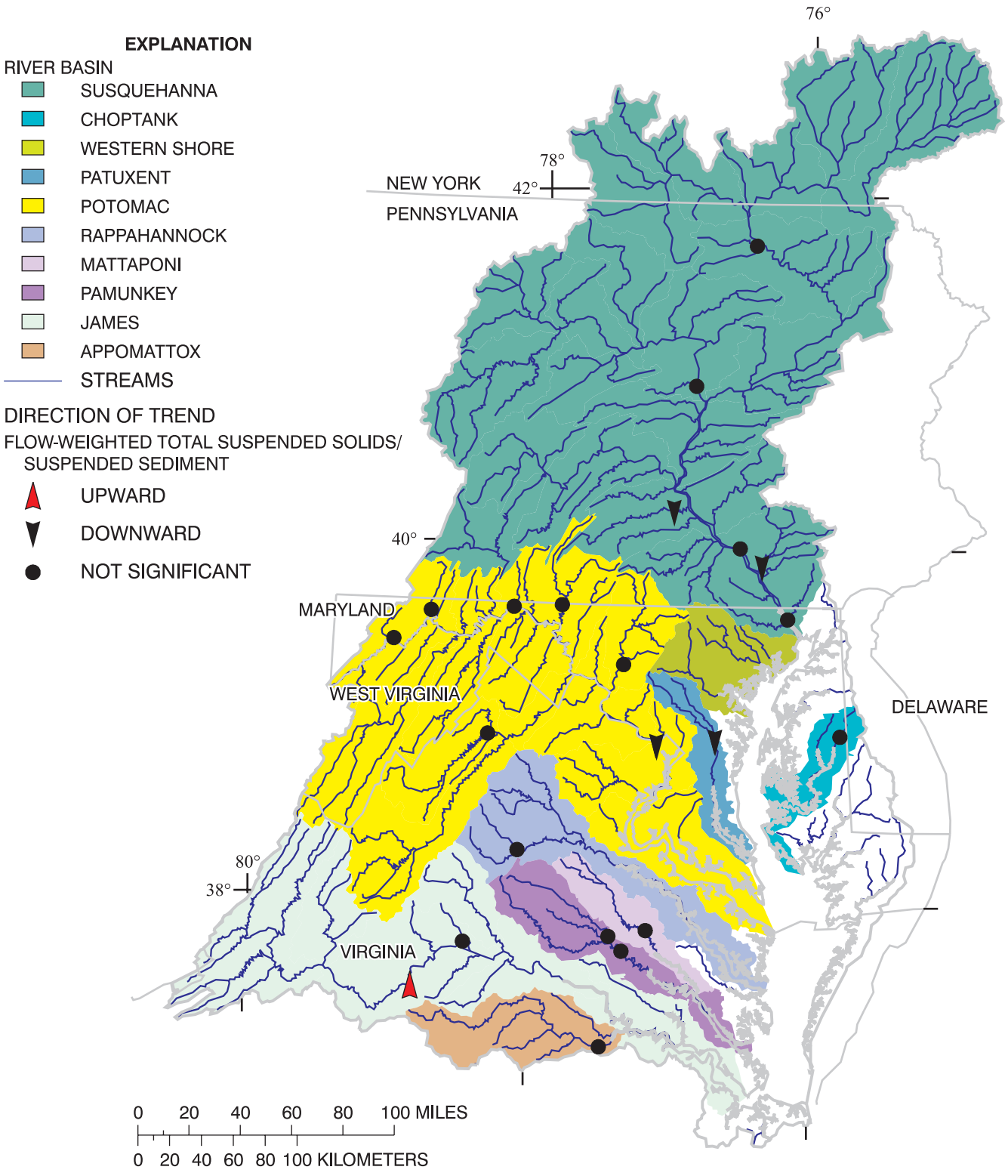

Figure 6A. Trends in flow-weighted concentrations for total suspended solids/suspended sediment.

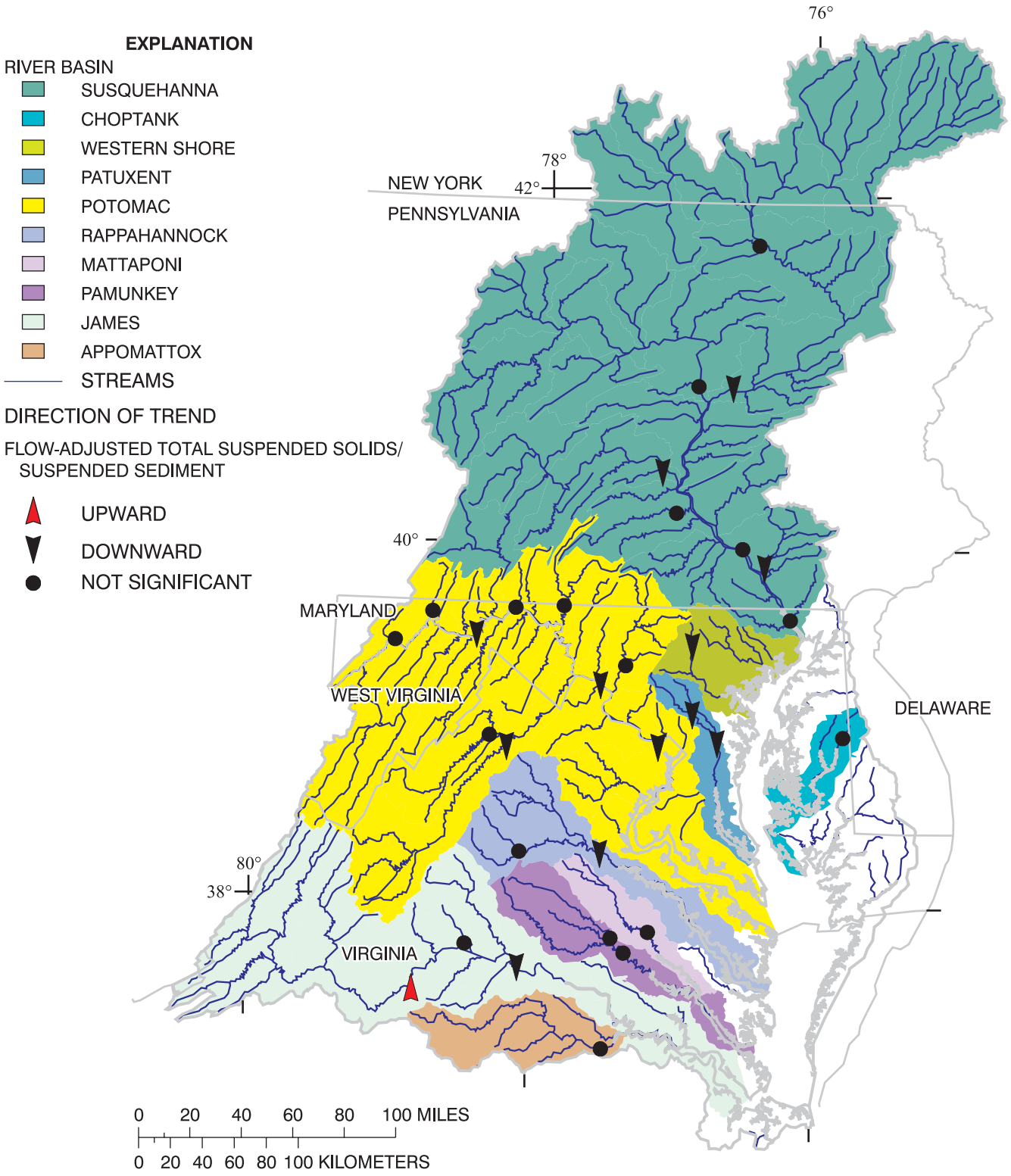

Figure 6B. Trends in flow-adjusted concentrations for total suspended solids/suspended sediment.

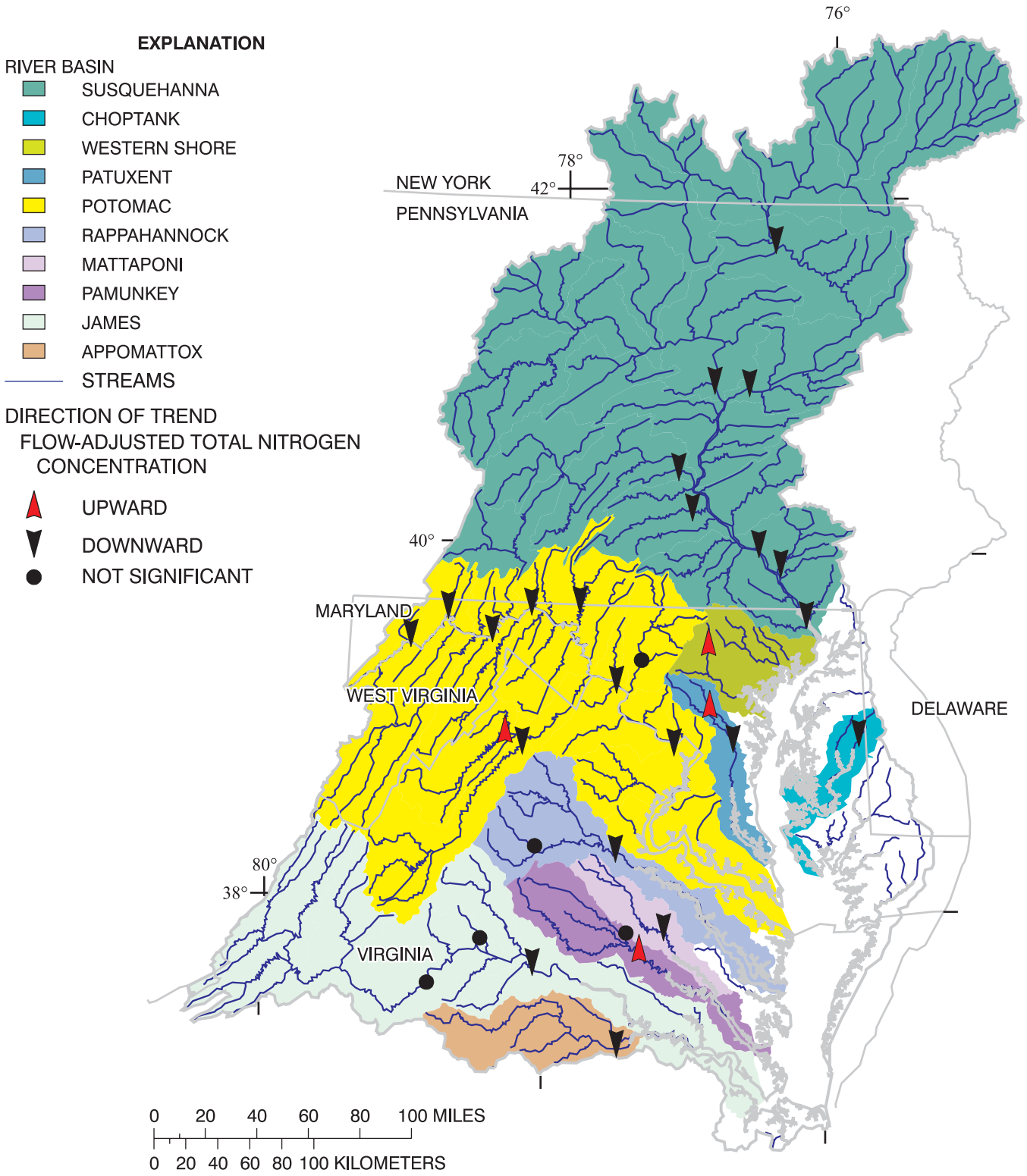

Figure 7A. Trends in flow-adjusted concentrations for total nitrogen.

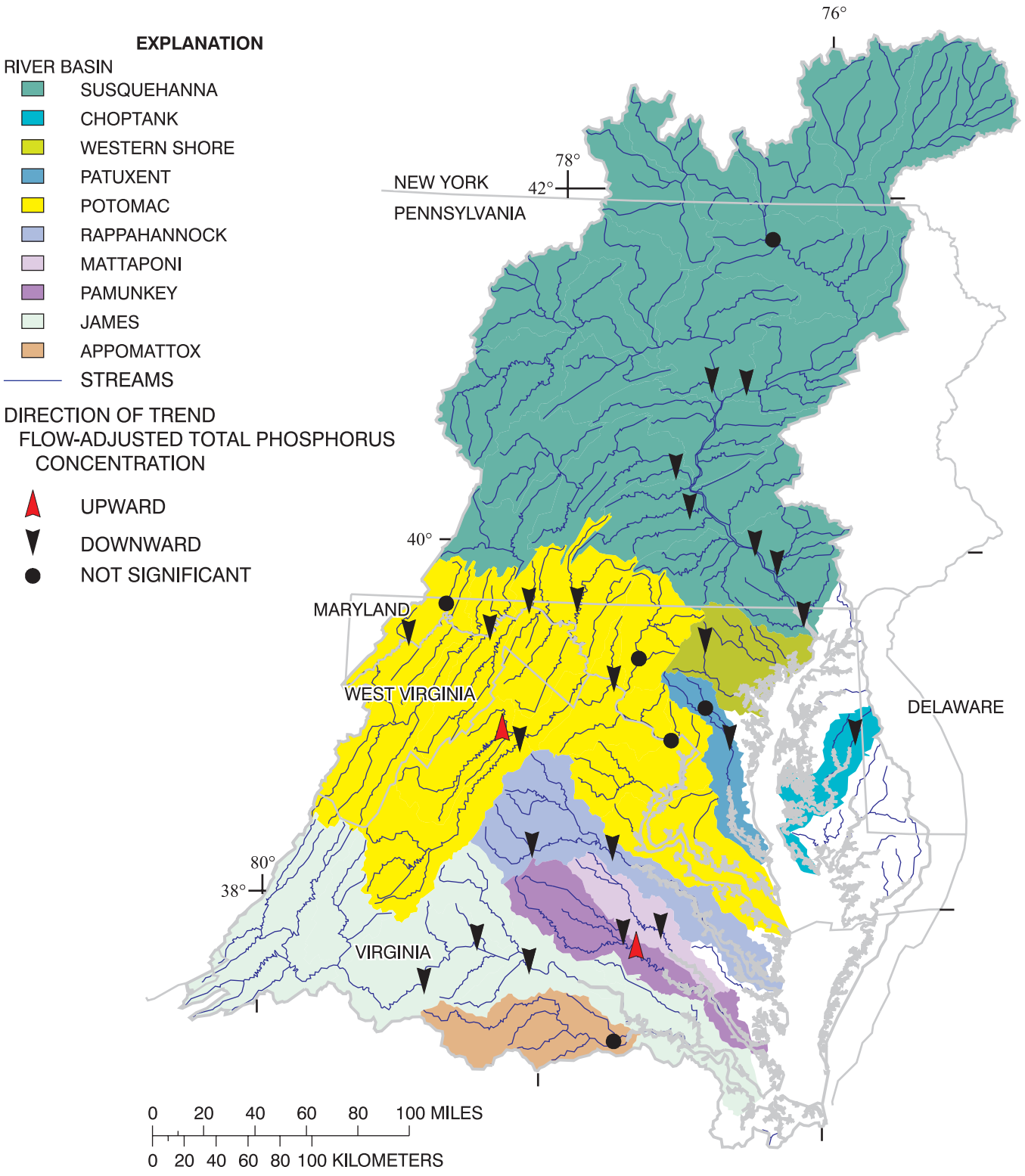

Figure 7B. Trends in flow-adjusted concentrations for total phosphorus.

STATUS

Status is a relative term used to describe current water-quality conditions. In order to help facilitate comparison of current water-quality conditions between basins (current status), median annual yields (annual loads from ESTIMATOR divided by the drainage area) and median flow-weighted concentrations were calculated for the possible constituents at each of the 31 sites presented in this report on the basis of the last 36 months of record. The "baseline," or median yield and median flow-weighted concentration also were calculated for each site on the basis of the first 24 months of record. The baseline and current status provide an indication of directional trend. Statistical data contained in the appendixes provide information on the significance, magnitude, and direction of the trend.

Median Yield

The "status" of current yields was assessed by station and constituent at the 31 sites in this study. As requested by the Data Analysis Work Group (DAWG), this "status" assessment was based on the median of the last 36 monthly loads for the years 1997, 1998, and 1999 and was determined as follows:

a. Compile the 36 monthly yield data by site and constituent

b. Determine the 5^{th} and 95^{th} percentile for each constituent using available data from the 31 sites

c. Subtract the 95^{th} percentile value from each status yield for each constituent

d. Subtract the 5^{th} and 95^{th} percentile values for each constituent

e. Divide the result from (c) by the result from (d) and multiply by 100.

The above procedure transforms the status yields from each basin and constituent into percentages between 0 and 100. The percentages were subtracted from 100 to allow a simple comparison between basins, because the lower the percentage the lower the yield. Status yields and percentage for the 31 sites are presented in Appendix 1. In summary, the areas with the highest nitrogen yields also contain higher percentages of land in agriculture with some association to carbonate rock type; lower yields coincide with higher percentages of forest land and less agricultural activity.

Median Concentration

The "status" of current water-quality concentrations was determined by site and constituent for the 31 sites. This status was based on the monthly median concentration for the period 1997-99. The same procedure discussed for median yields was used to compare median concentration. Status flow-weighted concentrations and percentages for the 31 sites are presented in Appendixes 2 and 3. Similar to the yields in Appendix 1, the areas with the highest nitrogen concentrations also contain higher percentages of land in agriculture; lower concentrations coincide with higher percentages of forest land.

SUMMARY

Nutrient and sediment data from 31 sites in nontidal portions of the Chesapeake Bay Basin were analyzed to document annual loads and trends for the period 1985 through 1999, part of an annual monitoring update and reporting for the Chesapeake Bay Program. Annual loads were estimated by use of the U.S. Geological Survey load model, referred to as the ESTIMATOR model. Trends were estimated using regression tests on non-transformed and log-transformed data. Trends were reported for monthly mean flow, monthly load, flow-weighted concentration, and flow-adjusted concentration. Baseline and current status, median values that are based on the first 24 and last 36 months of record, respectively, for loads (yields) and flow-weighted concentrations, were calculated to help facilitate comparisons between basins.

Most of the sites show no significant trends in flow. Significant upward trend in flow occurred at 4 of the 31 sites. The nearly basinwide drought in 1999 resulted in eight fewer sites having significantly increasing flow trends than the 1985-98 analysis and resulted in the lowest watershed freshwater inflow to the Bay in 15 years. At many of the 31 sites, annual mean flows have fluctuated between record maximums and minimums during two of the last 4 years. None of the 31 sites in the basin showed a downward trend in flow.

In general, loads for total nitrogen (TN) and total phosphorus (TP) entering the Bay estimated at the River Input sites from 1985 through 1999 indicated non-significant or downward trends. Trends in loads were significantly affected by the reduction in flow and corresponding drought in a large area of the Bay Basin during 1999. There were

10 less significant trends in loads in 1999 than in 1998. Trends results for TN and TP loads were mixed; most results indicated non-significant trends. An equal number of upward and downward trends (two) occurred for TN; five downward trends occurred for TP.

Trends in concentrations were generally downward or not significant for both the nitrogen and phosphorus species. Flow-weighted concentrations for TN were downward at nearly half the sites; three of the four sites with upward trends were in Virginia. TP trends were downward at 12 sites. Flow-adjusted trends in concentration were downward at 23 of the 31 sites for both TN and TP, indicating management actions are working in reducing nutrient concentrations. Downward trends were reported at 12 sites for total suspended solids / suspended sediment (TSS / SED).

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APPENDIX 1—TRENDS IN STREAMFLOW AND LOAD DATA FOR 9 RIVER INPUT MONITORING PROGRAM SITES AND 22 MULTI-AGENCY NONTIDAL PROGRAM SITES IN THE CHESAPEAKE BAY WATERSHED

Station: Flow, USGS streamflow station number; WQ, water-quality station number.

Parameters: Flow, streamflow; TN, total nitrogen; DN, dissolved nitrogen; DNH_4, dissolved ammonia; TNH_4, total ammonia; TNO_3, DNO_3, total or dissolved nitrate; TNOx, DNOx, total or dissolved nitrite plus nitrate; DKJD, dissolved ammonia plus organic nitrogen; TKJD, total ammonia plus organic nitrogen; TON, DON, total or dissolved organic nitrogen; Org C, organic carbon; TP, total phosphorus; DP, dissolved phosphorus; DIP, dissolved inorganic phosphorus; TSS, total suspended solids; SED, suspended sediment; $DSiO_2$, dissolved silica.

Statistics: POR, time period used in test; test, regression (Reg); log transformed, yes (Y) or no (N); slope, regression slope; p-value, measure of significance of regressor at 0.01; trend direction, up (UP), down (DN), residuals are not normal (nn), or not significant (ns); magnitude, minimum (min) and maximum (max) percentage change in trend for indicated period of record; baseline median, median of first 24 months of record; current median, median of last 36 months of record; relative rank, each individual status yield (pound per acre) compared to all others of the same parameter; shaded areas are significant at 99-percent confidence level; —, not applicable or insufficient data.

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics										
										Magnitude		Status		
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
1	01531500	TOW	FLOW	1989-99	Reg	Y	-0.0331	0.1083	ns	-55	8	11,000	9,100	—
1	01531500	TOW	TN	1989-99	Reg	Y	-.0620	.0044	DN	-68	-20	5.36	3.12	20
1	01531500	TOW	DN	1989-99	Reg	Y	-.0561	.0097	DN	-66	-14	4.58	2.81	57
1	01531500	TOW	TON	1989-99	Reg	Y	-.0326	.1570	ns	-57	14	2.33	1.20	9
1	01531500	TOW	DON	1989-99	Reg	Y	-.0121	.5858	ns	-46	41	1.62	1.04	7
1	01531500	TOW	DNH_4	1989-99	Reg	Y	-.0705	.0023	DN	-72	-25	.18	.09	34
1	01531500	TOW	TNH_4	1989-99	Reg	Y	-.0730	.0061	DN	-75	-21	.17	.10	42
1	01531500	TOW	DKJD	1989-99	Reg	Y	-.0183	.4370	ns	-51	36	1.66	1.13	16
1	01531500	TOW	TKJD	1989-99	Reg	Y	-.0336	.1473	ns	-58	14	2.64	1.40	34
1	01531500	TOW	TNOx	1989-99	Reg	Y	-.0753	.0005	DN	-72	-31	4.44	1.68	14
1	01531500	TOW	DNOx	1989-99	Reg	Y	-.0756	.0004	DN	-72	-32	4.37	1.66	12
1	01531500	TOW	TP	1989-99	Reg	Y	-.0509	.0562	ns	-68	1	.30	.18	27
1	01531500	TOW	DP	1989-99	Reg	Y	-.0718	.0005	DN	-71	-30	.21	.08	12
1	01531500	TOW	DIP	1989-99	Reg	Y	.0315	.1163	ns	-8	118	.08	.04	11
1	01531500	TOW	Org C	1989-99	Reg	Y	-.0362	.1272	ns	-60	12	15.6	9.12	34
1	01531500	TOW	SED	1989-99	Reg	Y	-.0317	.5232	ns	-76	105	152	62.9	25
2	01540500	DAN	FLOW	1985-99	Reg	Y	-.0007	.9500	ns	-30	40	12,000	13,000	—
2	01540500	DAN	TN	1985-99	Reg	Y	-.0194	.1254	ns	-48	8	5.64	4.35	32
2	01540500	DAN	DN	1985-99	Reg	Y	-.0166	.1953	ns	-46	13	4.87	3.81	77
2	01540500	DAN	TON	1985-99	Reg	Y	-.0271	.0390	ns	-55	-2	2.48	1.47	16
2	01540500	DAN	DON	1985-99	Reg	Y	-.0156	.2276	ns	-46	16	1.65	1.17	11
2	01540500	DAN	DNH_4	1985-99	Reg	Y	-.0510	.0001	DN	-68	-32	.35	.13	52
2	01540500	DAN	TNH_4	1985-99	Reg	Y	-.0594	.0001	DN	-73	-38	.38	.12	52
2	01540500	DAN	DKJD	1985-99	Reg	Y	-.0302	.0257	ns	-57	-6	2.03	1.26	21
2	01540500	DAN	TKJD	1985-99	Reg	Y	-.0287	.0279	ns	-55	-5	2.83	1.77	47
2	01540500	DAN	TNOx	1985-99	Reg	Y	-.0100	.4326	ns	-41	25	2.79	2.28	20
2	01540500	DAN	DNOx	1985-99	Reg	Y	-.0112	.3743	ns	-42	22	2.82	2.22	17
2	01540500	DAN	TP	1985-99	Reg	Y	-.0359	.0223	ns	-63	-8	.38	.23	38
2	01540500	DAN	DP	1985-99	Reg	Y	-.0543	.0001	DN	-70	-36	.13	.07	10
2	01540500	DAN	DIP	1985-99	Reg	Y	.0050	.7105	ns	-28	61	.04	.04	8
2	01540500	DAN	Org C	1985-99	Reg	Y	-.0197	.1186	ns	-49	8	14.6	1.55	51

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics										
										Magnitude		Status		
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
2	01540500	DAN	SED	1985-99	Reg	Y	-0.0388	0.1418	ns	-74	21	228	78.1	31
3	01553500	LEW	FLOW	1985-99	Reg	Y	-.0116	.3238	ns	-41	19	9,800	8,200	—
3	01553500	LEW	TN	1985-99	Reg	Y	-.0285	.0166	ns	-54	-8	6.01	2.49	15
3	01553500	LEW	DN	1985-99	Reg	Y	-.0223	.0485	ns	-48	0	5.14	2.57	52
3	01553500	LEW	TON	1985-99	Reg	Y	-.0473	.0009	DN	-67	-26	2.97	.87	0
3	01553500	LEW	DON	1985-99	Reg	Y	-.0321	.0118	ns	-57	-10	1.92	.75	2
3	01553500	LEW	DNH_4	1985-99	Reg	Y	-.0405	.0008	DN	-62	-23	.28	.09	32
3	01553500	LEW	TNH_4	1985-99	Reg	Y	-.0305	.0117	ns	-55	-10	.30	.11	46
3	01553500	LEW	DKJD	1985-99	Reg	Y	-.0291	.0289	ns	-56	-5	2.17	.84	5
3	01553500	LEW	TKJD	1985-99	Reg	Y	-.0411	.0043	DN	-64	-18	3.24	.99	20
3	01553500	LEW	TNOx	1985-99	Reg	Y	-.0176	.1083	ns	-44	6	3.04	1.64	14
3	01553500	LEW	DNOx	1985-99	Reg	Y	-.0178	.1033	ns	-44	5	3.03	1.65	12
3	01553500	LEW	TP	1985-99	Reg	Y	-.0424	.0042	DN	-66	-19	.27	.10	14
3	01553500	LEW	DP	1985-99	Reg	Y	-.0779	.0001	DN	-78	-57	.17	.04	1
3	01553500	LEW	DIP	1985-99	Reg	Y	-.0099	.3466	ns	-37	17	.04	.02	1
3	01553500	LEW	Org C	1985-99	Reg	Y	-.0153	.2437	ns	-46	17	9.62	5.67	6
3	01553500	LEW	SED	1985-99	Reg	Y	-.0143	.5965	ns	-63	78	138	43.1	17
4	01567000	JUN	FLOW	1985-99	Reg	Y	.0172	.1218	ns	-6	79	2,500	3,200	—
4	01567000	JUN	TN	1985-99	Reg	Y	.0066	.6195	ns	-25	63	4.44	4.25	31
4	01567000	JUN	DN	1985-99	Reg	Y	.0105	.4040	ns	-19	69	4.02	3.91	79
4	01567000	JUN	TON	1985-99	Reg	Y	-.0111	.4420	ns	-44	29	1.69	1.18	8
4	01567000	JUN	DON	1985-99	Reg	Y	.0022	.8658	ns	-29	51	1.18	.99	6
4	01567000	JUN	DNH_4	1985-99	Reg	Y	-.0330	.0180	ns	-59	-8	.12	.07	20
4	01567000	JUN	TNH_4	1985-99	Reg	Y	-.0239	.0818	ns	-53	4	.13	.08	30
4	01567000	JUN	DKJD	1985-99	Reg	Y	-.0005	.9701	ns	-33	47	1.34	1.08	15
4	01567000	JUN	TKJD	1985-99	Reg	Y	-.0100	.4937	ns	-44	32	1.85	1.29	31
4	01567000	JUN	TNOx	1985-99	Reg	Y	.0118	.3559	ns	-18	74	3.00	3.02	27
4	01567000	JUN	DNOx	1985-99	Reg	Y	.0136	.2870	ns	-16	78	2.89	3.01	24
4	01567000	JUN	TP	1985-99	Reg	Y	-.0288	.0424	ns	-57	-2	.26	.14	21
4	01567000	JUN	DP	1985-99	Reg	Y	-.0239	.0304	ns	-49	-4	.15	.10	16
4	01567000	JUN	DIP	1985-99	Reg	Y	.0219	.1986	ns	-16	129	.12	.10	39
4	01567000	JUN	Org C	1985-99	Reg	Y	-.0074	.5499	ns	-38	29	9.83	7.82	19

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
4	01567000	JUN	SED	1985-99	Reg	Y	0.0017	0.9474	ns	-51	114	83.1	46.0	18
5	01570000	01570000	FLOW	1989-99	REG	Y	.0358	.0860	ns	-6	89	452	448	—
5	01570000	01570000	TSS	1989-99	REG	Y	-.0745	.1269	ns	-84	25	86.3	28.9	72
5	01570000	01570000	TN	1989-99	REG	Y	.0023	.8955	ns	-30	49	13.1	1.23	86
5	01570000	01570000	TNH_4	1989-99	REG	Y	-.4361	.0001	DN	-100	-98	.12	.00	16
5	01570000	01570000	DKJD	1989-99	REG	Y	-.0480	.0249	ns	-63	-7	1.42	.63	3
5	01570000	01570000	TKJD	1989-99	REG	Y	-.0021	.9361	ns	-45	74	1.59	.93	18
5	01570000	01570000	TNOx	1989-99	REG	Y	.0284	.0932	ns	-5	96	11.9	1.91	100
5	01570000	01570000	TP	1989-99	REG	Y	-.0583	.1001	ns	-75	12	.27	.08	10
5	01570000	01570000	DP	1989-99	REG	Y	-.1577	.0001	DN	-90	-69	.13	.03	4
5	01570000	01570000	DIP	1989-99	REG	Y	.0569	.1046	ns	-12	296	.05	.03	7
6	01576000	MAR	FLOW	1987-99	Reg	Y	.0015	.9135	ns	-29	46	22,300	30,700	—
6	01576000	MAR	TN	1987-99	Reg	Y	-.0178	.2636	ns	-47	19	5.24	4.20	30
6	01576000	MAR	DN	1987-99	Reg	Y	-.0087	.5685	ns	-39	31	4.41	3.71	75
6	01576000	MAR	TON	1987-99	Reg	Y	.0601	.0010	UP	39	244	1.80	3.35	68
6	01576000	MAR	DON	1987-99	Reg	Y	.1281	.0001	UP	245	709	.95	3.72	92
6	01576000	MAR	DNH_4	1987-99	Reg	Y	-.0391	.0133	ns	-60	-10	.19	.09	30
6	01576000	MAR	TNH_4	1987-99	Reg	Y	-.0327	.0441	ns	-57	-1	.19	.09	33
6	01576000	MAR	DKJD	1987-99	Reg	Y	-.0006	.9667	ns	-32	44	1.16	1.14	17
6	01576000	MAR	TKJD	1987-99	Reg	Y	-.0232	.1700	ns	-52	14	2.12	1.65	43
6	01576000	MAR	TNOx	1987-99	Reg	Y	-.0095	.5544	ns	-41	33	3.16	2.70	24
6	01576000	MAR	DNOx	1987-99	Reg	Y	-.0086	.5931	ns	-41	35	3.15	2.68	21
6	01576000	MAR	TP	1987-99	Reg	Y	-.0186	.3572	ns	-53	31	.24	.21	34
6	01576000	MAR	DP	1987-99	Reg	Y	-.0282	.0542	ns	-52	0	.12	.09	13
6	01576000	MAR	DIP	1987-99	Reg	Y	.1041	.0001	UP	142	519	.02	.05	15
6	01576000	MAR	Org C	1987-99	Reg	Y	-.0035	.8189	ns	-35	41	9.72	9.85	43
6	01576000	MAR	SED	1987-99	Reg	Y	.0040	.8999	ns	-53	138	11.3	124	49
7	01576754	CON	FLOW	1985-99	Reg	Y	.0025	.7892	ns	-21	36	473	596	—
7	01576754	CON	TN	1985-99	Reg	Y	-.0077	.3788	ns	-31	15	28.1	25.6	100
7	01576754	CON	DN	1985-99	Reg	Y	.0031	.6954	ns	-17	32	23.1	24.5	100
7	01576754	CON	TON	1985-99	Reg	Y	-.0158	.2399	ns	-47	17	6.28	4.97	100
7	01576754	CON	DON	1985-99	Reg	Y	.0114	.2928	ns	-14	63	3.70	4.05	100

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
7	01576754	CON	DNH_4	1985-99	Reg	Y	-0.0794	0.0001	DN	-79	-56	0.93	0.26	100
7	01576754	CON	TNH_4	1985-99	Reg	Y	-.0792	.0001	DN	-79	-56	.95	.28	100
7	01576754	CON	DKJD	1985-99	Reg	Y	-.0043	.6965	ns	-32	29	5.04	4.18	100
7	01576754	CON	TKJD	1985-99	Reg	Y	-.0303	.0269	ns	-57	-5	8.13	5.01	100
7	01576754	CON	TNOx	1985-99	Reg	Y	.0040	.6061	ns	-16	34	18.8	21.8	100
7	01576754	CON	DNOx	1985-99	Reg	Y	.0031	.6864	ns	-16	31	18.6	21.0	100
7	01576754	CON	TP	1985-99	Reg	Y	-.0218	.1177	ns	-52	8	1.68	1.26	100
7	01576754	CON	DP	1985-99	Reg	Y	-.0368	.0003	DN	-57	-23	.88	.55	100
7	01576754	CON	DIP	1985-99	Reg	Y	-.0365	.0002	DN	-57	-23	.77	.46	100
7	01576754	CON	Org C	1985-99	Reg	Y	-.0469	.0001	DN	-65	-30	31.1	16.1	100
7	01576754	CON	SED	1985-99	Reg	Y	-.0471	.0641	ns	-77	4	484	282	100
9	01491000	01491000	FLOW	1985-99	Reg	Y	.0426	.0019	UP	27	182	57.0	101	—
9	01491000	01491000	TN	1985-99	Reg	Y	.0350	.0109	ns	13	152	6.68	1.59	89
9	01491000	01491000	TKJD	1985-99	Reg	Y	.0092	.6025	ns	-32	93	2.29	2.75	81
9	01491000	01491000	DNOx	1985-99	Reg	Y	.0492	.0001	UP	50	193	3.70	7.73	64
9	01491000	01491000	TP	1985-99	Reg	Y	.0452	.0192	ns	12	246	.21	.42	74
9	01491000	01491000	DP	1985-99	Reg	Y	.0622	.0012	UP	46	344	.07	.16	34
9	01491000	01491000	DIP	1985-99	Reg	Y	.0544	.0031	UP	33	286	.05	.11	40
9	01491000	01491000	SED	1985-99	Reg	Y	.0144	.5507	ns	-39	152	22.6	4.40	16
8	01578310	01578310	FLOW	1985-99	Reg	Y	-.0030	.7731	ns	-30	30	30,300	24,900	—
8	01578310	01578310	TN	1985-99	Reg	Y	-.0233	.0266	ns	-48	-4	15.5	9.32	77
8	01578310	01578310	TKJD	1985-99	Reg	Y	-.0612	.0001	DN	-71	-45	5.65	2.56	75
8	01578310	01578310	DNOx	1985-99	Reg	Y	-.0092	.3900	ns	-36	19	9.93	6.72	55
8	01578310	01578310	TP	1985-99	Reg	Y	-.0280	.0552	ns	-57	1	.37	.25	42
8	01578310	01578310	DP	1985-99	Reg	Y	-.0200	.1590	ns	-51	12	.14	.09	16
8	01578310	01578310	DIP	1985-99	Reg	Y	-.0465	.0042	DN	-69	-20	.09	.03	5
8	01578310	01578310	SED	1985-99	Reg	Y	-.0057	.7724	ns	-49	64	103	68.6	27
12	01586000	NPA0165	FLOW	1985-99	Reg	Y	.0249	.0035	UP	13	86	42.0	51.0	—
12	01586000	NPA0165	TSS	1985-99	Reg	Y	.0443	.2162	nn	—	—	2.64	32.4	83
12	01586000	NPA0165	TN	1985-99	Reg	Y	.0410	.0001	UP	46	133	9.24	12.0	102
12	01586000	NPA0165	DNH_4	1985-99	Reg	Y	-.0060	.7930	nn	—	—	.10	.07	22
12	01586000	NPA0165	DNO_3	1985-99	Reg	Y	.0424	.0001	UP	52	134	8.19	1.13	213

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics										
										Magnitude		Status		
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
12	01586000	NPA0165	TKJD	1985-99	Reg	Y	-0.0129	0.3873	nn	—	—	1.52	1.09	24
12	01586000	NPA0165	TNOx	1985-99	Reg	Y	.0879	.0001	UP	194	375	4.33	9.91	92
12	01586000	NPA0165	TP	1985-99	Reg	Y	-.0067	.8002	nn	—	—	.15	.10	14
10	01592500	PXT0809	FLOW	1985-99	Reg	Y	.0200	.2062	ns	-15	115	18.0	20.0	—
10	01592500	PXT0809	TSS	1985-99	Reg	Y	.0620	.0001	UP	60	300	3.42	6.28	2
10	01592500	PXT0809	TN	1985-99	Reg	Y	.0322	.0575	ns	-1	166	.63	.83	1
10	01592500	PXT0809	DNH_4	1985-99	Reg	Y	.0335	.0056	UP	16	135	.07	.10	36
10	01592500	PXT0809	DNO_3	1985-99	Reg	Y	.0316	.0744	ns	-4	169	.41	.48	2
10	01592500	PXT0809	TKJD	1985-99	Reg	Y	.0240	.1236	ns	-9	126	.31	.35	2
10	01592500	PXT0809	TNOx	1985-99	Reg	Y	.0919	.0001	UP	132	579	.23	.52	3
10	01592500	PXT0809	TP	1985-99	Reg	Y	.0149	.3261	ns	-20	95	.02	.02	1
11	01594440	01594440	FLOW	1985-99	Reg	Y	.0302	.001	UP	21	105	199	260	—
11	01594440	01594440	TN	1985-99	Reg	Y	-.0402	.0001	DN	-56	-33	20.0	11.5	97
11	01594440	01594440	TKJD	1985-99	Reg	Y	-.0439	.0001	DN	-61	-31	7.12	3.45	105
11	01594440	01594440	DNOx	1985-99	Reg	Y	-.0393	.0001	DN	-53	-34	12.9	8.25	68
11	01594440	01594440	TP	1985-99	Reg	Y	-.0506	.0001	DN	-66	-36	1.47	.71	129
11	01594440	01594440	DP	1985-99	Reg	Y	-.0596	.0001	DN	-67	-49	.57	.21	49
11	01594440	01594440	DIP	1985-99	Reg	Y	-.0523	.0001	DN	-64	-42	.47	.18	71
11	01594440	01594440	SED	1985-99	Reg	Y	-.0147	.4620	ns	-55	44	300	223	87
13	01599000	GEO0009	FLOW	1985-99	Reg	Y	-.0010	.9419	ns	-34	48	45.0	42.0	—
13	01599000	GEO0009	TSS	1985-99	Reg	Y	-.0041	.8419	ns	-49	72	43.8	38.3	101
13	01599000	GEO0009	TN	1985-99	Reg	Y	-.0262	.0478	ns	-54	-1	3.76	2.34	13
13	01599000	GEO0009	DNH_4	1985-99	Reg	Y	-.0689	.0003	DN	-79	-38	.51	.21	94
13	01599000	GEO0009	DNO_3	1985-99	Reg	Y	-.0496	.0010	DN	-69	-26	2.24	1.05	4
13	01599000	GEO0009	TKJD	1985-99	Reg	Y	-.0410	.0075	DN	-65	-16	1.11	.60	7
13	01599000	GEO0009	TNOx	1985-99	Reg	Y	-.0246	.0336	ns	-51	-3	2.91	1.68	14
13	01599000	GEO0009	TP	1985-99	Reg	Y	-.0506	.0005	DN	-69	-29	.18	.08	9
14	01601500	WIL0013	FLOW	1985-99	Reg	Y	-.0041	.7768	ns	-38	43	184	178	—
14	01601500	WIL0013	TSS	1985-99	Reg	Y	-.0119	.6786	ns	-64	94	3.51	11.9	19
14	01601500	WIL0013	TN	1985-99	Reg	Y	-.0451	.0231	ns	-71	-9	3.92	2.05	11
14	01601500	WIL0013	DNH_4	1985-99	Reg	Y	.0453	.0086	UP	19	225	-.07	.09	30
14	01601500	WIL0013	DNO_3	1985-99	Reg	Y	-.0448	.0386	ns	-73	-4	2.86	1.19	6

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics										
										Magnitude		Status		
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
14	01601500	WIL0013	TKJD	1985-99	Reg	Y	-0.0489	0.0065	DN	-71	-19	1.11	0.41	0
14	01601500	WIL0013	TNOx	1985-99	Reg	Y	-.1270	.0001	DN	-92	-72	8.76	1.38	11
14	01601500	WIL0013	TP	1985-99	Reg	Y	-.0129	.5696	ns	-58	60	.08	.04	3
15	01610000	POT2766	FLOW	1985-99	Reg	Y	-.0030	.8031	ns	-33	36	2,430	1,790	—
15	01610000	POT2766	TSS	1985-99	Reg	Y	-.0270	.3412	ns	-71	53	3.90	12.8	22
15	01610000	POT2766	TN	1985-99	Reg	Y	-.0163	.2420	ns	-48	18	2.88	1.84	9
15	01610000	POT2766	DNH_4	1985-99	Reg	Y	-.0241	.1968	ns	-60	20	.11	.06	13
15	01610000	POT2766	TKJD	1985-99	Reg	Y	-.0350	.0228	ns	-62	-7	1.18	.53	5
15	01610000	POT2766	TNOx	1985-99	Reg	Y	-.0368	.0049	DN	-61	-16	2.73	1.28	10
15	01610000	POT2766	TP	1985-99	Reg	Y	-.0305	.1205	nn	-64	12	.13	.06	5
16	01613000	POT2386	FLOW	1985-99	Reg	Y	-.0014	.9060	ns	-31	39	3,020	2,350	—
16	01613000	POT2386	TSS	1985-99	Reg	Y	.0139	.6510	ns	-50	202	26.5	16.9	35
16	01613000	POT2386	TN	1985-99	Reg	Y	-.0333	.0195	ns	-60	-8	3.15	1.58	6
16	01613000	POT2386	DNH_4	1985-99	Reg	Y	-.0272	.1104	ns	-60	9	.06	.03	0
16	01613000	POT2386	DNO_3	1985-99	Reg	Y	-.0234	.1493	ns	-56	13	1.69	.99	3
16	01613000	POT2386	TKJD	1985-99	Reg	Y	-.0459	.0008	DN	-66	-25	1.24	.53	4
16	01613000	POT2386	TNOx	1985-99	Reg	Y	-.0352	.0199	ns	-62	-8	2.12	1.09	8
16	01613000	POT2386	TP	1985-99	Reg	Y	-.0414	.0248	ns	-69	-8	.13	.06	5
17	01614500	CON0180	FLOW	1985-99	Reg	Y	.0362	.0025	UP	22	143	285	400	—
17	01614500	CON0180	TSS	1985-99	Reg	Y	.0672	.0193	ns	19	532	25.9	34.8	90
17	01614500	CON0180	TN	1985-99	Reg	Y	.0192	.1008	ns	-5	88	9.37	9.20	76
17	01614500	CON0180	DNH_4	1985-99	Reg	Y	-.0257	.1312	ns	-59	12	.09	.05	13
17	01614500	CON0180	DNO_3	1985-99	Reg	Y	.0225	.0453	ns	1	94	8.03	8.33	87
17	01614500	CON0180	TKJD	1985-99	Reg	Y	-.0042	.7726	ns	-39	44	1.39	1.05	23
17	01614500	CON0180	TNOx	1985-99	Reg	Y	.0536	.0001	UP	59	213	5.72	8.11	75
17	01614500	CON0180	TP	1985-99	Reg	Y	-.0150	.2273	nn	—	—	.35	.23	37
20	01631000	1BSSF003.56	FLOW	1985-99	Reg	Y	.0195	.0940	ns	0	80	27,900	29,200	—
20	01631000	1BSSF003.56	TSS	1985-99	Reg	Y	.0060	.8773	nn	—	—	9.69	6.39	2
20	01631000	1BSSF003.56	TN	1985-99	Reg	Y	.0036	.7992	ns	-21	42	2.47	1.99	10
20	01631000	1BSSF003.56	TNH_4	1985-99	Reg	Y	-.0413	.0082	nn	—	—	.20	.08	31
20	01631000	1BSSF003.56	TNO_3	1985-99	Reg	Y	.0186	.1879	ns	-2	77	1.64	1.78	72
20	01631000	1BSSF003.56	TKJD	1985-99	Reg	Y	-.0092	.5361	nn	—	—	1.05	.62	8

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics										
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Magnitude		Status		
										Minimum	Maximum	Baseline median	Current median	Relative rank
20	01631000	1BSSF003.56	TNOx	1985-99	Reg	Y	0.0167	0.3203	ns	-4	72	1.22	1.29	10
20	01631000	1BSSF003.56	TP	1985-99	Reg	Y	.0048	.7294	nn	—	—	.30	.25	41
20	01634000	1BNFS01.34	FLOW	1985-99	Reg	Y	.0296	.0348	ns	16	109	9,230	9,380	—
20	01634000	1BNFS01.34	TSS	1985-99	Reg	Y	.0434	.2327	nn	—	—	8.13	8.13	8
20	01634000	1BNFS01.34	TN	1985-99	Reg	Y	.0534	.0013	UP	66	199	1.69	2.48	15
20	01634000	1BNFS01.34	TNH_4	1985-99	Reg	Y	-.0267	.1288	ns	-50	-10	.12	.06	16
20	01634000	1BNFS01.34	TNO_3	1985-99	Reg	Y	.0861	.0001	UP	171	388	1.14	2.66	112
20	01634000	1BNFS01.34	TKJD	1985-99	Reg	Y	.0320	.0823	ns	20	117	.41	.42	1
20	01634000	1BNFS01.34	TNOx	1985-99	Reg	Y	.0830	.0001	UP	159	366	1.10	2.49	22
20	01634000	1BNFS01.34	TP	1985-99	Reg	Y	.0596	.0001	UP	82	228	.14	.20	33
19	01638500	POT1595	FLOW	1985-99	Reg	Y	.0155	.1855	ns	-10	78	6,300	5,910	—
19	01638500	POT1595	TSS	1985-99	Reg	Y	.0108	.7224	ns	-52	188	34.9	15.5	31
19	01638500	POT1595	TN	1985-99	Reg	Y	-.0014	.9091	ns	-31	40	4.51	3.53	24
19	01638500	POT1595	DNH_4	1985-99	Reg	Y	-.0358	.0467	ns	-65	-1	.09	.04	3
19	01638500	POT1595	DNO_3	1985-99	Reg	Y	.0061	.6181	ns	-23	56	2.87	2.54	21
19	01638500	POT1595	TKJD	1985-99	Reg	Y	-.0173	.2387	ns	-50	19	1.44	.73	12
19	01638500	POT1595	TNOx	1985-99	Reg	Y	-.0153	.1934	ns	-44	12	3.82	2.67	23
19	01638500	POT1595	TP	1985-99	Reg	Y	-.0186	.3075	nn	—	—	.19	.09	12
18	01643000	MON0155	FLOW	1985-99	Reg	Y	.0208	.1071	ns	-6	99	443	541	—
18	01643000	MON0155	TSS	1985-99	Reg	Y	.0449	.1317	ns	-18	370	41.2	26.1	63
18	01643000	MON0155	TN	1985-99	Reg	Y	.0175	.1395	ns	-8	84	7.27	7.67	62
18	01643000	MON0155	DNH_4	1985-99	Reg	Y	-.1098	.0001	DN	-89	-67	.73	.13	51
18	01643000	MON0155	DNO_3	1985-99	Reg	Y	.0398	.0010	UP	28	157	4.34	5.53	55
18	01643000	MON0155	TKJD	1985-99	Reg	Y	-.0248	.0959	ns	-55	7	3.09	1.25	29
18	01643000	MON0155	TNOx	1985-99	Reg	Y	.0057	.5788	ns	-19	47	6.33	5.76	52
18	01643000	MON0155	TP	1985-99	Reg	Y	.0206	.1891	ns	-14	115	.42	.28	48
22	01646580	PR01	FLOW	1985-99	Reg	Y	.0160	.2357	ns	-14	89	7,030	6,800	—
22	01646580	PR01	TN	1985-99	Reg	Y	.0116	.4883	ns	-27	95	9.03	8.23	67
22	01646580	PR01	TKJD	1985-99	Reg	Y	.0006	.9719	ns	-41	73	2.98	1.98	55
22	01646580	PR01	DNOx	1985-99	Reg	Y	.0137	.4264	ns	-26	104	6.22	5.96	49
22	01646580	PR01	TP	1985-99	Reg	Y	.0257	.2582	ns	-24	186	.43	.36	62
22	01646580	PR01	DP	1985-99	Reg	Y	.0159	.3815	ns	-26	116	.24	.18	41

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
22	01646580	PR01	DIP	1985-99	Reg	Y	0.0179	0.3540	ns	-26	130	0.16	0.12	43
22	01646580	PR01	SED	1985-99	Reg	Y	-.0582	.0685	ns	-84	6	206	42.7	17
23	01666500	3-ROB001.90	FLOW	1985-99	Reg	Y	.0221	.0980	ns	4	87	3,670	4,920	—
23	01666500	3-ROB001.90	TSS	1985-99	Reg	Y	.0770	.0979	nn	—	—	12.9	37.7	99
23	01666500	3-ROB001.90	TN	1985-99	Reg	Y	.0124	.4322	ns	-10	62	1.95	2.19	12
23	01666500	3-ROB001.90	TNH_4	1985-99	Reg	Y	-.0330	.0230	ns	-55	-18	.24	.14	64
23	01666500	3-ROB001.90	TNO_3	1985-99	Reg	Y	-.0012	.9315	ns	-27	32	1.21	1.34	52
23	01666500	3-ROB001.90	TKJD	1985-99	Reg	Y	.0289	.1652	nn	—	—	.47	.75	12
23	01666500	3-ROB001.90	TNOx	1985-99	Reg	Y	.0059	.7022	ns	-19	47	1.08	1.17	9
23	01666500	3-ROB001.90	TP	1985-99	Reg	Y	.0032	.8600	ns	-22	41	.18	.21	34
24	01668000	01668000	FLOW	1988-99	Reg	Y	.0006	.9778	ns	-44	82	31,700	28,100	—
24	01668000	01668000	TSS	1988-99	Reg	Y	.0015	.9818	ns	-82	496	64.5	49.9	137
24	01668000	01668000	TN	1988-99	Reg	Y	-.0077	.8058	ns	-63	115	1.99	1.48	5
24	01668000	01668000	DNOx	1988-99	Reg	Y	-.0255	.4976	ns	-72	65	1.05	.80	5
24	01668000	01668000	TP	1988-99	Reg	Y	-.0178	.6796	ns	-76	148	.15	.11	15
24	01668000	01668000	DIP	1988-99	Reg	Y	-.0197	.5136	ns	-69	80	.03	.02	1
26	01671020	8-NAR005.42	FLOW	1985-99	Reg	Y	.0031	.8259	ns	-22	41	6,300	4,850	—
26	01671020	8-NAR005.42	TSS	1985-99	Reg	Y	-.0008	.9737	ns	-45	78	1.91	5.97	1
26	01671020	8-NAR005.42	TN	1985-99	Reg	Y	.0225	.1802	ns	4	88	.48	.46	4
26	01671020	8-NAR005.42	TNH_4	1985-99	Reg	Y	-.0609	.0001	DN	-70	-46	.15	.04	8
26	01671020	8-NAR005.42	TNO_3	1985-99	Reg	Y	-.0125	.5317	ns	-38	11	.24	.14	3
26	01671020	8-NAR005.42	TKJD	1985-99	Reg	Y	.0116	.4681	ns	-11	60	.39	.34	2
26	01671020	8-NAR005.42	TNOx	1985-99	Reg	Y	-.0121	.5697	ns	-54	50	.18	.12	1
26	01671020	8-NAR005.42	TP	1985-99	Reg	Y	-.1265	.0001	DN	-89	-80	.16	.02	1
25	01673000	01673000	FLOW	1989-99	Reg	Y	-.0268	.2841	ns	-52	15	30,800	15,800	—
25	01673000	01673000	TSS	1989-99	Reg	Y	-.0547	.3042	ns	-81	61	84.9	37.0	97
25	01673000	01673000	TN	1989-99	Reg	Y	-.0180	.5145	ns	-47	26	1.79	1.13	2
25	01673000	01673000	DNOx	1989-99	Reg	Y	.0032	.8886	ns	-33	59	.55	.47	2
25	01673000	01673000	TP	1989-99	Reg	Y	-.0112	.7069	ns	-43	36	.20	.13	18
25	01673000	01673000	DIP	1989-99	Reg	Y	.0428	.0249	ns	29	99	.04	.04	11
27	01674500	01674500	FLOW	1990-99	Reg	Y	-.0096	.7264	ns	-39	34	16,300	9,320	—
27	01674500	01674500	TSS	1990-99	Reg	Y	-.0265	.5409	ns	-65	68	26.2	14.5	28

Appendix 1. *Trends in streamflow and load data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics										
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Magnitude		Status		
										Minimum	Maximum	Baseline median	Current median	Relative rank
27	01674500	01674500	TN	1990-99	Reg	Y	-0.0317	0.2980	ns	-60	31	1.78	0.81	1
27	01674500	01674500	DNOx	1990-99	Reg	Y	-.0428	.0947	ns	-56	-4	.52	.21	0
27	01674500	01674500	TP	1990-99	Reg	Y	-.0413	.1906	ns	-63	19	.15	.08	9
27	01674500	01674500	DIP	1990-99	Reg	Y	-.0013	.9614	ns	-33	46	.03	.02	2
28	02026000	2-JMS229.14	FLOW	1985-99	Reg	Y	.0022	.8356	ns	-23	39	77,900	78,300	—
28	02026000	2-JMS229.14	TSS	1985-99	Reg	Y	.1364	.0001	UP	220	1,768	6.72	—	—
28	02026000	2-JMS229.14	TN	1985-99	Reg	Y	-.0063	.6322	ns	-32	22	.95	.82	1
28	02026000	2-JMS229.14	TNH_4	1985-99	Reg	Y	-.0423	.0095	DN	-60	-29	.25	—	—
28	02026000	2-JMS229.14	TNO_3	1985-99	Reg	Y	-.0613	.0001	DN	-70	-46	.62	.29	4
28	02026000	2—-MS229.14	TKJD	1985-99	Reg	Y	.0803	.0001	UP	149	347	.46	—	—
28	02026000	2-JMS229.14	TNOx	1985-99	Reg	Y	-.0747	.0001	DN	-76	-56	.44	.17	0
28	02026000	2-JMS229.14	TP	1985-99	Reg	Y	-.0742	.0001	nn	—	—	.47	.17	27
29	02029000	2-JMS189.31	FLOW	1985-99	Reg	Y	.0039	.7213	ns	-21	42	101,000	102,000	—
29	02029000	2-JMS189.31	TSS	1985-99	Reg	Y	.0011	.9702	nn	—	—	14.6	15.9	32
29	02029000	2-JMS189.31	TN	1985-99	Reg	Y	-.0104	.4743	ns	-36	15	1.24	1.09	2
29	02029000	2-JMS189.31	TNH_4	1985-99	Reg	Y	-.0680	.0001	DN	-73	-52	.23	.10	40
29	02029000	2-JMS189.31	TNO_3	1985-99	Reg	Y	-.0405	.0115	ns	-59	-27	.73	.45	11
29	02029000	2-JMS189.31	TKJD	1985-99	Reg	Y	.0141	.3378	nn	—	—	.50	.60	7
29	02029000	2-JMS189.31	TNOx	1985-99	Reg	Y	-.0357	.0234	ns	-56	-22	.75	.48	3
29	02029000	2-JMS189.31	TP	1985-99	Reg	Y	-.0432	.0005	nn	—	—	.40	.23	37
30	02035000	02035000	FLOW	1989-99	Reg	Y	-.0030	.8455	ns	-24	22	152,000	151,000	—
30	02035000	02035000	TSS	1989-99	Reg	Y	-.0466	.3258	ns	-78	46	41.3	36.6	100
30	02035000	02035000	TN	1989-99	Reg	Y	-.0209	.3511	ns	-51	25	1.50	1.20	6
30	02035000	02035000	DNOx	1989-99	Reg	Y	-.0463	.0614	ns	-64	-8	.62	.38	4
30	02035000	02035000	TP	1989-99	Reg	Y	-.0734	.0018	DN	-75	-29	.39	.17	68
30	02035000	02035000	DIP	1989-99	Reg	Y	-.1197	.0001	DN	-81	-70	.30	.07	100
31	02041650	02041650	FLOW	1989-99	Reg	Y	-.0282	.2172	ns	-52	13	27,500	19,700	—
31	02041650	02041650	TSS	1989-99	Reg	Y	-.0556	.1745	ns	-77	28	13.5	1.48	15
31	02041650	02041650	TN	1989-99	Reg	Y	-.0367	.1367	ns	-57	3	.93	.79	1
31	02041650	02041650	DNOx	1989-99	Reg	Y	-.0381	.0586	ns	-47	-18	.30	.21	0
31	02041650	02041650	TP	1989-99	Reg	Y	-.0377	.1984	ns	-57	2	.07	.06	5
31	02041650	02041650	DIP	1989-99	Reg	Y	-.0307	.1944	ns	-54	10	.02	.01	3

APPENDIX 2—TRENDS IN FLOW-WEIGHTED CONCENTRATION DATA FOR 9 RIVER INPUT MONITORING PROGRAM SITES AND 22 MULTI-AGENCY NONTIDAL PROGRAM SITES IN THE CHESAPEAKE BAY WATERSHED

Station: Flow, USGS streamflow station number; WQ, water-quality station number.

Parameters: Flow, streamflow; TN, total nitrogen; DN, dissolved nitrogen; DNH_4, dissolved ammonia; TNH_4, total ammonia; TNO_3, DNO_3, total or dissolved nitrate; TNOx, DNOx, total or dissolved nitrite plus nitrate; DKJD, dissolved ammonia plus organic nitrogen; TKJD, total ammonia plus organic nitrogen; TON, DON, total or dissolved organic nitrogen; Org C, organic carbon; TP, total phosphorus; DP, dissolved phosphorus; DIP, dissolved inorganic phosphorus; TSS, total suspended solids; SED, suspended sediment; $DSiO_2$, dissolved silica.

Statistics: POR, time period used in test; test, regression (Reg); log transformed, yes (Y) or no (N); slope, regression slope; p-value, measure of significance of regressor at 0.01; trend direction, up (UP), down (DN), residuals are not normal (nn), or not significant (ns); magnitude, minimum (min) and maximum (max) percentage change in trend for indicated period of record; baseline median, median of first 24 months of record; status median, median of last 36 months of record; relative rank, each individual status yield (milligram per liter) compared to all others of the same parameter; shaded areas are significant at 99-percent confidence level; —, not applicable or insufficient data.

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
1	01531500	TOW	1989-99	TN	Reg	Y	-0.0289	0.0001	DN	-30	-25	2.92	1.19	16
1	01531500	TOW	1989-99	DN	Reg	Y	-.0230	.0001	DN	-25	-19	2.40	1.06	1
1	01531500	TOW	1989-99	TON	Reg	Y	.0005	.9279	ns	-10	13	1.13	.49	15
1	01531500	TOW	1989-99	DON	Reg	Y	.0211	.0001	UP	15	38	.68	.37	6
1	01531500	TOW	1989-99	DNH_4	Reg	Y	-.0373	.0001	DN	-37	-30	.11	.04	17
1	01531500	TOW	1989-99	TNH_4	Reg	Y	-.0399	.0001	DN	-43	-27	.10	.04	49
1	01531500	TOW	1989-99	DKJD	Reg	Y	.0148	.0009	UP	7	29	.77	.41	29
1	01531500	TOW	1989-99	TKJD	Reg	Y	-.0005	.9270	ns	-11	11	1.25	.54	58
1	01531500	TOW	1989-99	TNOx	Reg	Y	-.0422	.0001	DN	-40	-34	1.88	.64	12
1	01531500	TOW	1989-99	DNOx	Reg	Y	-.1749	.0001	DN	-36	-29	1.86	.64	19
1	01531500	TOW	1989-99	TP	Reg	Y	-.0178	.0450	nn	—	—	.14	.07	29
1	01531500	TOW	1989-99	DP	Reg	Y	-.0387	.0001	DN	-40	-29	.10	.03	23
1	01531500	TOW	1989-99	DIP	Reg	Y	.0647	.0001	nn	—	—	.03	.01	14
1	01531500	TOW	1989-99	TOC	Reg	Y	-.0031	.4240	ns	-11	5	6.54	3.26	68
1	01531500	TOW	1989-99	SED	Reg	Y	.0014	.9622	ns	-47	96	85.1	35.8	63
2	01540500	DAN	1985-99	TN	Reg	Y	-.0187	.0001	nn	—	—	2.45	1.47	23
2	01540500	DAN	1985-99	DN	Reg	Y	-.0159	.0001	nn	—	—	2.26	1.29	7
2	01540500	DAN	1985-99	TON	Reg	Y	-.0263	.0001	DN	-39	-25	1.15	.55	26
2	01540500	DAN	1985-99	DON	Reg	Y	-.0149	.0004	nn	—	—	.74	.39	9
2	01540500	DAN	1985-99	DNH_4	Reg	Y	-.0503	.0001	nn	—	—	.18	.05	29
2	01540500	DAN	1985-99	TNH_4	Reg	Y	-.0586	.0001	DN	-63	-54	.21	.05	65
2	01540500	DAN	1985-99	DKJD	Reg	Y	-.0294	.0001	DN	-43	-27	.89	.39	26
2	01540500	DAN	1985-99	TKJD	Reg	Y	-.0279	.0001	DN	-40	-27	1.30	.61	75
2	01540500	DAN	1985-99	TNOx	Reg	Y	-.0093	.0003	nn	—	—	1.35	.85	17
2	01540500	DAN	1985-99	DNOx	Reg	Y	-.0105	.0001	nn	—	—	1.36	.84	28
2	01540500	DAN	1985-99	TP	Reg	Y	-.0352	.0001	DN	-49	-32	.16	.08	37
2	01540500	DAN	1985-99	DP	Reg	Y	-.0536	.0001	nn	—	—	.06	.02	15
2	01540500	DAN	1985-99	DIP	Reg	Y	.0058	.3869	nn	—	—	.02	.01	11
2	01540500	DAN	1985-99	TOC	Reg	Y	-.0190	.0001	nn	-31	-18	6.82	3.59	100
2	01540500	DAN	1985-99	SED	Reg	Y	-.0381	.0149	ns	-64	-11	115	33.7	58
3	01553500	LEW	1985-99	TN	Reg	Y	-.0169	.0001	nn	—	—	1.43	1.26	18
3	01553500	LEW	1985-99	DN	Reg	Y	-.0106	.0001	DN	-16	-13	1.24	1.10	2

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
3	01553500	LEW	1985-99	TON	Reg	Y	-0.0364	0.0001	DN	-49	-34	0.65	0.38	3
3	01553500	LEW	1985-99	DON	Reg	Y	-.0204	.0001	DN	-34	-18	.43	.33	2
3	01553500	LEW	1985-99	DNH_4	Reg	Y	-.0289	.0001	DN	-38	-32	.07	.04	25
3	01553500	LEW	1985-99	TNH_4	Reg	Y	-.0058	.0001	DN	-29	-22	.07	.06	71
3	01553500	LEW	1985-99	DKJD	Reg	Y	-.0174	.0002	DN	-33	-12	.48	.36	20
3	01553500	LEW	1985-99	TKJD	Reg	Y	-.0295	.0001	DN	-44	-26	.70	.44	33
3	01553500	LEW	1985-99	TNOx	Reg	Y	-.0060	.0007	DN	-13	-4	.75	.70	13
3	01553500	LEW	1985-99	DNOx	Reg	Y	-.0062	.0003	DN	-13	-4	.75	.70	22
3	01553500	LEW	1985-99	TP	Reg	Y	-.0308	.0001	DN	-44	-29	.07	.05	13
3	01553500	LEW	1985-99	DP	Reg	Y	-.0103	.0001	DN	-69	-63	.04	.02	9
3	01553500	LEW	1985-99	DIP	Reg	Y	.0017	.8421	ns	-20	32	.01	.01	5
3	01553500	LEW	1985-99	TOC	Reg	Y	-.0036	.1198	ns	-12	1	2.46	2.35	22
3	01553500	LEW	1985-99	SED	Reg	Y	-.0027	.8670	ns	-40	53	33.6	17.9	20
4	01567000	JUN	1985-99	TN	Reg	Y	-.0106	.0001	DN	-21	-8	2.46	1.73	28
4	01567000	JUN	1985-99	DN	Reg	Y	-.0066	.0006	DN	-14	-4	2.08	1.64	16
4	01567000	JUN	1985-99	TON	Reg	Y	-.0282	.0001	DN	-44	-23	.90	.48	13
4	01567000	JUN	1985-99	DON	Reg	Y	-.0150	.0050	nn	—	—	.55	.40	11
4	01567000	JUN	1985-99	DNH_4	Reg	Y	-.0501	.0001	DN	-57	-48	.07	.03	8
4	01567000	JUN	1985-99	TNH_4	Reg	Y	-.0411	.0001	DN	-51	-41	.08	.04	29
4	01567000	JUN	1985-99	DKJD	Reg	Y	-.0177	.0028	DN	-35	-9	.64	.43	33
4	01567000	JUN	1985-99	TKJD	Reg	Y	-.0271	.0001	DN	-44	-21	1.00	.52	52
4	01567000	JUN	1985-99	TNOx	Reg	Y	-.0053	.0099	DN	-13	-2	1.53	1.24	25
4	01567000	JUN	1985-99	DNOx	Reg	Y	-.0036	.0746	ns	-11	0	1.47	1.23	44
4	01567000	JUN	1985-99	TP	Reg	Y	-.0460	.0001	DN	-55	-44	.14	.07	27
4	01567000	JUN	1985-99	DP	Reg	Y	-.0411	.0001	nn	—	—	.08	.04	42
4	01567000	JUN	1985-99	DIP	Reg	Y	.0047	.7021	nn	—	—	.05	.04	58
4	01567000	JUN	1985-99	TOC	Reg	Y	-.0246	.0001	DN	-36	-25	5.34	3.54	95
4	01567000	JUN	1985-99	SED	Reg	Y	-.0155	.2855	ns	-48	21	51.3	26.1	40
5	01570000	01570000	1989-99	TSS	Reg	Y	-.1027	.0009	DN	-83	-38	32.6	9.00	21
5	01570000	01570000	1989-99	TN	Reg	Y	-.0260	.0001	DN	-28	-21	5.85	3.20	62
5	01570000	01570000	1989-99	TNH_4	Reg	Y	-.4644	.0001	nn	—	—	.06	.00	39
5	01570000	01570000	1989-99	DKJD	Reg	Y	-.0763	.0001	DN	-61	-52	.60	.21	7

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

				Statistics										
	Station									Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
5	01570000	01570000	1989-99	TKJD	Reg	Y	-0.0304	0.0004	nn	—	—	0.63	0.30	0
5	01570000	01570000	1989-99	TNOx	Reg	Y	.0069	.9786	ns	-5	6	5.34	3.80	83
5	01570000	01570000	1989-99	TP	Reg	Y	-.0866	.0001	nn	—	—	.11	.03	0
5	01570000	01570000	1989-99	DP	Reg	Y	-.1860	.0001	DN	-89	-84	.06	.01	1
5	01570000	01570000	1989-99	DIP	Reg	Y	.0286	.1232	ns	-8	104	.02	.01	9
6	01576000	MAR	1987-99	TN	Reg	Y	-.0194	.0001	DN	-26	-18	2.68	1.39	21
6	01576000	MAR	1987-99	DN	Reg	Y	-.0102	.0001	DN	-15	-9	2.16	1.28	7
6	01576000	MAR	1987-99	TON	Reg	Y	.0586	.0001	UP	84	149	.79	.82	71
6	01576000	MAR	1987-99	DON	Reg	Y	.1265	.0001	UP	340	510	.44	.93	100
6	01576000	MAR	1987-99	DNH_4	Reg	Y	-.0406	.0001	DN	-44	-37	.09	.05	25
6	01576000	MAR	1987-99	TNH_4	Reg	Y	-.0343	.0001	DN	-40	-32	.08	.05	57
6	01576000	MAR	1987-99	DKJD	Reg	Y	-.0021	.6432	ns	-14	9	.56	.40	27
6	01576000	MAR	1987-99	TKJD	Reg	Y	-.0247	.0001	DN	-36	-18	.88	.52	53
6	01576000	MAR	1987-99	TNOx	Reg	Y	-.0111	.0001	DN	-19	-8	1.52	1.04	21
6	01576000	MAR	1987-99	DNOx	Reg	Y	-.0101	.0001	DN	-17	-7	1.50	1.03	35
6	01576000	MAR	1987-99	TP	Reg	Y	-.0201	.0037	DN	-35	-8	.11	.06	22
6	01576000	MAR	1987-99	DP	Reg	Y	-.0297	.0001	DN	-37	-27	.06	.03	25
6	01576000	MAR	1987-99	DIP	Reg	Y	.1025	.0001	UP	192	392	.01	.01	17
6	01576000	MAR	1987-99	TOC	Reg	Y	-.0050	.0411	ns	-12	0	4.47	3.31	73
6	01576000	MAR	1987-99	SED	Reg	Y	.0025	.8935	ns	-36	66	5.40	25.5	39
7	01576754	CON	1985-99	TN	Reg	Y	-.0102	.0001	nn	—	—	12.1	5.97	100
7	01576754	CON	1985-99	DN	Reg	Y	.0263	.6873	ns	-3	5	9.84	6.10	100
7	01576754	CON	1985-99	TON	Reg	Y	-.0183	.0004	DN	-35	-12	2.55	1.06	100
7	01576754	CON	1985-99	DON	Reg	Y	.0089	.0233	ns	2	28	1.46	.91	99
7	01576754	CON	1985-99	DNH_4	Reg	Y	-.0819	.0001	DN	-74	-67	.36	.09	67
7	01576754	CON	1985-99	TNH_4	Reg	Y	-.0817	.0001	DN	-74	-67	.37	.09	100
7	01576754	CON	1985-99	DKJD	Reg	Y	-.0068	.1190	ns	-20	3	1.94	.97	100
7	01576754	CON	1985-99	TKJD	Reg	Y	-.0328	.0001	DN	-48	-28	3.13	1.16	100
7	01576754	CON	1985-99	TNOx	Reg	Y	.0016	.3814	ns	-3	8	7.86	5.16	100
7	01576754	CON	1985-99	DNOx	Reg	Y	.0006	.7426	ns	-5	7	7.66	5.03	100
7	01576754	CON	1985-99	TP	Reg	Y	-.0243	.0001	nn	—	—	.84	.28	100
7	01576754	CON	1985-99	DP	Reg	Y	-.0393	.0001	DN	-47	-42	.39	.14	100

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
7	01576754	CON	1985-99	DIP	Reg	Y	-0.0390	0.0001	DN	-48	-40	0.32	0.13	100
7	01576754	CON	1985-99	TOC	Reg	Y	-.0493	.0001	DN	-57	-47	12.6	3.58	99
7	01576754	CON	1985-99	SED	Reg	Y	-.0496	.0030	DN	-71	-23	185	63.8	100
9	01491000	01491000	1985-99	TN	Reg	Y	-.0075	.0001	DN	-14	-8	2.13	1.96	34
9	01491000	01491000	1985-99	TKJD	Reg	Y	-.0336	.0001	DN	-48	-30	.77	.55	59
9	01491000	01491000	1985-99	DNOx	Reg	Y	.0064	.0298	ns	1	20	1.23	1.41	51
9	01491000	01491000	1985-99	TP	Reg	Y	.0024	.7067	nn	—	—	.07	.08	37
9	01491000	01491000	1985-99	DP	Reg	Y	.0194	.0024	UP	11	61	.03	.03	26
9	01491000	01491000	1985-99	DIP	Reg	Y	.0116	.0380	ns	1	40	.02	.02	32
9	01491000	01491000	1985-99	SED	Reg	Y	-.0284	.0129	ns	-53	-9	7.76	7.28	6
8	01578310	01578310	1985-99	TN	Reg	Y	-.0203	.0001	DN	-28	-24	2.45	1.88	32
8	01578310	01578310	1985-99	TKJD	Reg	Y	-.0581	.0001	DN	-62	-54	.94	.46	39
8	01578310	01578310	1985-99	DNOx	Reg	Y	-.0062	.0001	DN	-11	-6	1.46	1.38	50
8	01578310	01578310	1985-99	TP	Reg	Y	-.0249	.0001	DN	-41	-20	.06	.04	9
8	01578310	01578310	1985-99	DP	Reg	Y	-.0170	.0001	DN	-31	-12	.02	.01	6
8	01578310	01578310	1985-99	DIP	Reg	Y	-.0435	.0001	DN	-57	-37	.01	.01	3
8	01578310	01578310	1985-99	SED	Reg	Y	-.0027	.7932	nn	—	—	16.4	12.1	6
12	01586000	NPA0165	1985-99	TSS	Reg	Y	.0194	.5029	nn	—	—	12.7	15.2	53
12	01586000	NPA0165	1985-99	TN	Reg	Y	.0160	.0001	nn	—	—	4.18	5.17	107
12	01586000	NPA0165	1985-99	DNH_4	Reg	Y	-.0310	.0628	nn	—	—	.06	.03	12
12	01586000	NPA0165	1985-99	DNO_3	Reg	Y	.0175	.0001	nn	—	—	3.60	4.72	106
12	01586000	NPA0165	1985-99	TKJD	Reg	Y	-.0378	.0001	nn	—	—	.90	.53	56
12	01586000	NPA0165	1985-99	TNOx	Reg	Y	.0630	.0001	UP	132	185	1.94	4.58	101
12	01586000	NPA0165	1985-99	TP	Reg	Y	-.0316	.1093	nn	—	—	.08	.05	14
10	01592500	PXT0809	1985-99	TSS	Reg	Y	.0420	.0001	nn	—	—	7.89	13.5	44
10	01592500	PXT0809	1985-99	TN	Reg	Y	.0122	.0001	UP	16	24	1.79	2.14	38
10	01592500	PXT0809	1985-99	DNH_4	Reg	Y	.0135	.0190	ns	4	45	.13	.13	112
10	01592500	PXT0809	1985-99	DNO_3	Reg	Y	.0116	.0001	UP	12	26	1.12	1.28	17
10	01592500	PXT0809	1985-99	TKJD	Reg	Y	.0040	.0516	ns	0	13	.71	.72	102
10	01592500	PXT0809	1985-99	TNOx	Reg	Y	.0719	.0001	UP	166	225	.50	1.32	27
10	01592500	PXT0809	1985-99	TP	Reg	Y	-.0051	.0001	DN	-9	-5	.05	.05	14
11	01594440	01594440	1985-99	TN	Reg	Y	-.0704	.0001	DN	-68	-62	5.40	2.26	41

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
11	01594440	01594440	1985-99	TKJD	Reg	Y	-0.0745	0.0001	DN	-69	-65	1.81	0.70	95
11	01594440	01594440	1985-99	DNOx	Reg	Y	-.0695	.0001	DN	-69	-60	3.51	1.53	56
11	01594440	01594440	1985-99	TP	Reg	Y	-.0808	.0001	DN	-73	-67	.40	.13	77
11	01594440	01594440	1985-99	DP	Reg	Y	-.0898	.0001	DN	-78	-70	.18	.04	40
11	01594440	01594440	1985-99	DIP	Reg	Y	-.0825	.0001	DN	-75	-66	.15	.04	58
11	01594440	01594440	1985-99	SED	Reg	Y	-.0449	.0001	DN	-64	-29	61.4	36.2	64
13	01599000	GEO0009	1985-99	TSS	Reg	Y	-.0031	.6584	ns	-22	17	35.3	29.5	129
13	01599000	GEO0009	1985-99	TN	Reg	Y	-.0252	.0001	DN	-34	-29	2.44	1.73	29
13	01599000	GEO0009	1985-99	DNH_4	Reg	Y	-.0679	.0001	DN	-71	-55	.36	.13	106
13	01599000	GEO0009	1985-99	DNO_3	Reg	Y	-.0486	.0001	DN	-56	-47	1.39	.83	5
13	01599000	GEO0009	1985-99	TKJD	Reg	Y	-.0400	.0001	DN	-48	-42	.80	.47	40
13	01599000	GEO0009	1985-99	TNOx	Reg	Y	-.0236	.0001	DN	-36	-23	1.74	1.28	26
13	01599000	GEO0009	1985-99	TP	Reg	Y	-.0496	.0001	nn	—	—	.13	.07	28
14	01601500	WIL0013	1985-99	TSS	Reg	Y	-.0078	.6193	nn	—	—	17.6	12.4	39
14	01601500	WIL0013	1985-99	TN	Reg	Y	-.0410	.0001	DN	-54	-36	2.09	1.09	14
14	01601500	WIL0013	1985-99	DNH_4	Reg	Y	.0493	.0001	UP	70	158	.04	.06	45
14	01601500	WIL0013	1985-99	DNO_3	Reg	Y	-.0407	.0001	DN	-57	-32	1.47	.69	2
14	01601500	WIL0013	1985-99	TKJD	Reg	Y	-.0448	.0001	DN	-55	-43	.66	.34	9
14	01601500	WIL0013	1985-99	TNOx	Reg	Y	-.1230	.0001	DN	-87	-80	4.13	.76	15
14	01601500	WIL0013	1985-99	TP	Reg	Y	-.0088	.3575	nn	—	—	.05	.04	6
15	01610000	POT2766	1985-99	TSS	Reg	Y	-.0240	.1579	nn	—	—	15.6	9.2	22
15	01610000	POT2766	1985-99	TN	Reg	Y	-.0133	.0001	nn	—	—	1.42	1.10	14
15	01610000	POT2766	1985-99	DNH_4	Reg	Y	-.0211	.0153	ns	-43	-6	.06	.04	18
15	01610000	POT2766	1985-99	TKJD	Reg	Y	-.0320	.0001	nn	—	—	.70	.45	35
15	01610000	POT2766	1985-99	TNOx	Reg	Y	-.0338	.0001	nn	—	—	1.14	.69	13
15	01610000	POT2766	1985-99	TP	Reg	Y	-.0275	.0051	nn	—	—	.09	.06	21
16	01613000	POT2386	1985-99	TSS	Reg	Y	.0153	.4231	nn	—	—	14.2	10.0	26
16	01613000	POT2386	1985-99	TN	Reg	Y	-.0319	.0001	DN	-42	-34	1.70	1.05	13
16	01613000	POT2386	1985-99	DNH_4	Reg	Y	-.0257	.0001	nn	—	—	.03	.02	3
16	01613000	POT2386	1985-99	DNO_3	Reg	Y	-.0220	.0001	DN	-38	-17	.88	.63	0
16	01613000	POT2386	1985-99	TKJD	Reg	Y	-.0445	.0001	nn	—	—	.79	.42	29
16	01613000	POT2386	1985-99	TNOx	Reg	Y	-.0338	.0001	DN	-46	-33	1.06	.66	12

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

				Statistics										
	Station									Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
16	01613000	POT2386	1985-99	TP	Reg	Y	-0.0400	0.0001	nn	—	—	0.09	0.05	15
17	01614500	CON0180	1985-99	TSS	Reg	Y	.0310	.0686	ns	-3	162	16.8	16.3	59
17	01614500	CON0180	1985-99	TN	Reg	Y	-.0170	.0001	nn	—	—	5.53	4.60	94
17	01614500	CON0180	1985-99	DNH_4	Reg	Y	-.0619	.0001	DN	-66	-53	.06	.03	8
17	01614500	CON0180	1985-99	DNO_3	Reg	Y	-.0137	.0001	DN	-24	-13	4.52	4.05	89
17	01614500	CON0180	1985-99	TKJD	Reg	Y	-.0404	.0001	nn	—	—	1.02	.60	71
17	01614500	CON0180	1985-99	TNOx	Reg	Y	.0174	.0001	UP	17	44	2.85	4.02	88
17	01614500	CON0180	1985-99	TP	Reg	Y	-.0512	.0001	DN	-58	-48	.24	.12	71
19	01638500	POT1595	1985-99	TSS	Reg	Y	-.0047	.8083	nn	—	—	16.0	10.4	26
19	01638500	POT1595	1985-99	TN	Reg	Y	-.0169	.0001	nn	—	—	2.57	1.05	13
19	01638500	POT1595	1985-99	DNH_4	Reg	Y	-.0514	.0001	nn	—	—	.06	.02	3
19	01638500	POT1595	1985-99	DNO_3	Reg	Y	-.0095	.0013	DN	-20	-6	1.56	.63	0
19	01638500	POT1595	1985-99	TKJD	Reg	Y	-.0328	.0001	nn	—	—	.96	.42	29
19	01638500	POT1595	1985-99	TNOx	Reg	Y	-.0308	.0001	nn	—	—	2.13	.66	12
19	01638500	POT1595	1985-99	TP	Reg	Y	-.0341	.0001	nn	—	—	.13	.05	15
18	01643000	MON0155	1985-99	TSS	Reg	Y	.0242	.1649	ns	-14	139	18.7	16.3	59
18	01643000	MON0155	1985-99	TN	Reg	Y	-.0033	.0323	ns	-9	0	4.03	4.60	94
18	01643000	MON0155	1985-99	DNH_4	Reg	Y	-.1306	.0001	DN	-89	-81	.67	.03	8
18	01643000	MON0155	1985-99	DNO_3	Reg	Y	.0190	.0001	UP	22	45	2.21	4.05	89
18	01643000	MON0155	1985-99	TKJD	Reg	Y	-.0455	.0001	DN	-55	-43	1.87	.60	71
18	01643000	MON0155	1985-99	TNOx	Reg	Y	-.0151	.0001	DN	-27	-13	3.67	4.02	88
18	01643000	MON0155	1985-99	TP	Reg	Y	-.0002	.9669	nn	—	—	.28	.12	71
22	01646580	PR01	1985-99	TN	Reg	Y	-.0044	.2137	ns	-15	4	2.26	2.02	35
22	01646580	PR01	1985-99	TKJD	Reg	Y	-.0154	.0155	ns	-34	-4	.80	.61	74
22	01646580	PR01	1985-99	DNOx	Reg	Y	-.0023	.6476	ns	-17	12	1.55	1.33	48
22	01646580	PR01	1985-99	TP	Reg	Y	.0097	.3389	ns	-14	56	.11	.11	59
22	01646580	PR01	1985-99	DP	Reg	Y	-.0001	.9878	ns	-17	20	.06	.06	63
22	01646580	PR01	1985-99	DIP	Reg	Y	.0019	.7917	ns	-16	26	.04	.04	65
22	01646580	PR01	1985-99	SED	Reg	Y	-.0742	.0001	DN	-81	-43	33.5	13.3	9
20	01631000	1BSSF003.56	1985-99	TSS	Reg	Y	-.0136	.6253	nn	—	—	5.86	3.47	9
20	01631000	1BSSF003.56	1985-99	TN	Reg	N	-.0159	.0001	DN	-25	-13	1.36	1.15	15
20	01631000	1BSSF003.56	1985-99	TNH_4	Reg	Y	-.0608	.0001	nn	—	—	.12	.05	54

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

				Statistics										
	Station									Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
20	01631000	1BSSF003.56	1985-99	TNO_3	Reg	N	-0.0010	0.8130	ns	-10	8	0.89	0.95	59
20	01631000	1BSSF003.56	1985-99	TKJD	Reg	Y	-.0287	.0001	nn	—	—	.60	.40	22
20	01631000	1BSSF003.56	1985-99	TNOx	Reg	N	-.0028	.6980	ns	-20	17	.65	.75	14
20	01631000	1BSSF003.56	1985-99	TP	Reg	Y	-.0147	.0008	nn	—	—	.18	.15	95
21	01634000	1BNFS01.34	1985-99	TSS	Reg	Y	.0139	.5624	nn	—	—	6.62	5.25	1
21	01634000	1BNFS01.34	1985-99	TN	Reg	Y	.0239	.0001	UP	29	49	1.34	1.89	32
21	01634000	1BNFS01.34	1985-99	TNH_4	Reg	Y	-.0562	.0001	nn	—	—	.11	.05	51
21	01634000	1BNFS01.34	1985-99	TNO_3	Reg	Y	.0565	.0001	UP	88	135	.81	1.73	115
21	01634000	1BNFS01.34	1985-99	TKJD	Reg	Y	.0025	.6767	nn	—	—	.39	.38	18
21	01634000	1BNFS01.34	1985-99	TNOx	Reg	Y	.0534	.0001	UP	78	129	.81	1.71	36
21	01634000	1BNFS01.34	1985-99	TP	Reg	Y	.0300	.0001	nn	—	—	.12	.16	102
23	01666500	3-ROB001.90	1985-99	TSS	Reg	Y	.0550	.1099	nn	—	—	5.88	10.3	27
23	01666500	3-ROB001.90	1985-99	TN	Reg	Y	-.0097	.0002	DN	-14	-14	.85	.78	7
23	01666500	3-ROB001.90	1985-99	TNH_4	Reg	Y	-.0551	.0001	DN	-56	-56	.10	.05	57
23	01666500	3-ROB001.90	1985-99	TNO_3	Reg	Y	-.0233	.0001	DN	-30	-30	.58	.47	24
23	01666500	3-ROB001.90	1985-99	TKJD	Reg	Y	.0068	.4291	nn	—	—	.27	.26	9
23	01666500	3-ROB001.90	1985-99	TNOx	Reg	Y	-.0162	.0001	DN	-22	-22	.50	.43	7
23	01666500	3-ROB001.90	1985-99	TP	Reg	Y	-.0189	.0002	DN	-25	-25	.09	.07	31
24	01668000	01668000	1988-1999	TSS	Reg	Y	.0009	.9841	ns	-69	228	26.7	23.9	99
24	01668000	01668000	1988-1999	TN	Reg	Y	-.0083	.4409	ns	-34	18	.97	.83	8
24	01668000	01668000	1988-1999	DNOx	Reg	N	-.0261	.1464	ns	-41	59	.53	.47	12
24	01668000	01668000	1988-1999	TP	Reg	Y	-.0184	.4228	nn	—	—	.07	.05	18
24	01668000	01668000	1988-1999	DIP	Reg	Y	-.0202	.0290	ns	-26	-26	.01	.01	12
26	01671020	8-NAR005.42	1985-99	TSS	Reg	Y	-.0038	.7152	ns	-30	27	7.65	5.39	2
26	01671020	8-NAR005.42	1985-99	TN	Reg	Y	.0194	.0001	UP	19	49	.31	.36	3
26	01671020	8-NAR005.42	1985-99	TNH_4	Reg	Y	-.0639	.0001	nn	—	—	.11	.05	49
26	01671020	8-NAR005.42	1985-99	TNO_3	Reg	Y	-.0155	.0295	ns	-21	-21	.15	.12	0
26	01671020	8-NAR005.42	1985-99	TKJD	Reg	Y	.0085	.0002	UP	6	21	.27	.31	1
26	01671020	8-NAR005.42	1985-99	TNOx	Reg	Y	-.0152	.1072	ns	-20	-20	.11	.08	1
26	01671020	8-NAR005.42	1985-99	TP	Reg	Y	-.1296	.0001	DN	-87	-84	.11	.02	8
25	01673000	01673000	1989-99	TSS	Reg	Y	-.0279	.3488	ns	-52	13	32.7	20.0	79
25	01673000	01673000	1989-99	TN	Reg	N	.0088	.0057	UP	5	20	.73	.75	6

Appendix 2. *Trends in flow-weighted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics										
										Magnitude		Status		
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum	Baseline median	Current median	Relative rank
25	01673000	01673000	1989-99	DNOx	Reg	N	0.0300	0.0001	UP	37	54	0.24	0.32	6
25	01673000	01673000	1989-99	TP	Reg	N	.0156	.0111	ns	7	38	.08	.08	41
25	01673000	01673000	1989-99	DIP	Reg	N	.0696	.0001	UP	187	325	.02	.03	49
27	01674500	01674500	1990-99	TSS	Reg	N	-.0169	.3164	ns	-27	19	1.02	8.80	19
27	01674500	01674500	1990-99	TN	Reg	N	-.0221	.0001	DN	-27	-14	.70	.52	1
27	01674500	01674500	1990-99	DNOx	Reg	N	-.0332	.0001	DN	-34	-22	.17	.13	2
27	01674500	01674500	1990-99	TP	Reg	N	-.0318	.0001	DN	-33	-18	.06	.05	13
27	01674500	01674500	1990-99	DIP	Reg	N	.0083	.0261	ns	2	16	.01	.02	19
28	02026000	2-JMS229.14	1985-99	TSS	Reg	Y	.1010	.0001	UP	153	719	3.52	—	—
28	02026000	2-JMS229.14	1985-99	TN	Reg	Y	-.0085	.0350	ns	-12	-12	.49	.49	0
28	02026000	2-JMS229.14	1985-99	TNH_4	Reg	Y	-.0777	.0001	nn	—	—	.11	—	—
28	02026000	2-JMS229.14	1985-99	TNO_3	Reg	Y	-.0634	.0001	DN	-61	-61	.31	.15	2
28	02026000	2-JMS229.14	1985-99	TKJD	Reg	N	.0449	.0001	UP	77	77	.24	—	—
28	02026000	2-JMS229.14	1985-99	TNOx	Reg	N	-.0768	.0001	DN	-70	-45	.24	.11	0
28	02026000	2-JMS229.14	1985-99	TP	Reg	Y	-.0764	.0001	DN	-68	-68	.23	.10	57
29	02029000	2-JMS189.31	1985-99	TSS	Reg	Y	-.0028	.8784	nn	—	—	6.53	6.72	9
29	02029000	2-JMS189.31	1985-99	TN	Reg	Y	-.0142	.0006	nn	—	—	.61	.51	1
29	02029000	2-JMS189.31	1985-99	TNH_4	Reg	Y	-.0719	.0001	nn	—	—	.11	.04	43
29	02029000	2-JMS189.31	1985-99	TNO_3	Reg	Y	-.0444	.0001	DN	-56	-40	.34	.20	5
29	02029000	2-JMS189.31	1985-99	TKJD	Reg	Y	.0102	.0694		—	—	.29	.32	5
29	02029000	2-JMS189.31	1985-99	TNOx	Reg	Y	-.0396	.0001	DN	-52	-36	.34	.21	2
29	02029000	2-JMS189.31	1985-99	TP	Reg	Y	-.0471	.0001	nn	—	—	.21	.12	66
30	02035000	02035000	1989-99	TSS	Reg	Y	-.0437	.1827	ns	-71	20	15.9	14.3	54
30	02035000	02035000	1989-99	TN	Reg	Y	-.0179	.0165	ns	-19	-19	.58	.49	3
30	02035000	02035000	1989-99	DNOx	Reg	Y	-.0433	.0001	DN	-53	-25	.24	.18	3
30	02035000	02035000	1989-99	TP	Reg	Y	-.0704	.0001	nn	—	—	.16	.08	97
30	02035000	02035000	1989-99	DIP	Reg	Y	-.1167	.0001	DN	-80	-70	.14	.03	100
31	02041650	02041650	1989-99	TSS	Reg	Y	-.0275	.1396	ns	-40	-8	7.79	7.32	12
31	02041650	02041650	1989-99	TN	Reg	Y	-.0085	.0008	DN	-13	-4	.59	.55	2
31	02041650	02041650	1989-99	DNOx	Reg	Y	-.0100	.0412	ns	-18	0	.18	.17	1
31	02041650	02041650	1989-99	TP	Reg	Y	-.0096	.2051	ns	-22	5	.04	.04	8
31	02041650	02041650	1989-99	DIP	Reg	Y	-.0025	.4839	ns	-9	5	.01	.01	13

APPENDIX 3—TRENDS IN FLOW-ADJUSTED CONCENTRATION DATA FOR 9 RIVER INPUT MONITORING PROGRAM SITES AND 22 MULTI-AGENCY NONTIDAL PROGRAM SITES IN THE CHESAPEAKE BAY WATERSHED

Station: Flow, USGS streamflow site number; WQ, water-quality site number.

Parameters: Flow, streamflow; TN, total nitrogen; DN, dissolved nitrogen; DNH_4, dissolved ammonia; TNH_4, total ammonia; TNO_3, DNO_3, total or dissolved nitrate; TNOx, DNOx, total or dissolved nitrite plus nitrate; DKJD, dissolved ammonia plus organic nitrogen; TKJD, total ammonia plus organic nitrogen; TON, DON, total or dissolved organic nitrogen; Org C, organic carbon; TP, total phosphorus; DP, dissolved phosphorus; DIP, dissolved inorganic phosphorus; TSS, total suspended solids; SED, suspended sediment; $DSiO_2$, dissolved silica.

Statistics: POR, time period used in test; test, regression (MVUE); log transformed, yes (Y) or no (N); slope, regression slope; p-value, measure of significance of regressor at 0.05; trend direction, up (UP), down (DN), residuals are not normal (nn), or not significant (ns); magnitude, minimum (min) and maximum (max) percentage change in trend for indicated period of record; status not calculated for flow-adjusted concentrations); shaded areas are significant at 95-percent confidence level.

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics							
										Magnitude	
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
1	01531500	TOW	1989-99	TN	MVUE	Y	-0.0317	0.0000	DN	-35	-23
1	01531500	TOW	1989-99	DN	MVUE	Y	-.0229	.0000	DN	-29	-15
1	01531500	TOW	1989-99	TON	MVUE	Y	-.0126	.1374	ns	-28	5
1	01531500	TOW	1989-99	DON	MVUE	Y	.0151	.0717	ns	-2	42
1	01531500	TOW	1989-99	DNH_4	MVUE	Y	-.0500	.0000	DN	-55	-27
1	01531500	TOW	1989-99	TNH_4	MVUE	Y	-.0198	.0578	ns	-36	1
1	01531500	TOW	1989-99	DKJD	MVUE	Y	.0111	.1694	ns	-5	35
1	01531500	TOW	1989-99	TKJD	MVUE	Y	-.0154	.0579	ns	-29	1
1	01531500	TOW	1989-99	TNOx	MVUE	Y	-.0373	.0000	DN	-40	-27
1	01531500	TOW	1989-99	DNOx	MVUE	Y	-.0380	.0000	DN	-40	-27
1	01531500	TOW	1989-99	TP	MVUE	Y	-.0193	.0417	ns	-34	-1
1	01531500	TOW	1989-99	DP	MVUE	Y	-.0509	.0000	DN	-52	-32
1	01531500	TOW	1989-99	DIP	MVUE	Y	.0424	.0064	UP	14	123
1	01531500	TOW	1989-99	TOC	MVUE	Y	-.0024	.5485	ns	-11	6
1	01531500	TOW	1989-99	SED	MVUE	Y	.0286	.0520	ns	-1	89
2	01540500	DAN	1985-99	TN	MVUE	Y	-.0226	.0000	DN	-35	-22
2	01540500	DAN	1985-99	DN	MVUE	Y	-.0173	.0000	DN	-30	-15
2	01540500	DAN	1985-99	TON	MVUE	Y	-.0312	.0000	DN	-48	-24
2	01540500	DAN	1985-99	DON	MVUE	Y	-.0157	.0044	DN	-33	-7
2	01540500	DAN	1985-99	DNH_4	MVUE	Y	-.0510	.0000	DN	-62	-43
2	01540500	DAN	1985-99	TNH_4	MVUE	Y	-.0611	.0000	DN	-68	-49
2	01540500	DAN	1985-99	DKJD	MVUE	Y	-.0300	.0000	DN	-46	-25
2	01540500	DAN	1985-99	TKJD	MVUE	Y	-.0327	.0000	DN	-48	-27
2	01540500	DAN	1985-99	TNOx	MVUE	Y	-.0120	.0002	DN	-24	-8
2	01540500	DAN	1985-99	DNOx	MVUE	Y	-.0133	.0000	DN	-25	-10
2	01540500	DAN	1985-99	TP	MVUE	Y	-.0437	.0000	DN	-58	-36
2	01540500	DAN	1985-99	DP	MVUE	Y	-.0595	.0000	DN	-66	-51
2	01540500	DAN	1985-99	DIP	MVUE	Y	.0113	.2390	ns	-11	58
2	01540500	DAN	1985-99	TOC	MVUE	Y	-.0229	.0000	DN	-35	-23
2	01540500	DAN	1985-99	SED	MVUE	Y	-.0391	.0001	DN	-59	-25
3	01553500	LEW	1985-99	TN	MVUE	Y	-.0176	.0000	DN	-31	-15
3	01553500	LEW	1985-99	DN	MVUE	Y	-.0113	.0000	DN	-22	-9

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics							
										Magnitude	
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
3	01553500	LEW	1985-99	TON	MVUE	Y	-0.0326	0.0000	DN	-51	-23
3	01553500	LEW	1985-99	DON	MVUE	Y	-.0134	.0274	ns	-32	-2
3	01553500	LEW	1985-99	DNH_4	MVUE	Y	-.0230	.6002	ns	-45	-9
3	01553500	LEW	1985-99	TNH_4	MVUE	Y	-.0149	.0770	ns	-38	3
3	01553500	LEW	1985-99	DKJD	MVUE	Y	-.0093	.1406	ns	-28	5
3	01553500	LEW	1985-99	TKJD	MVUE	Y	-.0244	.0008	DN	-44	-14
3	01553500	LEW	1985-99	TNOx	MVUE	Y	-.0091	.0014	DN	-20	-5
3	01553500	LEW	1985-99	DNOx	MVUE	Y	-.0093	.0009	DN	-20	-6
3	01553500	LEW	1985-99	TP	MVUE	Y	-.0341	.0000	DN	-53	-23
3	01553500	LEW	1985-99	DP	MVUE	Y	-.0673	.0000	DN	-70	-56
3	01553500	LEW	1985-99	DIP	MVUE	Y	.0068	.5578	ns	-22	57
3	01553500	LEW	1985-99	TOC	MVUE	Y	-.0013	.7477	ns	-13	11
3	01553500	LEW	1985-99	SED	MVUE	Y	.0101	.3512	ns	-16	61
4	01567000	JUN	1985-99	TN	MVUE	Y	-.0129	.0000	DN	-23	-12
4	01567000	JUN	1985-99	DN	MVUE	Y	-.0079	.0001	DN	-16	-6
4	01567000	JUN	1985-99	TON	MVUE	Y	-.0279	.0000	DN	-44	-22
4	01567000	JUN	1985-99	DON	MVUE	Y	-.0101	.0223	ns	-25	-2
4	01567000	JUN	1985-99	DNH_4	MVUE	Y	-.0531	.0000	DN	-64	-43
4	01567000	JUN	1985-99	TNH_4	MVUE	Y	-.0439	.0000	DN	-59	-35
4	01567000	JUN	1985-99	DKJD	MVUE	Y	-.0136	.0029	DN	-29	-7
4	01567000	JUN	1985-99	TKJD	MVUE	Y	-.0274	.0000	DN	-44	-22
4	01567000	JUN	1985-99	TNOx	MVUE	Y	-.0078	.0003	DN	-17	-5
4	01567000	JUN	1985-99	DNOx	MVUE	Y	-.0061	.0047	DN	-14	-3
4	01567000	JUN	1985-99	TP	MVUE	Y	-.0500	.0000	DN	-61	-43
4	01567000	JUN	1985-99	DP	MVUE	Y	-.0395	.0000	DN	-54	-34
4	01567000	JUN	1985-99	DIP	MVUE	Y	.0141	.2313	ns	-13	76
4	01567000	JUN	1985-99	TOC	MVUE	Y	-.0244	.0000	DN	-39	-22
4	01567000	JUN	1985-99	SED	MVUE	Y	-.0350	.0004	DN	-56	-21
5	01570000	01570000	1989-99	TSS	MVUE	Y	-.0647	.3698	ns	-90	149
5	01570000	01570000	1989-99	TN	MVUE	Y	-.0246	.0000	DN	-30	-16
5	01570000	01570000	1989-99	TNH_4	MVUE	Y	-.0484	.4330	ns	-86	140
5	01570000	01570000	1989-99	DKJD	MVUE	Y	-.0757	.0000	DN	-66	-44

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics							
										Magnitude	
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
5	01570000	01570000	1989-99	TKJD	MVUE	Y	-0.0388	0.0053	DN	-52	-12
5	01570000	01570000	1989-99	TNOx	MVUE	Y	-.0058	.6061	ns	-27	21
5	01570000	01570000	1989-99	TP	MVUE	Y	-.1070	.0000	DN	-79	-55
5	01570000	01570000	1989-99	DP	MVUE	Y	-.1890	.0000	DN	-92	-81
5	01570000	01570000	1989-99	DIP	MVUE	Y	.0304	.2078	ns	-19	140
6	01576000	MAR	1987-99	TN	MVUE	Y	-.0200	.0000	DN	-29	-16
6	01576000	MAR	1987-99	DN	MVUE	Y	-.0095	.0030	DN	-19	-4
6	01576000	MAR	1987-99	TON	MVUE	Y	.0522	.0000	UP	59	145
6	01576000	MAR	1987-99	DON	MVUE	Y	.1212	.0000	UP	281	512
6	01576000	MAR	1987-99	DNH_4	MVUE	Y	-.0415	.0000	DN	-53	-28
6	01576000	MAR	1987-99	TNH_4	MVUE	Y	-.0370	.0000	DN	-50	-24
6	01576000	MAR	1987-99	DKJD	MVUE	Y	-.0086	.1948	ns	-24	6
6	01576000	MAR	1987-99	TKJD	MVUE	Y	-.0330	.0000	DN	-46	-22
6	01576000	MAR	1987-99	TNOx	MVUE	Y	-.0074	.0314	ns	-17	-1
6	01576000	MAR	1987-99	DNOx	MVUE	Y	-.0067	.0559	ns	-16	0
6	01576000	MAR	1987-99	TP	MVUE	Y	-.0292	.0001	DN	-43	-18
6	01576000	MAR	1987-99	DP	MVUE	Y	-.0332	.0000	DN	-45	-23
6	01576000	MAR	1987-99	DIP	MVUE	Y	.0964	.0000	UP	149	392
6	01576000	MAR	1987-99	TOC	MVUE	Y	-.0092	.0046	DN	-18	-4
6	01576000	MAR	1987-99	SED	MVUE	Y	-.0109	.2605	ns	-32	11
7	01576754	CON	1985-99	TN	MVUE	Y	-.0106	.0000	DN	-19	-10
7	01576754	CON	1985-99	DN	MVUE	Y	.0009	.6112	ns	-4	7
7	01576754	CON	1985-99	TON	MVUE	Y	-.0193	.0003	DN	-36	-13
7	01576754	CON	1985-99	DON	MVUE	Y	.0079	.1358	ns	-4	32
7	01576754	CON	1985-99	DNH_4	MVUE	Y	-.0817	.0000	DN	-76	-65
7	01576754	CON	1985-99	TNH_4	MVUE	Y	-.0815	.0000	DN	-76	-64
7	01576754	CON	1985-99	DKJD	MVUE	Y	-.0075	.1067	ns	-22	2
7	01576754	CON	1985-99	TKJD	MVUE	Y	-.0334	.0000	DN	-48	-30
7	01576754	CON	1985-99	TNOx	MVUE	Y	.0024	.3124	ns	-3	11
7	01576754	CON	1985-99	DNOx	MVUE	Y	.0014	.5508	ns	-5	10
7	01576754	CON	1985-99	TP	MVUE	Y	-.0247	.0000	DN	-41	-19
7	01576754	CON	1985-99	DP	MVUE	Y	-.0401	.0000	DN	-50	-40

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics							
										Magnitude	
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
7	01576754	CON	1985-99	DIP	MVUE	Y	-0.0387	0.0000	DN	-52	-35
7	01576754	CON	1985-99	TOC	MVUE	Y	-.0493	.0000	DN	-57	-47
7	01576754	CON	1985-99	SED	MVUE	Y	-.0418	.0000	DN	-58	-32
9	01491000	01491000	1985-99	TN	MVUE	Y	-.0065	.0138	DN	-16	-2
9	01491000	01491000	1985-99	DNH_4	MVUE	Y	-.0093	.3207	ns	-34	15
9	01491000	01491000	1985-99	DNO_3	MVUE	Y	-.0381	.0001	DN	-57	-25
9	01491000	01491000	1985-99	DKJD	MVUE	Y	-.0484	.0000	DN	-58	-44
9	01491000	01491000	1985-99	TKJD	MVUE	Y	-.0428	.0000	DN	-55	-39
9	01491000	01491000	1985-99	DNOx	MVUE	Y	.0154	.0000	UP	13	40
9	01491000	01491000	1985-99	TP	MVUE	Y	-.0152	.0406	DN	-36	-1
9	01491000	01491000	1985-99	DP	MVUE	Y	.0099	.1561	ns	-6	43
9	01491000	01491000	1985-99	DIP	MVUE	Y	.0026	.7875	ns	-22	39
9	01491000	01491000	1985-99	TOC	MVUE	Y	-.0009	.7785	ns	-10	8
9	01491000	01491000	1985-99	$DSiO_2$	MVUE	Y	.0022	.4979	ns	-6	14
9	01491000	01491000	1985-99	SED	MVUE	Y	-.0483	.0000	DN	-62	-38
8	01578310	01578310	1985-99	TN	MVUE	Y	-.0064	.0000	DN	-31	-17
8	01578310	01578310	1985-99	DNH_4	MVUE	Y	.0028	.0000	DN	-53	-24
8	01578310	01578310	1985-99	DNO_2	MVUE	Y	.0186	.0000	DN	-62	-35
8	01578310	01578310	1985-99	DKJD	MVUE	Y	-.0201	.0000	DN	-76	-66
8	01578310	01578310	1985-99	TKJD	MVUE	Y	-.0206	.0000	DN	-67	-54
8	01578310	01578310	1985-99	DNOx	MVUE	Y	.0063	.9765	ns	-10	11
8	01578310	01578310	1985-99	TP	MVUE	Y	-.0038	.0000	DN	-51	-24
8	01578310	01578310	1985-99	DP	MVUE	Y	-.0020	.4495	ns	-30	17
8	01578310	01578310	1985-99	DIP	MVUE	Y	.0039	.0029	DN	-60	-17
8	01578310	01578310	1985-99	TOC	MVUE	Y	-.0235	.3737	ns	-6	17
8	01578310	01578310	1985-99	$DSiO_2$	MVUE	Y	.0107	.0428	DN	-32	0
8	01578310	01578310	1985-99	SED	MVUE	Y	-.0876	.3297	ns	-21	8
12	01586000	NPA0165	1985-99	TSS	MVUE	Y	-.0396	.0123	DN	-65	-12
12	01586000	NPA0165	1985-99	TN	MVUE	Y	.0153	.0000	UP	16	37
12	01586000	NPA0165	1985-99	DNH_4	MVUE	Y	-.0650	.0000	DN	-75	-43
12	01586000	NPA0165	1985-99	DNO_3	MVUE	Y	.0222	.0000	UP	28	52
12	01586000	NPA0165	1985-99	TKJD	MVUE	Y	-.0467	.0000	DN	-62	-35

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics						Magnitude	
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
12	01586000	NPA0165	1985-99	TNOx	MVUE	Y	0.0111	0.0738	ns	-2	43
12	01586000	NPA0165	1985-99	TP	MVUE	Y	-.0688	.0000	DN	-77	-44
10	01592500	PXT0809	1985-99	TSS	MVUE	Y	.0419	.0010	UP	29	173
10	01592500	PXT0809	1985-99	TN	MVUE	Y	.0097	.0020	UP	5	27
10	01592500	PXT0809	1985-99	DNH_4	MVUE	Y	.0436	.0270	UP	7	246
10	01592500	PXT0809	1985-99	DNO_3	MVUE	Y	.0104	.0068	UP	4	31
10	01592500	PXT0809	1985-99	TKJD	MVUE	Y	.0016	.8166	ns	-17	27
10	01592500	PXT0809	1985-99	TNOx	MVUE	Y	.0243	.0007	UP	16	78
10	01592500	PXT0809	1985-99	TP	MVUE	Y	-.0049	.6506	ns	-33	29
11	01594440	01594440	1985-99	TN	MVUE	Y	-.0189	.0000	DN	-65	-58
11	01594440	01594440	1985-99	DNH_4	MVUE	Y	-.0343	.0000	DN	-84	-74
11	01594440	01594440	1985-99	DNO_2	MVUE	Y	-.0466	.0000	DN	-80	-65
11	01594440	01594440	1985-99	DKJD	MVUE	Y	-.0839	.0000	DN	-76	-68
11	01594440	01594440	1985-99	TKJD	MVUE	Y	-.0627	.0000	DN	-74	-66
11	01594440	01594440	1985-99	DNOx	MVUE	Y	-.0001	.0000	DN	-61	-52
11	01594440	01594440	1985-99	TP	MVUE	Y	-.0328	.0000	DN	-81	-71
11	01594440	01594440	1985-99	DP	MVUE	Y	-.0065	.0000	DN	-79	-68
11	01594440	01594440	1985-99	DIP	MVUE	Y	-.0365	.0000	DN	-71	-55
11	01594440	01594440	1985-99	TOC	MVUE	Y	.0032	.0000	DN	-29	-13
11	01594440	01594440	1985-99	$DSiO_2$	MVUE	Y	-.0130	.0532	ns	0	17
11	01594440	01594440	1985-99	SED	MVUE	Y	-.0052	.0000	DN	-75	-59
11	01594440	01594440	1985-99	TSS	MVUE	Y	-.0008	.9559	ns	-37	54
13	01599000	GEO0009	1985-99	TN	MVUE	Y	-.0254	.0000	DN	-42	-19
13	01599000	GEO0009	1985-99	DNH_4	MVUE	Y	-.1103	.0000	DN	-89	-68
13	01599000	GEO0009	1985-99	DNO_3	MVUE	Y	-.0132	.1372	ns	-38	8
13	01599000	GEO0009	1985-99	TKJD	MVUE	Y	-.0373	.0001	DN	-57	-25
13	01599000	GEO0009	1985-99	TNOx	MVUE	Y	-.0013	.9119	ns	-32	42
13	01599000	GEO0009	1985-99	TP	MVUE	Y	-.0528	.0003	DN	-70	-30
14	01601500	WIL0013	1985-99	TSS	MVUE	Y	-.0210	.2768	ns	-59	30
14	01601500	WIL0013	1985-99	TN	MVUE	Y	-.0382	.0000	DN	-53	-33
14	01601500	WIL0013	1985-99	DNH_4	MVUE	Y	-.0118	.4788	ns	-49	38
14	01601500	WIL0013	1985-99	DNO_3	MVUE	Y	-.0255	.0538	ns	-55	3

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

	Station			Statistics							
										Magnitude	
Site number	Flow	WQ	Parameter	POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
14	01601500	WIL0013	1985-99	TKJD	MVUE	Y	-0.0437	0.0001	DN	-63	-27
14	01601500	WIL0013	1985-99	TNOx	MVUE	Y	-.0812	.0000	DN	-79	-58
14	01601500	WIL0013	1985-99	TP	MVUE	Y	-.0196	.2115	ns	-53	19
15	01610000	POT2766	1985-99	TSS	MVUE	Y	-.0328	.0457	DN	-63	0
15	01610000	POT2766	1985-99	TN	MVUE	Y	-.0170	.0006	DN	-33	-10
15	01610000	POT2766	1985-99	DNH_4	MVUE	Y	-.0688	.0000	DN	-77	-46
15	01610000	POT2766	1985-99	TKJD	MVUE	Y	-.0372	.0000	DN	-55	-27
15	01610000	POT2766	1985-99	TNOx	MVUE	Y	-.0304	.0013	DN	-52	-16
15	01610000	POT2766	1985-99	TP	MVUE	Y	-.0478	.0000	DN	-65	-32
16	01613000	POT2386	1985-99	TSS	MVUE	Y	.0117	.4351	ns	-24	86
16	01613000	POT2386	1985-99	TN	MVUE	Y	-.0313	.0000	DN	-46	-27
16	01613000	POT2386	1985-99	DNH_4	MVUE	Y	-.0284	.0330	DN	-56	-3
16	01613000	POT2386	1985-99	DNO_3	MVUE	Y	-.0179	.0185	DN	-39	-4
16	01613000	POT2386	1985-99	TKJD	MVUE	Y	-.0433	.0000	DN	-58	-36
16	01613000	POT2386	1985-99	TNOx	MVUE	Y	-.0354	.0099	DN	-61	-12
16	01613000	POT2386	1985-99	TP	MVUE	Y	-.0431	.0014	DN	-65	-22
17	01614500	CON0180	1985-99	TSS	MVUE	Y	-.0135	.3721	ns	-48	28
17	01614500	CON0180	1985-99	TN	MVUE	Y	-.0214	.0000	DN	-34	-20
17	01614500	CON0180	1985-99	DNH_4	MVUE	Y	-.0587	.0007	DN	-75	-31
17	01614500	CON0180	1985-99	DNO_3	MVUE	Y	-.0119	.0002	DN	-24	-8
17	01614500	CON0180	1985-99	TKJD	MVUE	Y	-.0491	.0000	DN	-62	-39
17	01614500	CON0180	1985-99	TNOx	MVUE	Y	-.0457	.0000	DN	-59	-38
17	01614500	CON0180	1985-99	TP	MVUE	Y	-.0528	.0000	DN	-63	-45
19	01638500	POT1595	1985-99	TSS	MVUE	Y	-.0285	.0223	DN	-55	-6
19	01638500	POT1595	1985-99	TN	MVUE	Y	-.0211	.0000	DN	-35	-18
19	01638500	POT1595	1985-99	DNH_4	MVUE	Y	-.0548	.0002	DN	-71	-32
19	01638500	POT1595	1985-99	DNO_3	MVUE	Y	-.0075	.0735	ns	-21	1
19	01638500	POT1595	1985-99	TKJD	MVUE	Y	-.0369	.0000	DN	-56	-25
19	01638500	POT1595	1985-99	TNOx	MVUE	Y	-.0517	.0000	DN	-63	-42
19	01638500	POT1595	1985-99	TP	MVUE	Y	-.0449	.0000	DN	-60	-35
18	01643000	MON0155	1985-99	TSS	MVUE	Y	.0019	.8876	ns	-31	53
18	01643000	MON0155	1985-99	TN	MVUE	Y	-.0051	.1651	ns	-17	3

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics						Magnitude	
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
18	01643000	MON0155	1985-99	DNH_4	MVUE	Y	-0.1806	0.0000	DN	-96	-88
18	01643000	MON0155	1985-99	DNO_3	MVUE	Y	.0203	.0000	UP	20	53
18	01643000	MON0155	1985-99	TKJD	MVUE	Y	-.0349	.0000	DN	-52	-27
18	01643000	MON0155	1985-99	TNOx	MVUE	Y	-.0210	.0003	DN	-39	-13
18	01643000	MON0155	1985-99	TP	MVUE	Y	-.0048	.4756	ns	-24	14
22	01646580	PR01	1985-99	TN	MVUE	Y	-.0634	.0004	DN	-14	-4
22	01646580	PR01	1985-99	DNH_4	MVUE	Y	-.1072	.6522	ns	-13	26
22	01646580	PR01	1985-99	DNO_3	MVUE	Y	-.0883	.0528	ns	-1	77
22	01646580	PR01	1985-99	DKJD	MVUE	Y	-.0854	.0000	DN	-33	-18
22	01646580	PR01	1985-99	TKJD	MVUE	Y	-.0802	.0000	DN	-34	-19
22	01646580	PR01	1985-99	DNOx	MVUE	Y	-.0554	.0261	UP	1	19
22	01646580	PR01	1985-99	TP	MVUE	Y	-.0969	.3933	ns	-17	8
22	01646580	PR01	1985-99	DP	MVUE	Y	-.0910	.7231	ns	-18	15
22	01646580	PR01	1985-99	DIP	MVUE	Y	-.0682	.5071	ns	-11	26
22	01646580	PR01	1985-99	TOC	MVUE	Y	-.0162	.0000	DN	-39	-19
22	01646580	PR01	1985-99	$DSiO_2$	MVUE	Y	.0052	.1724	ns	-7	48
22	01646580	PR01	1985-99	SED	MVUE	Y	-.0753	.0000	DN	-81	-61
20	01631000	1BSSF003.56	1985-99	TSS	MVUE	Y	-.0467	.0058	DN	-69	-16
20	01631000	1BSSF003.56	1985-99	TN	MVUE	Y	-.0213	.0103	DN	-42	-7
20	01631000	1BSSF003.56	1985-99	TNH_4	MVUE	Y	-.0617	.0000	—	—	—
20	01631000	1BSSF003.56	1985-99	DNO_3	MVUE	Y	-.0165	.0981	ns	-41	5
20	01631000	1BSSF003.56	1985-99	TNO_3	MVUE	Y	-.0061	.4261	ns	-27	15
20	01631000	1BSSF003.56	1985-99	TKJD	MVUE	Y	-.0293	.0002	DN	-48	-18
20	01631000	1BSSF003.56	1985-99	TNOx	MVUE	Y	-.0128	.2929	ns	-43	21
20	01631000	1BSSF003.56	1985-99	TP	MVUE	Y	-.0148	.0479	DN	-35	0
21	01634000	1BNFS01.34	1985-99	TSS	MVUE	Y	-.0206	.0840	ns	-47	5
21	01634000	1BNFS01.34	1985-99	TN	MVUE	Y	.0206	.0310	UP	1	79
21	01634000	1BNFS01.34	1985-99	TNH_4	MVUE	Y	-.0605	.0000	—	—	—
21	01634000	1BNFS01.34	1985-99	DNO_3	MVUE	Y	.0517	.0000	UP	51	196
21	01634000	1BNFS01.34	1985-99	TNO_3	MVUE	Y	.0537	.0000	UP	54	207
21	01634000	1BNFS01.34	1985-99	TKJD	MVUE	Y	-.0047	.5940	ns	-28	21
21	01634000	1BNFS01.34	1985-99	TNOx	MVUE	Y	.0498	.0004	UP	36	212

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics						Magnitude	
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
21	01634000	1BNFS01.34	1985-99	TP	MVUE	Y	0.0313	0.0011	UP	18	109
23	01666500	3-ROB001.90	1985-99	TSS	MVUE	Y	.0140	.3436	ns	-22	92
23	01666500	3-ROB001.90	1985-99	TN	MVUE	Y	-.0152	.0014	—	—	—
23	01666500	3-ROB001.90	1985-99	TNH_4	MVUE	Y	-.0468	.0000	—	—	—
23	01666500	3-ROB001.90	1985-99	DNO_3	MVUE	Y	-.0266	.0002	DN	-45	-17
23	01666500	3-ROB001.90	1985-99	TNO_3	MVUE	Y	-.0286	.0000	DN	-44	-22
23	01666500	3-ROB001.90	1985-99	TKJD	MVUE	Y	-.0039	.7051	ns	-31	29
23	01666500	3-ROB001.90	1985-99	TNOx	MVUE	Y	-.0228	.0092	—	—	—
23	01666500	3-ROB001.90	1985-99	TP	MVUE	Y	-.0284	.0172	DN	-54	-4
24	01668000	01668000	1988-99	TSS	MVUE	Y	-.0336	.0409	DN	-53	-1
24	01668000	01668000	1988-99	TN	MVUE	Y	-.0174	.0041	DN	-29	-6
24	01668000	01668000	1988-99	DNOx	MVUE	Y	-.0242	.0345	DN	-41	-2
24	01668000	01668000	1988-99	TP	MVUE	Y	-.0449	.0000	DN	-53	-25
24	01668000	01668000	1988-99	DIP	MVUE	Y	-.0133	.1333	ns	-30	5
26	01671020	8-NAR005.42	1985-99	TSS	MVUE	Y	-.0007	.9516	—	—	—
26	01671020	8-NAR005.42	1985-99	TN	MVUE	Y	.0254	.0266	—	—	—
26	01671020	8-NAR005.42	1985-99	TNH_4	MVUE	Y	-.0584	.0000	—	—	—
26	01671020	8-NAR005.42	1985-99	DNO_3	MVUE	Y	-.0016	.8256	ns	-21	20
26	01671020	8-NAR005.42	1985-99	TNO_3	MVUE	Y	-.0076	.3963	ns	-31	17
26	01671020	8-NAR005.42	1985-99	TKJD	MVUE	Y	.0073	.2369	ns	-7	33
26	01671020	8-NAR005.42	1985-99	TNOx	MVUE	Y	-.0020	.8997	—	—	—
26	01671020	8-NAR005.42	1985-99	TP	MVUE	Y	-.1276	.0000	DN	-89	-78
25	01673000	01673000	1989-99	TSS	MVUE	Y	.0191	.1847	ns	-10	65
25	01673000	01673000	1989-99	TN	MVUE	Y	.0094	.0327	UP	1	21
25	01673000	01673000	1989-99	DNOx	MVUE	Y	.0260	.0000	UP	15	50
25	01673000	01673000	1989-99	TP	MVUE	Y	.0172	.0313	UP	2	41
25	01673000	01673000	1989-99	DIP	MVUE	Y	.0638	.0000	UP	67	129
27	01674500	01674500	1990-99	TSS	MVUE	Y	-.0004	.9695	ns	-23	29
27	01674500	01674500	1990-99	TN	MVUE	Y	-.0203	.0000	DN	-25	-12
27	01674500	01674500	1990-99	DNOx	MVUE	Y	-.0314	.0002	DN	-38	-14
27	01674500	01674500	1990-99	TP	MVUE	Y	-.0291	.0000	DN	-34	-16
27	01674500	01674500	1990-99	DIP	MVUE	Y	.0137	.0677	ns	-2	34

Appendix 3. *Trends in flow-adjusted concentration data for 9 River Input Monitoring Program sites and 22 Multi-Agency Nontidal Program sites in the Chesapeake Bay Watershed—Continued*

Site number	Station		Parameter	Statistics						Magnitude	
	Flow	WQ		POR	Test	Log transform	Slope	p-value	Trend direction	Minimum	Maximum
28	02026000	2-JMS229.14	1985-99	TSS	MVUE	Y	0.0522	0.0188	UP	6	213
28	02026000	2-JMS229.14	1985-99	TN	MVUE	Y	-.0125	.1763	ns	-35	8
28	02026000	2-JMS229.14	1985-99	TNH_4	MVUE	Y	-.0678	.0000	—	—	—
28	02026000	2-JMS229.14	1985-99	DNO_3	MVUE	Y	-.0344	.0140	DN	-51	-7
28	02026000	2-JMS229.14	1985-99	TNO_3	MVUE	Y	-.0683	.0000	DN	-72	-49
28	02026000	2-JMS229.14	1985-99	TKJD	MVUE	Y	.0371	.0001	UP	24	90
28	02026000	2-JMS229.14	1985-99	TNOx	MVUE	Y	-.0872	.0000	DN	-82	-55
28	02026000	2-JMS229.14	1985-99	TP	MVUE	Y	-.0783	.0000	DN	-76	-55
29	02029000	2-JMS189.31	1985-99	TSS	MVUE	Y	-.0041	.6899	ns	-30	27
29	02029000	2-JMS189.31	1985-99	TN	MVUE	Y	-.0138	.0503	ns	-33	0
29	02029000	2-JMS189.31	1985-99	TNH_4	MVUE	Y	-.0649	.0000	DN	-65	-57
29	02029000	2-JMS189.31	1985-99	DNO_3	MVUE	Y	-.0435	.0003	DN	-62	-25
29	02029000	2-JMS189.31	1985-99	TNO3	MVUE	Y	-.0435	.0003	DN	-62	-25
29	02029000	2-JMS189.31	1985-99	TKJD	MVUE	Y	.0103	.2020	ns	-8	47
29	02029000	2-JMS189.31	1985-99	TNOx	MVUE	Y	-.0384	.0005	DN	-58	-22
29	02029000	2-JMS189.31	1985-99	TP	MVUE	Y	-.0463	.0000	DN	-59	-35
30	02035000	02035000	1989-99	TSS	MVUE	Y	-.0275	.0139	DN	-43	-6
30	02035000	02035000	1989-99	TN	MVUE	Y	-.0177	.0010	DN	-28	-8
30	02035000	02035000	1989-99	DNOx	MVUE	Y	-.0403	.0000	DN	-47	-26
30	02035000	02035000	1989-99	TP	MVUE	Y	-.0671	.0000	DN	-62	-44
30	02035000	02035000	1989-99	DIP	MVUE	Y	-.0963	.0000	DN	-73	-60
31	02041650	02041650	1989-99	TSS	MVUE	Y	.0102	.2572	ns	-8	34
31	02041650	02041650	1989-99	TN	MVUE	Y	-.0102	.0183	DN	-18	-2
31	02041650	02041650	1989-99	DNOx	MVUE	Y	-.0230	.0204	DN	-36	-4
31	02041650	02041650	1989-99	TP	MVUE	Y	-.0086	.2226	ns	-21	6
31	02041650	02041650	1989-99	DIP	MVUE	Y	-.0049	.5599	ns	-20	13