

Prepared in cooperation with the City of Kansas City, Missouri, Water Services Department

Character and Trends of Water Quality in the Blue River Basin, Kansas City Metropolitan Area, Missouri and Kansas, 1998 through 2007



Scientific Investigations Report 2009–5169

Cover photograph. Brush Creek community rain garden in Kansas City, Missouri adjacent to site 16 (photograph by Donald H. Wilkison, U.S. Geological Survey).

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By Donald H. Wilkison, Daniel J. Armstrong, and Sarah A. Hampton

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Conversion Factors, Abbreviations, and Datums

Multiply	By	To obtain
Flow rate		
cubic foot per second (ft ³ /s)	0.02832	cubic meter per second (m ³ /s)
Length		
centimeter (cm)	0.3937	inch (in.)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
Area		
square kilometer (km ²)	247.1	acre
square kilometer (km ²)	0.3861	square mile (mi ²)
Volume		
liter (L)	0.2642	gallon (gal)
Mass		
gram (g)	0.03527	ounce, avoirdupois (oz)
kilogram (kg)	2.205	pound avoirdupois (lb)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:

$$^{\circ}\text{F}=(1.8\times^{\circ}\text{C})+32$$

Vertical coordinate information is referenced to North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to North American Datum of 1983 (NAD 83).

Specific conductance is given in microsiemens per centimeter at 25 degrees Celsius (µS/cm at 25 °C).

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or micrograms per liter (µg/L).

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Abstract

Water-quality and ecological character and trends in the metropolitan Blue River Basin were evaluated from 1998 through 2007 to provide spatial and temporal resolution to factors that affect the quality of water and biota in the basin and provide a basis for assessing the efficacy of long-term combined sewer control and basin management plans. Assessments included measurements of stream discharge, pH, dissolved oxygen, specific conductance, turbidity, nutrients (dissolved and total nitrogen and phosphorus species), fecal-indicator bacteria (*Escherichia coli* and fecal coliform), suspended sediment, organic wastewater and pharmaceutical compounds, and sources of these compounds as well as the quality of stream biota in the basin.

Because of the nature and myriad of factors that affect basin water quality, multiple strategies are needed to decrease constituent loads in streams. Strategies designed to decrease or eliminate combined sewer overflows (CSOs) would substantially reduce the annual loads of nutrients and fecal-indicator bacteria in Brush Creek, but have little effect on Blue River loadings. Nonpoint source reductions to Brush Creek could potentially have an equivalent, if not greater, effect on water quality than would CSO reductions. Nonpoint source reductions could also substantially decrease annual nutrient and bacteria loadings to the Blue River and Indian Creek. Methods designed to decrease nutrient loads originating from Blue River and Indian Creek wastewater treatment plants (WWTPs) could substantially reduce the overall nutrient load in these streams.

For the main stem of the Blue River and Indian Creek, primary sources of nutrients were nonpoint source runoff and WWTPs discharges; however, the relative contribution of each source varied depending on how wet or dry the year was and the number of upstream WWTPs. On Brush Creek, approximately two-thirds of the nutrients originated from nonpoint sources and the remainder from CSOs. Nutrient assimilation processes, which reduced total nitrogen loads by approximately 13 percent and total phosphorus loads by double that amount in a 20-kilometer reach of the Blue River

during three synoptic base-flow sampling events between August through September 2004 and September 2005, likely are limited to selected periods during any given year and may not substantially reduce annual nutrient loads.

Bacteria densities typically increased with increasing urbanization, and bacteria loadings to the Blue River and Indian Creek were almost entirely the result of nonpoint source runoff. WWTPs contributed, on average, less than 1 percent of the bacteria to these reaches, and in areas of the Blue River that had combined sewers, CSOs contributed only minor amounts (less than 2 percent) of the total annual load in 2005. The bulk of the fecal-indicator bacteria load in Brush Creek also originated from nonpoint sources with the remainder from CSOs. From October 2002 through September 2007, estimated daily mean *Escherichia coli* bacteria density in upper reaches of the Blue River met the State of Missouri secondary contact criterion standard approximately 85 percent of the time. However, in lower Blue River reaches, the same threshold was exceeded approximately 45 percent of the time.

The tributary with the greatest number of CSO discharge points, Brush Creek, contributed approximately 10 percent of the bacteria loads to downstream reaches. The tributary Town Fork Creek had median base-flow *Escherichia coli* densities that were double that of other basin sites and stormflow densities 10 times greater than those in other parts of the basin largely because approximately one-fourth of the runoff in the Town Fork Creek Basin is believed to originate in combined sewers. Genotypic source typing of bacteria indicated that more than half of the bacteria in this tributary originated from human sources with two storms contributing the bulk of all bacteria sourced as human. However, areas outside of the combined sewer system also contributed substantially to elevated bacteria densities in basin streams.

From 1998 through 2007, flow-adjusted concentration trends at six sites in the basin were determined for as many as 22 constituents using fitted linear regression models that included concentration, flow, time, and in some cases, yearly or seasonal terms. Flow-adjusted concentration trends were not significant for approximately two-thirds of the constituents indicating that, in general, basin-level changes did not affect many constituent concentrations from 1998 through

2007. Where statistically significant flow-adjusted trends were detected, most (88 percent) were declines. Trend declines occurred primarily in flow-adjusted suspended sediment concentrations and water-quality constituents that have strong associations with suspended sediment. Flow-adjusted concentration declines may be related to a number of measures implemented in the basin since 1998 that were designed to control erosion and reduce sediment in runoff.

Nutrient and organic wastewater compound loads in the effluent-dominated Blue River were on average about 20 times greater than for the CSO-dominated Brush Creek. Seasonally, the largest contributions of nutrients, caffeine, n,n-diethyl-meta-toluamide (DEET), sterol (cholesterol plus coprostanol), and triclosan occurred between March to August, in part, because this mirrored the basin precipitation pattern and runoff was a primary component of loads. In effluent-dominated stream reaches of the Blue River and Indian Creek, reductions in WWTP removal efficiencies from December to February likely resulted in increased contributions during winter months, and increased biogeochemical activity during the summer resulted in increased efficiencies and proportionally smaller contributions. Peaks in DEET loads corresponded to the period (June to August) when expected use would be the highest.

Biological assessments included measurements of macroinvertebrate community diversity and abundance, habitat assessments, and toxicity evaluations. The diversity of benthic aquatic communities in the upper Blue River stream reaches was similar to sites in adjacent Johnson County, Kansas, which were least impacted by human disturbance. However, no stream reaches in the Blue River Basin or the outside control site met the criteria for full support of aquatic life from 2002 to 2007. Sites in lower basin reaches had the least diversity, the largest percentage of pollution tolerant organisms, and were considered nonsupportive of biologic life. Declines in aquatic community and health followed a pattern of increasing urbanization and, in general, these trends were reflected by similar declines in stream physical habitat quality. Channel modifications and riparian habitat loss accounted for the greatest difference between physical habitat scores at sites. Low-head dams in Brush Creek reduced stream circulation, increased sediment accumulation, and resulted in significantly lower median monthly dissolved-oxygen concentrations in Brush Creek than on the Blue River. Sediment trapping in Brush Creek impoundments likely resulted in median monthly turbidity values on the Blue River being approximately twice that of those measured in Brush Creek. The median monthly specific conductance on the Blue River was double that of Brush Creek because treated effluent comprised a large percentage of the flow in the Blue River and increased impervious cover in Brush Creek resulted in reduced infiltration and greater runoff. Large spikes in specific conductance values followed the application of road deicers and subsequent runoff events.

Introduction

Kansas City, Missouri, is 1 of approximately 750 municipalities in the United States with a combined storm and sanitary sewer system (CSS) and is preparing plans for the long-term control of sewage discharges from the system into receiving waters (U.S. Environmental Protection Agency, 1999). Control plans provide strategies for reduction in the frequency and volume of these discharges, termed combined sewer overflows (CSOs), into receiving streams, provide data on the current (2009) status of the system, and provide information on the expected benefits from system alterations (City of Kansas City, Missouri, 2008). Also, CSO receiving streams may frequently receive inputs from a variety of other sources that have the potential to degrade water quality.

Streams in the largely urban basin receive inputs from a variety of sources including, and most predominantly, nonpoint-source runoff, CSOs, and discharges from wastewater treatment plants (WWTPs). These sources overlap in many parts of the basin, which compounds the deleterious water-quality effects of individual inputs. Channel modifications designed to convey floodwaters have resulted in the loss of riparian and instream habitat, altered hydrologic regimes, and degraded stream ecological quality (Wilkison and others, 2006).

To better understand factors that affect the water quality of receiving streams in the CSS area of Kansas City, Missouri, the U.S. Geological Survey (USGS) in cooperation with the city of Kansas City, Missouri, Water Services Department initiated studies designed to characterize water quality from a basinwide perspective, identify sources of selected constituents in the basin, and evaluate trends in selected water-quality physical properties and constituents (Wilkison and others, 2002; 2005; 2006).

Background

Approximately 20 percent [67 square kilometers (km²)] of Kansas City, Missouri, is served by a CSS. All but 3 percent of the CSS area is located south of the Missouri River, with approximately two-thirds of the CSS situated in the Blue River Basin. The remaining area of the city (approximately 680 km²) is served by separate storm and sanitary sewer systems. Unlike a separate sanitary system, CSSs are designed to carry wastewater and storm runoff and are designed to function differently during dry and wet weather conditions.

In dry weather, a CSS is designed to operate exactly like a separate system and convey sewage from homes, businesses, and industry to a WWTP for treatment. After undergoing treatment, the water is discharged to a receiving stream in accordance with applicable water-quality standards.

During wet weather, the CSS carries part of the stormwater runoff and sewage to the WWTP where the combination is treated and discharged. If the storm runoff and sewage

volume exceed pipe or treatment-plant capacities, the excess is diverted into receiving streams. All of this excess flow, a mixture of stormwater and sewage—regardless of the relative ratio of the two components, is considered to be part of the CSO. There are approximately 160 diversion structures that drain to 100 stream outfall points in Kansas City, Missouri. Approximately 90 percent of these outfalls are located in the Blue River Basin (City of Kansas City, Missouri, 2008).

Long-term control plans are designed to implement strategies that will reduce the volume and frequency of these events in order to comply with Federal clean water statutes and applicable water-quality standards (U.S. Environmental Protection Agency, 1994; Missouri Department of Natural Resources, 2007). Previous work (Wilkison and others, 2002; 2005; 2006) has demonstrated that the combination of many urban-related factors, including inputs from CSOs, have produced deleterious effects on water quality in many stream reaches in the Blue River Basin.

Purpose and Scope

The purpose of this report is to characterize stream-water quality from a basin perspective; identify sources of selected constituents in the Blue River Basin, including portions of Kansas City, Missouri, that receive urban nonpoint runoff, CSOs, and treated wastewater effluent; and identify trends and patterns in stream-water and biological quality in the basin. This includes summaries of continuous pH, water temperature, specific conductance, dissolved oxygen, and turbidity measurements recorded from July 1998 through December 2007. Also included are results from discrete water samples collected from August 2004 through December 2007. These samples, collected during both base-flow and stormflow conditions, provided data for total and dissolved nutrients, fecal-indicator bacteria, suspended sediment, organic wastewater compounds, and selected over-the-counter and prescription drugs. Genotypic microbial source-tracking results also are presented for stream samples collected from February 2002 through August 2007. Data from this report, together with previously published work (Wilkison and others, 2002; 2005; 2006) are used to develop trend and load estimation models for a selected number of constituents at basin sites from 1998 through 2007. Measurements of aquatic macroinvertebrate community diversity and abundance are presented for 2002 through 2007, along with stream habitat assessments and toxicity screenings of stream-water and bottom sediment samples. The results presented may be used to better understand the relative contribution of point and nonpoint sources to stream contaminants, to better understand the role that season and stream discharge have in determining concentration and load patterns and how those patterns change with time, and to provide a baseline for evaluating the effectiveness of long-term CSO control and basin management plans to meet water-quality standards and protect designated stream uses.

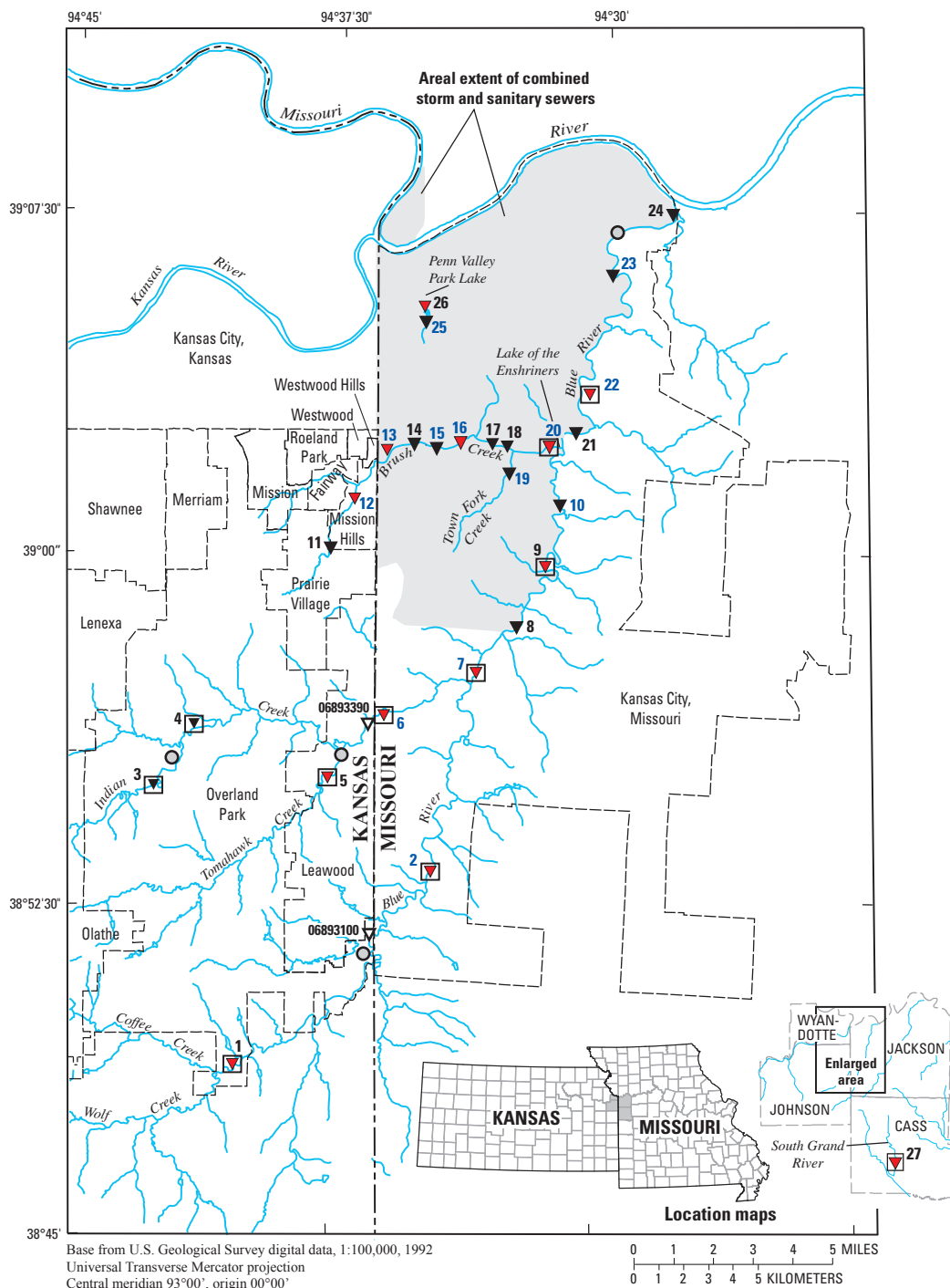
Study Area Description

The study area includes 24 surface-water sampling sites in the Blue River Basin and primarily encompasses reaches of the Blue River, Brush Creek, Indian Creek, and Town Fork Creek (fig. 1). These data were supplemented by data from two additional sites in the basin sampled as part of other studies (Poulton and others, 2007; Rasmussen and others, 2008). The Blue River Basin encompasses 725 km² and about one-half of the Kansas City metropolitan area south of the Missouri River (fig. 2). The interjurisdictional basin extends through 2 states (Missouri and Kansas), 4 counties (Johnson and Wyandotte in Kansas; Jackson and Cass in Missouri), and 11 municipalities. Fifty-four percent of the basin is located in Kansas and 46 percent in Missouri. Data for additional sites that also may receive CSOs including George Washington Lake in Penn Valley Park (hereafter referred to in this report as Penn Valley Lake; fig. 1, site 26) and the unnamed tributary to this lake (site 25) also were sampled as part of this study. One stream site in the basin, Tomahawk Creek (site 5), and one outside the basin, South Grand River near Freeman (site 27), were sampled as control sites for aquatic biota measurements. A control site was chosen because it was an urban site without apparent wastewater sources (site 5) or it was a nonurban site within the same ecoregion (site 27).

Previous Studies

Streamflow measurement began in the basin in 1939 at site 7 (Blue River near Kansas City, Missouri; fig. 1) and continues through the present (2009). Previous studies (Becker, 1990; Becker and others, 1983; Blevins, 1986; Wilkison and others, 2002; 2005; Lee and others, 2005; Rasmussen and others, 2008) have established other gages throughout the basin, many of which are still in use today and were part of this study. Streamflow and continuous water-quality data are published annually in reports by the U.S. Geological Survey (2007; 2008a) and current and historical data are made available online (U.S. Geological Survey, 2009a; 2009b).

Blevins (1986) examined stream reaches in lower Brush Creek and the middle and lower Blue River and determined that CSOs occasionally degraded stream water quality, especially in small storms that followed dry, antecedent conditions. This work was conducted prior to a number of channel modifications that were implemented around 1996 along Brush Creek and the lower Blue River to mitigate the effects of large floods in the basin (Hauth and others, 1981; Becker and others, 1983; U.S. Army Corps of Engineers, 2008). The effects of wastewater contaminant loadings were characterized for selected stream reaches in the CSS area (fig. 1) from 1998 to 2000 (Wilkison and others, 2002). This work focused on stream reaches in the CSS area and identified those most affected by the discharge of wastewater-related compounds. The most intensely developed parts of the CSS area were the most affected, and impounded reaches of Brush Creek were



EXPLANATION

- 1▼ **Water-quality sampling site and number**—Blue number indicates stormwater sampling site. Open triangle, sites 06893100 and 06893390, from concurrent studies (Poulton and others, 2007; Rasmussen and others, 2008)
- 14▼ **Water-quality and bottom sediment sampling site and number**—Blue number indicates stormwater sampling site
- **Biologic sampling site**
- **Wastewater-treatment plant**

Figure 1. Location of study area, sampling sites, wastewater-treatment plants, and area of combined storm and sanitary sewers.

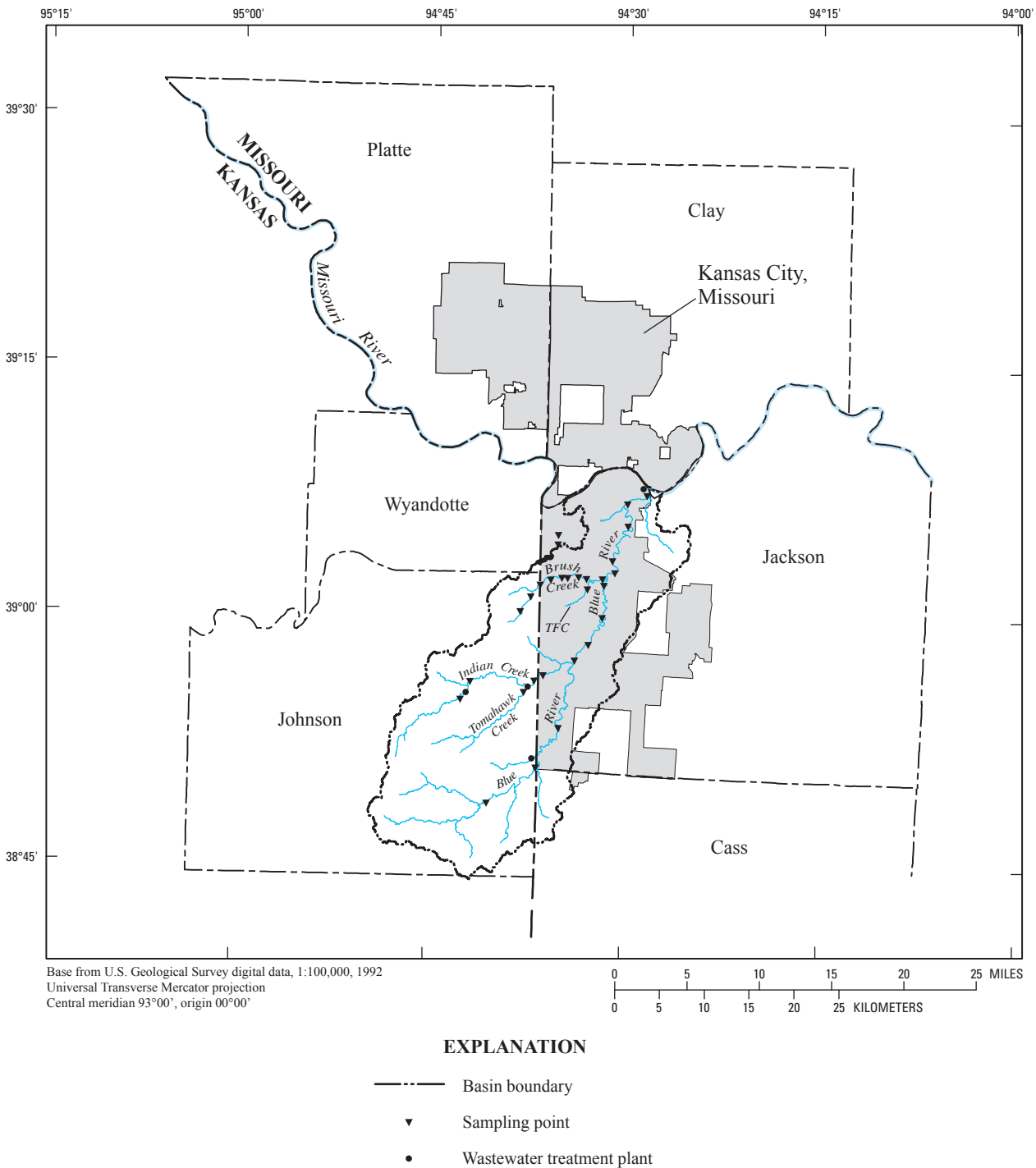


Figure 2. Location of Blue River Basin in relation to Kansas City, Missouri, municipal area.

shown to trap and limit the downstream movement of sediment and associated contaminants. Based upon those results, a basin-wide approach was undertaken to characterize the water-quality data from a larger perspective than just the CSS area (Wilkison and others, 2005; 2006) and to evaluate the quality of aquatic benthic biota in the basin. These studies indicated that approximately 60 percent of the nutrients

(nitrogen and phosphorus) in the middle and lower Blue River originated from the Indian Creek tributary, smaller amounts (16 to 28 percent) from the upper Blue River, and less than 5 percent from Brush Creek. Bacteria were largely the result of nonpoint-source contributions during storms, although sewage originating from CSOs was estimated to contribute as much as 40 percent of the bacteria load in selected reaches. Presump-

tive sources of *Escherichia coli* (*E. coli*) were largely attributable to domestic pets and humans (about one-half to three-fourths of the total), with lesser contributions from waterfowl and unknown sources. Declines in macroinvertebrate abundance and diversity were correlated with several, interrelated urbanization factors including percent impervious cover, nutrient enrichment, and the prevalence of organic wastewater compounds and pharmaceuticals (Wilkison and others, 2006).

Additional work conducted in Johnson County, Kansas, included evaluations of the headwater reaches of the Blue River (upstream from site 2) and middle portions of Indian Creek upstream from site 6. Lee and others (2005) used a variety of analyses, including fecal-indicator bacteria, nutrients, metals, organic wastewater and pharmaceutical compounds, and pesticides in water and sediments to examine the role of point and nonpoint-source contributions on stream water quality. These data indicated that during base-flow conditions, WWTPs contributed the bulk of the flow, nutrients, organic wastewater compounds, and pharmaceuticals to downstream reaches, but did not substantially contribute bacteria. Consequently, concentrations of suspended sediment and indicator bacteria were much larger in stormflow. Poulton and others (2007) evaluated the biological condition of streams in Johnson County and determined that upstream Blue River sites were among the least impacted streams in the county, whereas middle and downstream reaches of Indian and Tomahawk Creek, the Blue River, and Brush Creek were the most affected by human disturbance. More recently, Rasmussen and others (2008) estimated constituent concentrations, loads, and yields in relation to various basin characteristics in Johnson County streams, including the upper Blue River and lower Indian Creek. Increased yields of sediment, chloride, and indicator bacteria in streams were positively correlated with increased urban density and impervious cover. Large storm events were responsible for most (greater than 97 percent) of the annual bacteria load in 2005 and 2006, and the majority of this was attributable to nonpoint-source runoff. WWTP discharge contributed substantial portions (from 66 to more than 90 percent) of the downstream nutrient loads in Indian Creek and notable amounts (from 25 to 70 percent) to downstream Blue River reaches.

Methods

A network of 27 water-quality and streamflow sites was established in the basin (table 1) as part of this study and designed to complement and utilize existing gages whenever possible. Water-quality and streamflow data were collected from July 1998 through December 2007 (Wilkison and others, 2002; 2005; 2006). Data included instantaneous and continuous streamflow; discrete and continuous water-quality properties; discrete water samples analyzed for nutrients, organic wastewater and pharmaceutical compounds, fecal-indicator bacteria and bacteria sources, and suspended sediment in base-

flow and stormflow samples; assessments of aquatic macroinvertebrates and stream habitat; and toxicity screening (table 1).

Sampling and Laboratory Protocols

Sampling sites generally were selected to provide a comprehensive assessment of the effects of point and nonpoint sources within the basin, to identify water-quality trends, and to assess the biologic integrity of selected stream reaches within the Blue River Basin and the factors that might be affecting stream biota. Locations were based upon a variety of factors including accessibility, security, geographic location, and proximity to tributaries, CSS areas, or WWTPs (table 2). Samples were collected during base-flow (defined as streamflow unaffected by runoff) and stormflow events. Descriptions of the streamflow and water-quality sampling methods employed in this study have been previously described in considerable detail (Wilkison and others, 2002; 2005; 2006). A summary description follows.

Streamflow was determined by discharge measurements made at the time of sample collection or from established stage-discharge relations (ratings) using USGS procedures outlined by Rantz and others, (1982a; 1982b) and Simpson (2001). Ratings were periodically updated throughout the course of the study as additional measurements and analysis of the stage-discharge relations warranted. Daily mean streamflow and water-quality data were published annually (Hauck and Nagel, 2000; 2001; 2002; 2003; 2004; Hauck and Harris, 2005; U.S. Geological Survey, 2007; 2008a) or in previous reports (Wilkison and others, 2002; 2005; 2006) and are available in the USGS National Water Information System (U.S. Geological Survey, 2009a; 2009b).

Physical properties, including pH, water temperature, specific conductance, dissolved oxygen, and turbidity were measured continuously (15-minute intervals) at a site on the main stem of the Blue River (site 7) and at one site on the tributary Brush Creek (site 16) from early spring to late fall (generally the first of April to the beginning of December each year) using multiparameter probes designed for continuous instream measurement. Data were not collected during winter months because of the potential for probe freezing and instrument damage.

All water-quality samples were collected and processed using protocols designed to prevent contamination. Collection and processing equipment were comprised of inert materials—glass, fluorocarbon polymer, or stainless steel (Lane and others, 2003; Wilde, 2004; 2005; Wilde and others, 2004). Base-flow samples were depth- and width-integrated across streams unless depth or width limitations necessitated the collection of grab samples from the centroid of flow (U.S. Geological Survey, 2006). Stormflow samples were collected using automatic samplers programmed by a remote data logger to collect flow-weighted samples after minimum stage thresholds were exceeded. Sample programs were based on the shape and duration of precipitation events expected to be of

Table 1. Location of sample sites and type of water-quality and streamflow data collected from 1998 through 2007.

[fig., figure; ID, identification number; BQW, base-flow water quality; SQW, stormflow water quality; CQW, continuous water quality; MST, microbial source-tracking; IQW, benthic macroinvertebrates; HABI-TAT, stream physical habitat; TOX, toxicity; QI, instantaneous discharge; QC, continuous discharge; --, no data or not applicable]

Site number (fig. 1)	Station name	Station ID	Latitude/ Longitude	Water-quality data							Stream-flow		Bottom sediment
				BQW	SQW	CQW	MST	IQW	HABI-TAT	TOX	QI	QC	
1	Blue River near Stanley, Kansas	06893080	384845/0944031	X	X	--	--	X	X	X	--	X	X
2	Blue River at Blue Ridge Boulevard Extension, Kansas City, Missouri	06893150	385324/0943452	X ¹	X	--	X	X	X	X	--	X	X
3	Indian Creek at 69 Highway, Overland Park, Kansas	06893270	385513/0944216	X	--	--	--	X	X	--	X	--	--
4	Indian Creek at Farley, Overland Park, Kansas	06893280	385600/0944139	X	--	--	--	X	X	--	X	--	--
5	Tomahawk Creek near 111th Street, Johnson County, Kansas	385539094372100	385539/0943721	X	--	--	--	X	X	X	X	--	X
6	Indian Creek at 103rd Street, Kansas City, Missouri	06893400	385631/0943616	X ¹	X	--	X	X	X	X	--	X	X
7	Blue River near Kansas City, Missouri	06893500	385726/0943331	X ¹	X	X	X	X	X	X	--	X	X
8	Blue River at Prospect, Kansas City, Missouri	385818094325301	385818/0943253	X ¹	--	--	--	--	--	--	--	--	--
9	Blue River near Gregory Boulevard, Kansas City, Missouri	06893520	385958/0943139	X ¹	--	--	--	X ²	X ²	X	X	--	--
10	Blue River at Blue Parkway, Kansas City, Missouri	06893552	390206/0943136	X	X	--	--	--	--	--	X	--	X
11	Brush Creek at Mission, Johnson County, Kansas	390109094370301	390109/0943703	X ¹	--	--	--	--	--	--	X	--	--
12	Brush Creek at Belinder Avenue, Johnson County, Kansas	390127094365800	390127/0943658	X	X	--	--	--	--	X	X	--	X
13	Brush Creek at Ward Parkway, Kansas City, Missouri	06893557	390159/0943619	X ¹	X	--	X	--	--	X	--	X	X
14	Brush Creek at Summit Avenue, Kansas City, Missouri	06893558	390220/0943555	X ¹	--	--	--	--	--	--	X	--	--
15	Brush Creek at Kansas City, Missouri	06893560	390222/0943504	X ¹	X	--	X	--	--	--	--	X	--
16	Brush Creek at Rockhill Road, Kansas City, Missouri	06893562	390221/0943443	X ¹	X	X	X	--	--	X	--	X	X
17	Brush Creek at Woodland Avenue, Kansas City, Missouri	390234094334901	390234/0943349	X ¹	--	--	--	--	--	--	X	--	--
18	Brush Creek at Benton Boulevard, Kansas City, Missouri	390227094331501	390227/0943315	X ¹	--	--	--	--	--	--	X	--	--
19	Town Fork Creek at Satchel Paige Memorial Stadium, Kansas City, Missouri	06893563	390202/0943242	X ¹	X	--	X	--	--	X	--	X	--
20	Brush Creek at Elmwood Avenue, Kansas City, Missouri	06893564	390211/0943152	X ¹	--	--	X	X ³	X ³	X	X	--	X
21	Blue River at Coal Mine Road, Kansas City, Missouri	06893566	390240/0943045	X ¹	--	--	--	--	--	--	X	--	--
22	Blue River at Stadium Drive, Kansas City, Missouri	06893578	390330/0943042	X ¹	X	--	X	X	X	X	X	X	X
23	Blue River near St. John Avenue, Kansas City, Missouri	06893592	390652/0942956	X ¹	--	--	--	--	--	--	X	--	--
24	Blue River near mouth of Missouri River, Kansas City, Missouri	390720094272101	390736/0942927	X ¹	--	--	--	--	--	--	X	--	--
25	Unnamed tributary at Penn Valley Park, Kansas City, Missouri	390436094563001	390436/0945630	X ¹	X	--	--	--	--	--	X	--	--
26	Penn Valley Park Lake, Kansas City, Missouri	390440094353301	390440/0943533	X	--	--	--	--	--	X	--	--	X
27	South Grand River near Freeman, Missouri	06921582	383520/0942630	X	X	--	--	X	X	X	X	--	X

¹Synoptic base-flow sampling between August 2004 and August 2005.

²Sampled near 63rd Street.

³Sampled in free-flowing section below dam.

Table 2. Stream reach and wastewater source categories for sites sampled in the Blue River Basin.

[WWTP, wastewater-treatment plant; CSO, combined sewer overflow; --, not applicable]

Site number (figure 1)	Station name	Stream reach category	Wastewater source category
1	Blue River near Stanley, Kansas	Upper Blue River	Other ¹
2	Blue River at Blue Ridge Boulevard Extension, Kansas City, Missouri	Upper Blue River	WWTP
3	Indian Creek at 69 Highway, Overland Park, Kansas	Upper Indian Creek	Other ¹
4	Indian Creek at Farley, Overland Park, Kansas	Middle Indian Creek	WWTP
5	Tomahawk Creek near 111th Street, Johnson County, Kansas	Lower Tomahawk Creek	Other ¹
6	Indian Creek at 103rd Street, Kansas City, Missouri	Lower Indian Creek	WWTP
7	Blue River near Kansas City, Missouri	Middle Blue River	WWTP
8	Blue River at Prospect, Kansas City, Missouri	Middle Blue River	WWTP/CSO
9	Blue River near Gregory Boulevard, Kansas City, Missouri	Middle Blue River	WWTP/CSO
10	Blue River at Blue Parkway, Kansas City, Missouri	Middle Blue River	WWTP/CSO
11	Brush Creek at Mission, Johnson County, Kansas	Upper Brush Creek	Other ¹
12	Brush Creek at Belinder Avenue, Johnson County, Kansas	Upper Brush Creek	Other ^{1,2}
13	Brush Creek at Ward Parkway, Kansas City, Missouri	Middle Brush Creek	Other ^{1,2}
14	Brush Creek at Summit Avenue, Kansas City, Missouri	Middle Brush Creek	Other ^{1,2}
15	Brush Creek at Kansas City, Missouri	Middle Brush Creek	CSO ²
16	Brush Creek at Rockhill Road, Kansas City, Missouri	Middle Brush Creek	CSO ²
17	Brush Creek at Woodland Avenue, Kansas City, Missouri	Lower Brush Creek	CSO ²
18	Brush Creek at Benton Boulevard Kansas City, Missouri	Lower Brush Creek	CSO ²
19	Town Fork Creek at Satchel Paige Memorial Stadium, Kansas City, Missouri	Lower Brush Creek	CSO
20	Brush Creek at Elmwood Avenue, Kansas City, Missouri	Lower Brush Creek	CSO ²
21	Blue River at Coal Mine Road, Kansas City, Missouri	Lower Blue River	WWTP/CSO
22	Blue River at Stadium Drive, Kansas City, Missouri	Lower Blue River	WWTP/CSO
23	Blue River near St. John Avenue, Kansas City, Missouri	Lower Blue River	WWTP/CSO
24	Blue River near mouth of Missouri River, Kansas City, Missouri	Lower Blue River	WWTP/CSO
25	Unnamed tributary at Penn Valley Park, Kansas City, Missouri	--	CSO
26	Penn Valley Park Lake, Kansas City, Missouri	--	CSO
27	South Grand River near Freeman, Missouri	South Grand River ³	Other ³

¹Site upstream from municipal wastewater-treatment plants and combined sewer system area.²Site downstream from high-rate treatment plant with occasional bypass flows.³Outside basin control site.

sufficient duration and intensity to trigger overflow events in the CSS area. Characterization of the magnitude and duration of overflow events was not part of this study. Every attempt was made to sample the complete hydrograph during storms; however, this was not always the case, and not all sites were sampled during every event, especially where storms triggered events in parts of the basin, but not in other parts.

Stream samples were analyzed for physical properties, nutrients, fecal-indicator bacteria (*E. coli* and fecal coliform), suspended sediment, organic wastewater and pharmaceutical compounds, major ions, and trace metals. Nutrients analyzed included total ammonia plus organic nitrogen (N), dissolved ammonia (NH₄), dissolved nitrate (NO₃), dissolved nitrite

(NO₂), total N (sum of total and dissolved N species), ortho-phosphate (PO₄), and dissolved (DP) and total phosphorus (TP). Organic wastewater compounds included a suite of 72 common household and industrial chemicals, including, but not limited to, detergent surfactants and surfactant metabolites, the antimicrobial compound triclosan, the insect repellent DEET, plasticizers, musks, and fragrance compounds. Table 3 lists the organic wastewater compounds analyzed and their general category of use. Pharmaceutical compounds analyzed included common over-the-counter medications such as the analgesic acetaminophen; the anticonvulsant carbamazepine; antibiotics sulfamethoxazole and trimethoprim; cardiac and anticoagulating medications dehydronifedipine, diltiazem, and

warfarin; the cholesterol regulator gemfibrozil; the narcotic codeine; and the stimulants caffeine and cotinine, a metabolite of nicotine.

E. coli and total coliform bacteria samples were enumerated in three dilutions using defined enzyme substrate methodology (Eaton and others, 2005), and the results were reported as the measurement average. Fecal coliform bacteria samples were enumerated using multiple dilutions (a minimum of three) to ensure that the count density fell in the optimal range as prescribed by Myers and others (2007). When enumeration and densities fell outside of tolerance limits, densities were estimated based upon nonideal counts using standardized criteria (Myers and others, 2007).

Subsets of bacteria samples collected from selected base flow and storm samples were analyzed for presumptive host sources using previously described methods (Wilkison and others, 2005). The genetic similarity of *E. coli* isolated from water samples was compared to *E. coli* isolated from three hosts—dogs, geese, and humans—all of which were known to be present in the basin based on previous data (Wilkison and others, 2002; 2006), field observations, and knowledge of potential contaminant sources. Repetitive extragenic palindromic-PCR (rep-PCR) genetic fingerprint patterns of samples were developed and matched against a locally based host-source library for source determination (Carson and others, 2003).

Benthic macroinvertebrates were sampled in accordance with biological assessment protocols established in Missouri and Kansas for the evaluation of the biological condition of wadeable streams (Rabeni and others, 1997; Kansas Department of Health and Environment, 2000; Sarver, 2003a). Samples collected in 2002, 2006, and 2007 were obtained from standard habitats, typically coarse-mineral substrate at riffles, with a D-frame kicknet. Samples were split in a gridded tray with organisms sorted from sample debris and enumerated until a target threshold of 600 organisms was reached. Samples were obtained in 2003 and 2004 from all habitats present at a site in proportion to the total present with the dominant habitat at each site being coarse-grained substrate and the number of target organisms being 200. The intent of both procedures was to quantify the abundance and diversity of organisms at any given site. All samples were identified and enumerated in USGS laboratories using microscopy to the lowest practical taxonomic level, generally species.

Habitat assessments were conducted in 2006 at 11 sites previously sampled for macroinvertebrates in 2002, 2003, and 2004. This rapid assessment procedure evaluated the physical habitat of a site through measurement of features designed to assess the quality of stream habitat to support the biological community (Sarver, 2003b) and identify potential limits on site attainability. The stream physical habitat procedure incorporates measures of channel and flow characteristics, bank stability, sedimentation, and vegetative characteristics that would be expected to affect health, diversity, and abundance of stream biota.

Toxicity screenings were conducted in 2007 using a tiered approach designed to evaluate potential deleterious effects that water quality might have on aquatic community health by utilizing acute and short-term chronic toxicity tests that represent multiple biotic levels. This was done for a number of reasons. Surface waters and bottom sediments in the area contain constituent concentrations that are known or suspected to have endocrine effects (Wilkison and others, 2006). The synergistic effect of these chemicals is unknown and previous studies have documented declines in aquatic communities with movement downstream in the basin. The cause of these declines was positively correlated to urbanization factors and to some sample constituents (Wilkison and others, 2006). Toxicity analyses were done at the USGS laboratory in Lee's Summit, Missouri, according to methods described by Personne and others (2000), Hoffman and others (2003), Johnson (2005), and Waara and Färm (2008).

Bottom sediment samples were collected using a stainless steel Ponar dredge sampler in accordance with standard procedures (Radtke, 2005). A minimum of 5 separate randomly spaced samples were collected from the upper 10 centimeters (cm) of recently deposited sediments and composited into an 11-liter (L) stainless steel bowl. The sample was thoroughly mixed prior to subsampling aliquots [approximately 500 milligrams (mg)] for further analysis.

Sediment volume in an impounded reach of Brush Creek (Lake of the Enshriners, adjacent to site 20; fig. 1) was determined by using real-time kinematic surveying linked to a global-positioning system (Heimann and Richards, 2003). Universal Transverse Mercator coordinates and an elevation were established from a nearby known benchmark, and these data points were then used to construct digital surfaces of the impoundment bottom and sediment layer in order to determine accumulation volume.

Water and bottom sediment samples were analyzed at the USGS National Water Quality Laboratory, Denver, Colorado, using established USGS procedures (Faries, 1993; Fishman, 1993; Fishman and Friedman, 1989; Moulton and others, 2000; Burkhardt and others, 2005; 2006; Zaugg and others, 2006; Furlong and others, 2008) with the exception of *E. coli* microbial source-tracking samples. Microbial source-tracking samples were analyzed at the University of Missouri Veterinary Pathobiology Laboratory in Columbia, Missouri, using procedures outlined in Carson and others (2001; 2003; 2005).

The wastewater and pharmaceutical analytical methods provide data at extremely low chemical concentrations (micrograms per liter) and are extremely sensitive to the detection of target analytes. Both methods are termed "information-rich" (Childress and others, 1999) because enhanced analyte identification capabilities provide qualified low-concentration data for interpretation and statistical analysis. Therefore, reported concentrations of some analytes may be marked as estimated (E) if they occur at concentrations outside of instrument calibration ranges or if the compounds exhibit poor recovery analytical and method recovery.

Table 3. General use categories for organic wastewater compounds analyzed in this report.

[PAH, polycyclic aromatic hydrocarbon; AHTN, acetyl-hexamethyl-tetrahydro-naphthalene; HHCB, Hexa-hydro-hexamethyl-cyclopenta-benzopyran; categories modified from Wilkison and others, 2006]

Antioxidant	Detergent	Disinfectant	Fire retardant	Flavoring or fragrance	PAH or combustion by-product
5-Methyl-1H-benzotriazole	4-Cumylphenol	Phenol	Tributylphosphate	3-Methyl-1H-indole (skatol)	1-Methyl-naphthalene
3-tert-Butyl-4-hydroxyanisole (BHA)	4-Nonylphenol	Tribromomethane	Tris (2-chloroethyl) phosphate	Acetophenone	2,6-Dimethylnaphthalene
	4- <i>n</i> -Octylphenol	Triclosan	Tris (dichlorisopropyl) phosphate	AHTN	2-Methyl-naphthalene
	4- <i>tert</i> -octylphenol			Camphor	Anthracene
	Nonylphenol monoethoxylate			<i>d</i> -Limonene	Benzo[<i>a</i>]pyrene
	Nonylphenol diethoxylate			HHCB	Fluoranthene
	Octylphenol monoethoxylate			Indole	Naphthalene
	Octylphenol diethoxylate			Isoquinoline	<i>para</i> -Cresol
				Menthol	Phenanthrene
				Methylsalicylate	Pyrene

Pesticide	Plastics	Solvent	Sterol or stanol	Stimulant
1,4-Dichlorobenzene	Bis(2-ethylhexyl) phthalate	Isophorone	3- <i>b</i> -Coprostanol	Caffeine
3,4-Dichlorophenyl isocyanate	Bisphenol A	Isopropylbenzene (cumene)	Cholesterol	Cotinine
Anthraquinone	Diethylphthalate	Tetrachloroethylene	Sitosterol	
Atrazine	Triethyl citrate		Stigmasterol	
Benzophenone	Triphenyl phosphate			
Bromacil	Tris (2-butoxyethyl) phosphate			
Carbaryl				
Carbazole				
Chlorpyrifos				
Diazinon				
Dichlorvos				
Metaxyl				
Metolachlor				
N,N-diethyl- <i>meta</i> -toluamide (DEET)				
Pentachlorophenol				
Prometon				

Quality Control and Assurance

Approximately 10 percent of all field samples collected consisted of quality control and assurance samples designed to ensure the integrity of the water-quality data analyzed in this report. Field equipment blank samples were used to detect sample contamination during field collection, sample processing and cleaning, or from lack of sterility (in the case of bacteria samples) of sampling and processing equipment.

Field replicate samples were collected to determine the effect that variability in sample collection and processing procedures may have on the precision of environmental concentrations. Quality assurance results for data collected in previous studies have been utilized in this report and have been reported elsewhere (Wilkison and others, 2002; 2005; 2006). A summary of these data and values for data collected from October 2004 through December 2007 are presented in tables 4 through 6 (at the back of this report). The average percent difference between 638 replicate sample pair analyses for dissolved constituents was 5.2 percent. The average percent difference for over 3,600 whole-water sample pair analyses was 15 percent. Median values of relative percent difference were much lower, 0 percent for dissolved constituents and 2 percent for whole-water analyses indicating that the central tendency of sample replicates was considerably less than the average percent difference.

Field equipment blanks were collected by passing highly purified water through the same equipment used to collect and process water-quality samples. The samples were then stored, shipped, and analyzed by the identical methods that were used for environmental samples. Measureable concentrations in blank water can result from trace amounts of constituents in the purified water, as well as residual material in sample processing or analytical equipment. Most compounds were not detected in field equipment blanks; if detected, the reported concentrations were near the detection limit for the compounds and environmental concentrations were many times greater. Analytical results for field equipment blank samples collected from October 2004 through December 2007 are reported in tables 7 through 13 (at the back of this report) adjacent to the results from environmental sample collected sequential to the blank samples. Among the blank samples collected for nutrient analysis, one sample had a concentration of ammonia plus organic N estimated at 0.05 mg/L and an orthophosphate concentration of 0.02 mg/L. This same sample had a reported concentration of 0.4 mg/L for dissolved organic carbon and an estimated concentration of 0.3 mg/L for total organic carbon. These concentrations are equivalent (for nutrients) or slightly above (for organic carbon) to the reporting limit for these compounds; environmental concentrations of these constituents were generally two to three orders of magnitude greater than those determined in blank samples. For the organic wastewater compounds there were estimated detections of 0.01 micrograms per liter ($\mu\text{g/L}$) for 1-methylnaphthalene and 2-methylnaphthalene, 0.03 $\mu\text{g/L}$ for naphthalene, and 0.16 $\mu\text{g/L}$ for DEET in one blank sample. There

were no detections of pharmaceutical compounds detected in any of the blank samples.

For bacteria analyses one storm sample field equipment blank had reported *E. coli* densities of 2 colonies per 100 milliliters (col/100mL), fecal coliform densities of 6 col/100 mL and total coliform densities of 307 col/100 mL. Environmental storm samples had bacteria densities three to five orders of magnitude greater than that observed in this blank, indicating the potential for sample bias was minimal. Additionally, a laboratory equipment blank was processed before and after every environmental sample (approximately 250 samples; data not shown) to ensure the sterility of filtering equipment and to evaluate cross-contamination potential. No bacteria colonies were observed in any of the equipment blanks.

The USGS National Water Quality Laboratory utilizes additional quality assurance procedures designed to assess potential sample contamination as well as to quantify method performance, bias, variability, and to verify analytical instrument sensitivity and calibration. Laboratory quality assurance data and methods are documented (U.S. Geological Survey, 2008b) and in Childress and others (1999), Zaugg and others (2002; 2006), Cahill and others (2004), and Furlong and others (2008).

The precision and accuracy of the microbial source-tracking methods employed in this study are described by Carson and others (2003). To assess the method's ability to determine unknown sources, 25 percent of sample isolates were held from the source library and then presented as unknowns. The rate of correct classification for ribotyping of unknown samples from source categories used in this study was determined to be 70 percent for dog, 82 percent for human, and 80 percent for geese. When rep-PCR methods were used, the rate of correct classification for these same three categories increased to 100, 100, and 90 percent (Carson and others, 2003). A sensitivity analysis on 1 nanogram of genetic material was used to evaluate the ability of the *Bacteroides thetaiotaomicron* marker to verify human fecal contamination. The marker was recovered in 96 percent of human samples, 16 percent of dog samples, and 0 percent of geese samples. Positive detections in dog samples indicated there may be the potential for some sharing of enteric bacteria between humans and their canine pets but not for other types of wildlife (Carson and others, 2005).

These data indicate that the combination of sampling and analytical variability, especially for dissolved constituents, contribute only small amounts of uncertainty to analytical results. These data also indicate that a slightly higher degree of uncertainty resulted when compounds were determined from whole-water samples, likely because of slight differences in suspended sediment or organic matter, or because constituents were mediated by biologic activity between the time of sample collection and analysis.

Data Analysis

Water-quality data were analyzed for various factors that may have been expected to affect concentrations, loads, trends, and patterns observed in stream samples and at sites over the course of the study. These factors included physical stream properties, constituent concentrations and sources, biological integrity, and how these factors may have varied temporally and spatially in the basin.

Continuous Water-Quality Monitors

Continuous measurements (every 15 minutes) of water temperature, specific conductance, dissolved oxygen, pH, and turbidity were evaluated, corrected, and computed using established protocols (Wagner and others, 2006). This approach involves daily analysis of the record in order to identify and minimize data loss or erroneous data related to equipment malfunction, fouling, and drift. Routinely—generally every 2 weeks—sensors were cleaned, serviced, and calibrated. Field values were verified during these visits through the use of comparison readings using independently calibrated equipment. These data were used to correct the record for calibration drift and sensor-fouling errors and to ensure that quality assurance criteria were met before final record computation and publication of the data. Data that were outside of tolerance limits (less than 2 percent of the total) were not included in the record computation.

Loads

Instantaneous loads of selected constituents at stream sites were determined by multiplying the measured concentration in discrete samples by the streamflow (discharge) at the time of sample collection and then by an appropriate conversion factor to keep units consistent. Daily, monthly, seasonal, and annual load estimates for selected constituents were determined from load estimation models using minimum variance unbiased estimation techniques, a form of multiple linear regression analysis, and the S-LOADEST computer program (Runkel and others, 2004) in S-Plus (version 7.0, release 6, TIBCO Software, Inc., Palo Alto, California). For model development, the dependent variable was constituent concentration, and the independent variables were streamflow, decimal time, and season. If appropriate, ladders of power transformation of streamflow (Helsel and Hirsch, 1992) and breakpoints in streamflow were considered. These procedures were designed to account for nonnormal distributions, seasonal or annual cycles, censored data, biases associated with logarithmic transformation, and serial correlation of the residuals (Cohn, 1988; Cohn and others, 1989).

Model selection was done according to the following criteria. From evaluation of the Akaike information criteria (Akaike, 1981), the best-fit model was selected using combi-

nations of streamflow, natural logarithm of streamflow, square of streamflow, square of the natural logarithm of streamflow, decimal time, square of decimal time, sine and cosine of time, and square of the sine and cosine of time. Residual plots were evaluated for homoscedasticity (constant variance) and normality. Models that failed these critical assumptions were rejected, and additional combinations of the above variables were examined for linearity based upon the rank of the Akaike information criteria. Failing that test, an additional step involved examination of models that incorporated breakpoints in streamflow in combination with the aforementioned time terms.

Each observation in the data set was used to develop a best-fit model, which was then used to estimate daily loads. Loads were then summed to provide monthly, seasonal, and annual estimates. Yield estimates were determined by dividing the constituent load determined at the site by the site's drainage area. Flow-weighted concentrations were calculated from the estimated loads by dividing the daily mean load by the daily mean streamflow.

Estimates of monthly mean contaminant loads from WWTPs were determined by multiplying the monthly mean concentration of selected contaminant loads by the reported monthly mean plant discharge (U.S. Environmental Protection Agency, 2005; 2008) and then by an appropriate conversion factor to normalize units. Annual load estimates from CSOs were determined by multiplying the average concentration determined in CSO samples discharging into given stream reaches by the average annual CSO discharge for those reaches and then by an appropriate conversion factor.

Trends

Trends in constituent concentrations in streams can be affected by natural and anthropogenic processes. Seasonal and annual precipitation variations induce changes in streamflow, which affect concentrations of nutrients, suspended sediment, fecal-indicator bacteria, and other constituents. Human factors such as land-use changes, advanced treatment technologies, and the implementation of best-management strategies, also may affect instream concentrations. Flow-adjusted trends in concentrations remove the variability associated with streamflow to allow changes with time caused by human factors to be properly assessed. Flow-adjusted trend was determined from the coefficient of the LOADEST model decimal time term using a significance level of 0.05 (Sprague and others, 2006). Constituent trends were only reported where a valid model was calibrated; however, not all reported trends were determined to be statistically significant.

Flow-adjusted trend in concentration is expressed as the average percent change over the time modeled and calculated from the following formula (Sprague and others, 2006):

$$\% \Delta \text{FAC} = 100 * (e^{(2\beta_{DT}(T_m - T_a) + \beta_T * T)}) - 1 \quad (1)$$

where

$\%\Delta\text{FAC}$	is the flow-adjusted trend in concentration, expressed as the average percent change per year;
e	is exponential;
β_{DT}	is the coefficient of the decimal time squared term;
T_m	is the decimal time at the midpoint of the period of record;
T_a	is the decimal time centered so that the linear and quadratic time variables are orthogonal;
T	is the decimal time of the period of record; and
β_T	is the coefficient of the decimal time term.

Trends were considered significant if the p-value of the decimal time term was equal to or less than 0.05. The trend was bracketed with a 95 percent confidence interval by applying 2 times the standard deviations of the time terms (β_{DT} and β_T) to the above equation to achieve the upper and lower bounds of the trend. β_{DT} was set to zero if the term, decimal time squared, did not appear in the final model.

Bacteria Source-Tracking

Genetic characteristics of *E. coli* isolated from water samples were compared to a library of *E. coli* isolates from three known hosts in the basin—dogs, geese, and humans (Wilkison and others, 2002; 2006) to determine the amount of *E. coli* from each host. The host-source library was developed from fecal samples collected at sites adjacent to the stream that could be expected to contribute instream bacteria. Adjacent stream sites sampled for host-source library samples included dog kennels, sanitary sewers, and parks where geese congregate in large numbers. Genetic fingerprint rep-PCR patterns of samples were determined only after a four-step confirmation process that ensured isolates were fecal *E. coli* strains. Bionumerics software (version 3.0, Applied Maths, Kortrijk, Belgium) was used to determine the similarity of water-borne *E. coli* rep-PCR patterns to those in the library (Carson and others, 2003). Samples with greater than 75 percent similarity to those of a known host were assigned to that host group, and samples outside of the limits were presumed to be from unknown sources. A 75 percent similarity cutoff was chosen so that data collected during 2005 to 2006 could be pooled with previously collected data from 1999 to 2004; however, the actual similarity measured was greater than 75 percent (81 percent for those identified as humans, 82 percent for those identified as geese, and 83 percent for those identified as dogs). Human-host source contamination identified using rep-PCR was verified through the use of DNA extracted from water samples and amplified for the genetic marker, Bacteroides thetaiotaomicron, because of its high specificity in human fecal matter (Teng and others, 2004; Carson and others, 2005)

and the presence of 3 β -coprostanol, a human-fecal biomarker, in stream samples.

Biological

The Invertebrate Data Analysis Program (IDAS) was used to calculate measures of community diversity and to resolve taxonomic ambiguities in the data (Cuffney, 2003). Taxonomic ambiguities were resolved by data combination for all sites and then assignment of ambiguous parents to children. This approach is appropriate when sites were expected to have similar assemblages in the absence of anthropogenic effects, as is the case in this study area. Once individual site metrics were determined, data from selected stream reaches were averaged with nearby sites to aid and simplify data interpretation. These groupings were assigned in accordance with a human disturbance gradient grouping developed by Poulton and others (2007) and knowledge of basin land-use patterns.

Missouri Stream Condition Index (SCI) values were determined according to procedures outlined in Sarver and others (2002). Individual metric values for total taxa richness; Ephemeroptera, Plecoptera, Trichoptera (EPT) richness; Missouri Biotic Index; and the Shannon Diversity Index at each site are scored and then normalized by comparison to the range of reference site values for the ecoregion, in this case the Plains/Missouri Tributaries between the Blue and Lamine Rivers. The four normalized values then are summed to achieve the final SCI value. Based on the SCI scores, an aquatic life use status (ALUS) was determined to be either non-supportive, partially supportive, or fully supportive of biota (Sarver and others, 2002).

Stream physical habitat was assessed using standards outlined for Missouri by Sarver (2003b). Ten physical attributes of the instream and riparian areas adjacent to the sampling site that could be expected to affect biotic habitat were measured or rated on a scale of 0 to 20. Attributes were summed to provide an overall assessment; higher scores indicated habitat better suited for aquatic organisms.

Toxicity evaluations included the responses of primary producers (algae), consumers (crustaceans), and decomposers (bacteria) to surface-water samples. Samples were considered toxic when sample response was greater than a prescribed difference (10 to 50 percent) of the control samples (Canna-Michealidou and others, 2000; Johnson, 2005).

A chronic toxicity test, using the unicellular freshwater algae *Pseudokirchneriella subcapitata*, (formerly *Selenastrum capricornutum*), was performed under controlled conditions of light and temperature [21–25 °Celsius (C)]. Algae concentrations of five serial dilutions of samples (three replicates each) were determined every 24 hours over a 3-day growth period by optical density measurement at 670 nanometers. Toxicity was measured as percent growth inhibition in samples relative to the exponential growth rate of the control.

Toxicity tests, using the crustacean *Daphnia magna*, were determined by exposing recently hatched neonates (less than 24-hours old) to surface-water and bottom sediment samples.

Five replicates per sample and one control, each of which contained five daphnids, were measured for each sample. Exposures were 24-hour and 48-hour at 20 °C in darkness. The percentage of deceased or immobilized daphnids at the end of each time was compared against the control to determine toxicity.

The response of the bioluminescent bacteria, *Vibrio fischeri*, exposed to samples was measured under standard conditions and compared to that measured in controls at 5- and 20-minute intervals. The percent reduction in the light output of the luminescent bacteria between the samples and the control was used to determine toxicity. All samples were measured in duplicate and at a minimum of two concentrations, full strength and at 50 percent dilution. Samples that exhibited light inhibition greater than 25 percent compared to the control were resampled for toxicity confirmation.

Statistical Analyses

Statistical analyses were conducted comparing water-quality characteristics between sites. Nonparametric statistical methods were used to analyze the data because water-quality data are not normally distributed, the data frequently contain values less than the method detection limit (censored data), and because these methods are not unduly influenced by extreme data values (outliers) since ranks of the data are used instead of constituent concentrations. A significance level (α) of 0.05 was used for the statistical tests. However, the attained significance level or probability of error (p-value) from the test was frequently much lower and was reported to provide a qualitative indication of the degree of similarity or difference between data sets.

The nonparametric methods included the Kruskal-Wallis test and multiple comparison t-tests on the ranks (Helsel and Hirsch, 1992). The Kruskal-Wallis test is an analysis of variance test on the ranks of the data to evaluate for differences in the central tendency, medians, of two or more groups. When the the Kruskal-Wallis tests indicated a significant difference at the 0.05-level, a t-test on the ranks (Mann-Whitney) was performed on each pair group to evaluate which groups were statistically different from one another.

Water-Quality Character and Trends in the Blue River Basin

Trends are the average increases or decreases in measurements over a specific time or through space that are unlikely to have occurred by chance (Helsel and Hirsch, 1992). The time frame for trends can vary from short (hours or days), long (months or seasons), to long term (year or decade) depending upon the type of constituent or property being evaluated and the amount or type of change being examined. Spatial trends can include changes that occur on small scales within streams

or between sites or within the water column—such as those changes that occur between the overlying water column and underlying bottom sediments. They also may include changes that occur between tributaries or those that occur along various stream reaches.

Water-quality trends in the Blue River Basin from 1998 through 2007 were assessed using a multidisciplinary approach that included temporal and spatial dimensions. Previous studies examined how concentrations, loads, and yields of constituents varied at sites within the basin and the role of hydrology and various point and nonpoint sources in receiving water concentrations and loads (Wilkison and others, 2002; 2006). For this study, measurements of streamflow, physical properties, nutrients, fecal-indicator bacteria, suspended sediment, organic wastewater and pharmaceutical compounds in base-flow and stormflow samples from basin streams collected October 2004 through December 2007 (tables 7–13, at the back of this report) were incorporated with similar measurements from earlier studies (Wilkison and others, 2002; 2005; 2006) to evaluate temporal and spatial trends over a 10-year period. A combination of benthic macroinvertebrate assessments, stream physical habitat assessments, and toxicity evaluations was used to assess the biological integrity of basin streams.

Continuous Water-Quality Data

Continuous (every 15 minute) water-quality data were collected at two sites (sites 7 and 16; fig. 1; table 1) from April through early to mid-December 1998 through 2007. Data included water temperature, specific conductance, dissolved oxygen, pH, and turbidity. Values for continuous water-quality variables and the range of values observed each month are shown in figure 3. Water-temperature data at site 16 (Brush Creek at Rockhill Road) for the months December through March were measured only from 1998 through 2002.

Water temperature is strongly affected by the ambient air temperature. Maximum temperatures in the Kansas City area occur in July and these are reflected in the water temperatures for that month. Stream temperature is important because it mediates biogeochemical processes. Warmer water temperatures support aquatic growth, which can contribute to stream eutrophication. Warmer temperatures, coupled with increased solar radiation, also can lead to increased degradation of contaminants, just as cooler temperatures can increase the half-life of chemicals and produce longer residence times. Additionally, because many wastewater-treatment processes are biologically mediated, these facilities operate more efficiently in warmer temperatures. Although the median temperatures between the two sites are similar, Brush Creek temperatures typically were higher by as much as 1 °C during July and September. Instantaneous temperature values sometimes exceeded the State of Missouri warm-water standard of 32.2 °C (Missouri Department of Natural Resources, 2007), but the daily mean value

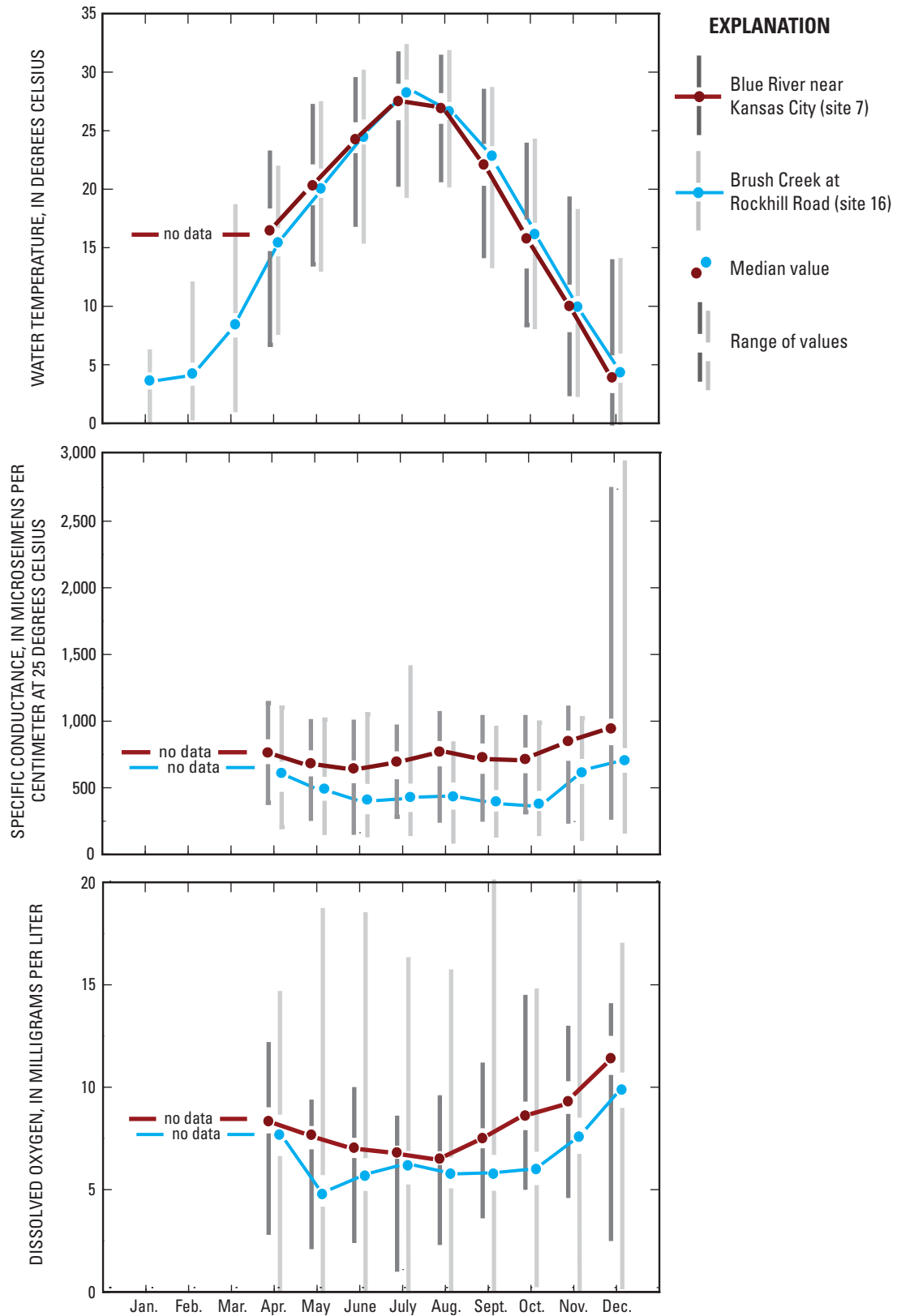


Figure 3. Continuous water-quality and streamflow data by month from 1998 through 2007.

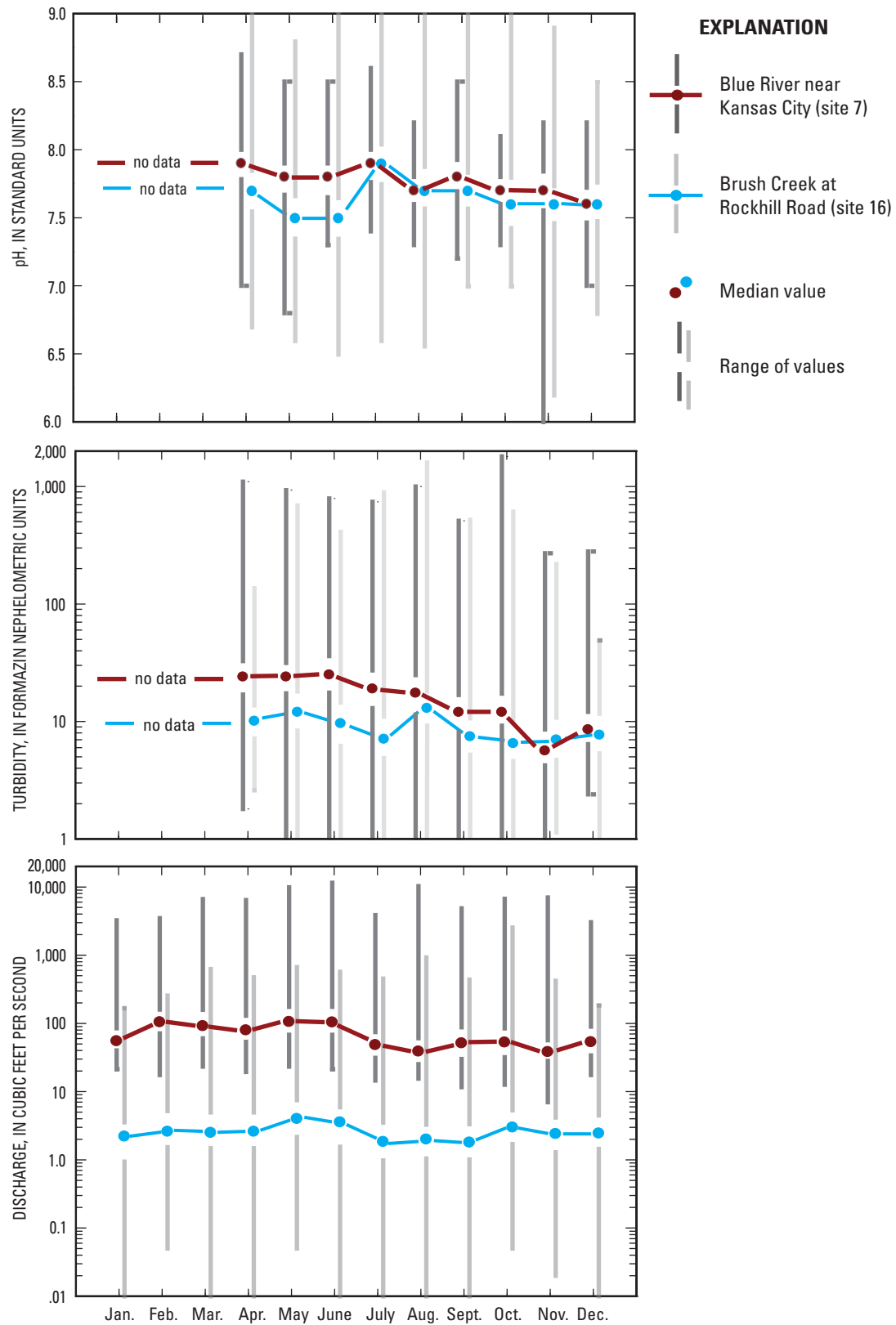


Figure 3. Continuous water-quality and streamflow data by month from 1998 through 2007.—Continued

rarely did. Two instances of daily mean water temperature exceeding 32.2 °C occurred only at site 16.

Specific conductance values on Blue River near Kansas City (site 7) typically were larger than the values on Brush Creek at Rockhill Road (site 16). There are several factors that likely are responsible for this. In many instances, a large percentage of the flow at site 7 consists of treated wastewater effluent. Sewage generally has larger concentrations of common dissolved ions, many of which are not substantially removed during treatment. Although the water has been treated prior to its discharge into the river in accordance with applicable standards, it does contain concentrations of a variety of substances that can elevate the specific conductance. The percentage of impervious cover upstream from site 16 is 2.5 times greater than at site 7 (Wilkison and others, 2006), thus a larger amount of runoff in this area does not infiltrate into the ground and migrate through the unsaturated zone before entering the stream as groundwater recharge. Consequently, runoff from impervious surfaces has fewer opportunities to pick up

dissolved constituents or buffering capacity, although exceptions to these phenomena can sometimes occur.

Large spikes in specific conductance values seen in December (figs. 3–4) were associated with deicing and road salt applications that occurred in anticipation of winter storms at sites 7 and 16 as well as at adjacent sites (06893100 and 06893390) operated as part of concurrent studies in the basin (Rasmussen and others, 2008). Specific conductance values two to five times the background levels occurred following a series of small winter storms in parts of the basin where road deicers were applied and subsequently rapidly moved into basin streams during snowmelt (fig. 4). USGS site 06893100 is located approximately midway between sites 1 and 2 (fig. 1) and USGS site 06893390 is approximately 0.8 kilometer upstream from site 6 (fig.1). Sites in areas with the highest population density (site 16) or kilometers of road surfaces (site 06893390) (Wilkison and others, 2006) typically showed the sharpest increase and most pronounced effects. These data indicate there are few mechanisms to slow or limit the

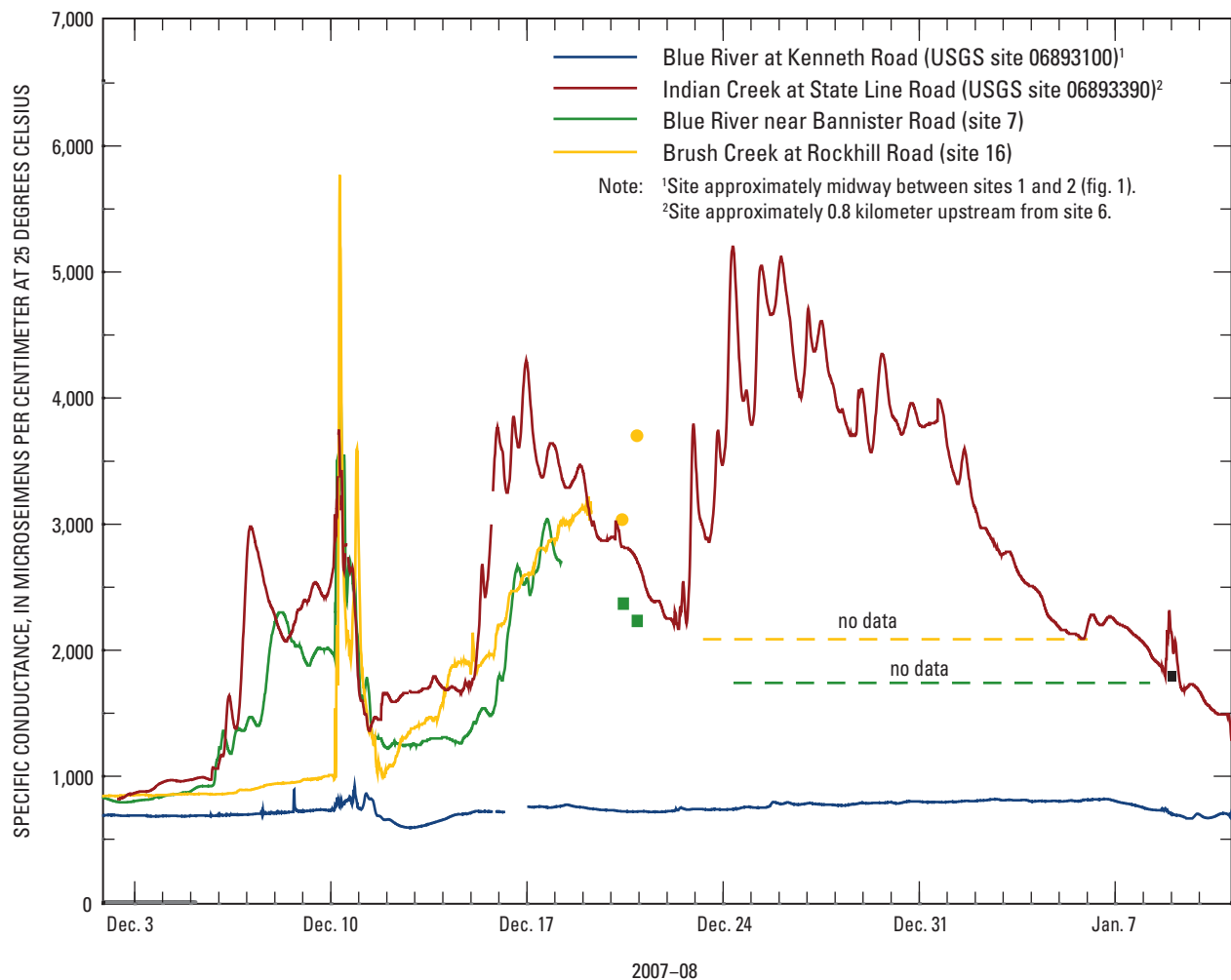


Figure 4. Hourly specific-conductance values for four streams in the Blue River Basin from December 2, 2007 to January 11, 2008.

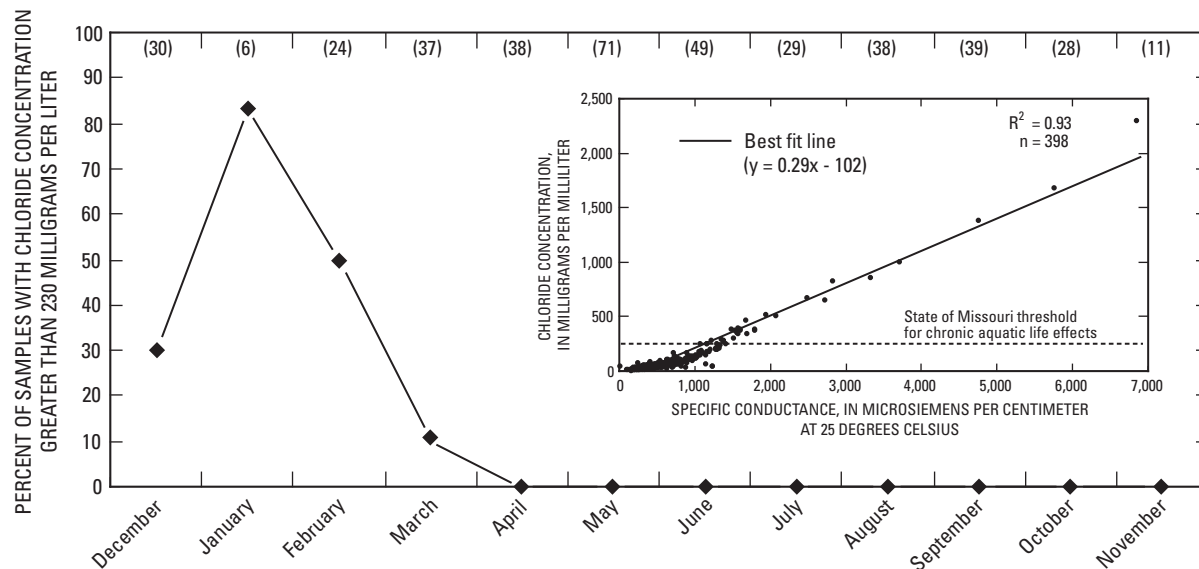


Figure 5. Percentage of stream samples collected in the Blue River Basin from July 1998 through December 2007 with dissolved chloride values greater than the State of Missouri threshold of 230 milligrams per liter and relation between specific conductance values and chloride concentration in stream samples.

movement of highly soluble road salts into streams. In some winters, such as occurred in 2007, winter storms occur at a frequency of about once every 7 to 10 days for a month or more with each storm contributing successive pulses of road salt to streams (fig. 4). When this is the case, deicing and road salts can linger in the environment for extended periods and prolong elevated specific conductance values above background concentrations.

Specific-conductance values were strongly correlated with chloride concentrations in stream samples (fig. 5; coefficient of determination, 0.93) and specific conductance values in excess of 1,400 microsiemens per centimeter at 25 °C ($\mu\text{S}/\text{cm}$) are representative of stream chloride concentrations greater than the State of Missouri threshold of 230 milligrams per liter (mg/L) for chronic effects on aquatic life (Missouri Department of Natural Resources, 2007). Based upon the relation between specific conductance values and dissolved chloride concentrations (fig. 5), stream segments in Indian Creek, the Blue River downstream from its junction with Indian Creek, and Brush Creek likely would have had chloride concentrations in excess of this threshold for more than a month. Samples collected from December to March had chloride concentrations greater than the chronic threshold for full support of aquatic life, with the coldest months, January and February, having the largest percentage (more than 50 percent) of samples greater than the chloride chronic standard (fig. 5). Four samples from December to March had chloride concentrations greater than 860 mg/L, the State of Missouri acute threshold for support of aquatic life (Missouri Department of Natural Resources, 2007). No samples collected April through November had chloride concentrations in excess of State acute or chronic thresholds (fig. 5). These data indicated that stream chloride concentrations in excess of 230 mg/L resulted primar-

ily from road deicers entering streams in winter months, which likely coincided with periods of decreased benthic invertebrate activity. The determination of potential deleterious effects on stream biota from individual compounds was beyond the scope of this study. However, because of the seasonality of this phenomenon, elevated chloride concentrations from road salt applications may be less important to overall stream health than other factors, such as urbanization and habitat loss.

At both sites, monthly median dissolved-oxygen concentrations increased in the fall, late September through early December, (fig. 3) as water temperatures declined and solubility increased. As water temperatures increased from April to July, the solubility of dissolved oxygen in streams declined, and median values decreased. However, monthly median dissolved-oxygen concentrations at site 7 (Blue River near Kansas City) were significantly greater than values at site 16 (Brush Creek at Rockhill Road) for all months between April and November of each year (Mann-Whitney tests; $p < 0.001$). Dissolved-oxygen concentrations at site 16 also fluctuated two to three times more than at site 7, in part because of the varied nature of inputs into Brush Creek in concert with stream hydrologic alterations. Numerous reaches on Brush Creek have low-head dams that impound water and concrete-lined channel beds and sides. Except during storm events, flows through these reaches are limited, but nutrients typically are not. This can lead to frequent and rapid algal blooms. During these periods, photosynthesis during daylight hours tends to induce super-saturated dissolved-oxygen concentrations, whereas at night, respiration causes dissolved-oxygen concentrations to drop sharply. As previously reported (Wilkison and others, 2006), storms can induce rapid reductions in dissolved-oxygen concentrations as organic matter during wet weather enters these reaches, collects in the impoundments, and then

begins to degrade, which depletes dissolved-oxygen concentrations. Dissolved-oxygen declines were more frequent during months with the highest average precipitation (May, June, and September) and more frequent discharges from combined sewers. The largest decrease in median monthly dissolved-oxygen concentrations occurred at site 16 during May (fig. 3)—the month with the highest average precipitation.

Processes such as eutrophication and storm inputs have substantial effects on stream dissolved-oxygen concentrations. Daily mean dissolved-oxygen concentrations at site 16 were below the State of Missouri standard of 5 mg/L for full support of aquatic life (Missouri Department of Natural Resources, 2007) 27 percent of the time compared to only 3 percent of the time at site 7 (fig. 6).

Values for pH at sites 7 and 16 frequently ranged over several units but were usually in the range of 6 to 9 standard units (fig. 3). A substantial part of the pH fluctuation has to do with nutrient saturation that occurs in these streams. Excess nutrients foster algal blooms. As these blooms progress, stream pH tends to peak near the time of daily maximum photosynthesis, while respiration reduces the pH during the night as excess carbon dioxide is released into the water column (Wetzel, 2001). The pH of the Blue River near Kansas City (site 7) is buffered some by treated effluent being discharged upstream from this site, so the Blue River does not have the same degree of fluctuation as does Brush Creek at Rockhill Road (site 16). There is a drop in pH in the months of May and June at both sites because of increased runoff; however, the Brush Creek pH decline is more evident because of the relatively large amount of impervious area in Brush Creek, which generates runoff from lower pH, lightly buffered precipitation that undergoes minimal soil contact. Additionally, CSO events, which tend to have lower pH values than receiving streams in part because of the large percentage of rainfall in the overflow, would be more frequent during May and June, a factor that may also have reduced pH values.

Stream pH values are most commonly in the range between 7 and 8, which is consistent with the range where many organic wastewater and pharmaceutical compounds would be expected to be persistent in the aqueous phase (Wells, 2006). This, coupled with the daily inputs from WWTPs and the less frequent, but still common, inputs from CSOs, helps to explain the persistent nature of some of these compounds in many stream reaches (Wilkison and others, 2002; 2005; 2006).

Turbidity values often correlate with the concentration of suspended particles in streams, which can be organic matter (for example, algal matter or leaf debris) or inorganic particles. Median turbidity values at site 7 were about twice that at site 16. Algal matter in streams is largely a function of available light, nutrients, and temperature, although zooplankton grazing also can be an important limiting control (Wetzel, 2001). Because dissolved inorganic nitrogen and phosphorus are available, stream reaches in the basin are not nutrient limited. Therefore, algal populations likely are limited by light, temperature, or heterotrophy, which all peak in midsum-

mer. Higher turbidity values also correlate with storm events that contribute large amounts of sediment into streams. The majority of instream sediment is mobilized by the largest storms, which occur in the months with the highest median turbidity values. Monthly median turbidity values in the Blue River were about twice those in Brush Creek during the spring and summer, an indication of the much higher sediment load transported in the main stem of the Blue River than in Brush Creek. Impounded reaches on Brush Creek trap sediments and minimize downstream transport.

Longitudinal Trends

Synoptic samples, samples collected in a short timeframe under near-uniform base flow hydrologic conditions, were collected from 19 sites in the Blue River Basin during base flow in August through September 2004 and again in May and August 2005. Sample-site locations were focused in the CSS area. Eight sites on the main stem of the Blue River (sites 2, 7–9, and 21–24), eight sites on Brush Creek (sites 11, 13–18, and 20), and one site each on Indian Creek (site 6), Town Fork Creek (site 19), and an unnamed tributary in Penn Valley Park (site 25) were sampled.

Average fecal-indicator bacteria densities and loads for these three sampling events are shown in figure 7. Although bacteria densities fluctuated somewhat between sites, densities generally increased downstream in the basin. This increase corresponds with increased amounts of urbanization that occurred progressively downstream in the basin. Rasmussen and others (2008) showed that bacteria densities increased as the percent of urban land increased in Johnson County, Kansas. Because these downstream increases occurred during base-flow conditions, they are an indication of nonpoint-source contributions to basin streams during dry weather. One potential source of these contributions would be the interaction of groundwater and water migrating through the unsaturated zone with compromised sewer lines and its ultimate discharge into surface waters. Some of these interactions would be expected to occur along preferential flow paths that would allow limited opportunities for the adsorption and degradation of bacteria. This potential is additionally underscored by previous work (Wilkison and others, 2002; 2005) where typically at least one-third of *E. coli* bacteria were attributable to human sources during base-flow conditions. The age of many system pipes coupled with historical construction techniques employed to join pipe segments are believed to provide an opportunity for inflow and infiltration processes to occur in many parts of the system (City of Kansas City, Missouri, 2009).

Instantaneous *E. coli* loads during base-flow conditions were large in streams even before they entered the CSS area. Lower Blue River sites (sites 21–24) generally had increased densities of bacteria, but inputs from Brush Creek only accounted for approximately 10 percent of the total downstream loads because of its much smaller discharge.

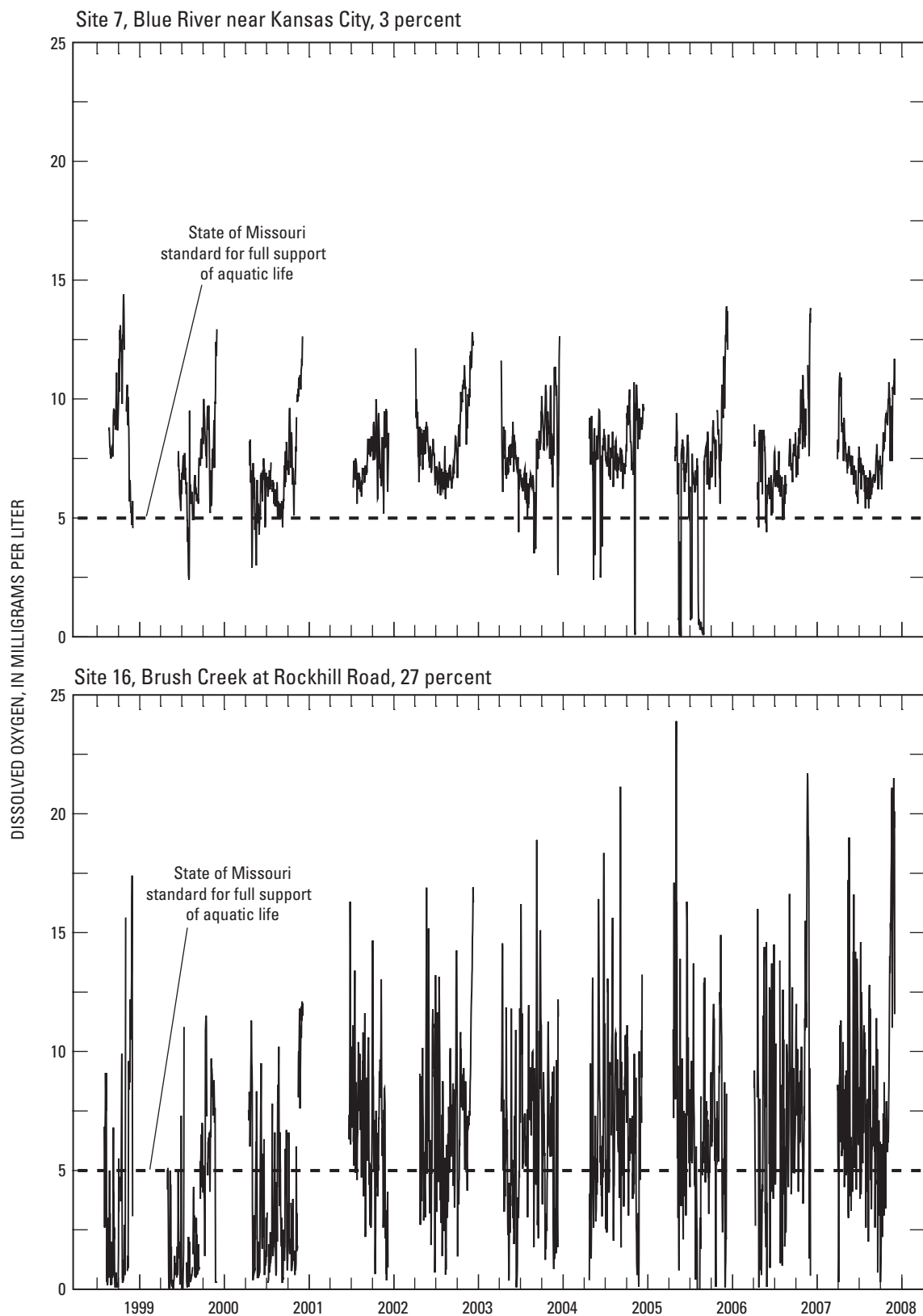


Figure 6. Daily mean dissolved-oxygen concentrations at sites 7 and 16 from July 1998 through December 2007 and percentage of days where mean concentration was below the standard for full support of aquatic life.

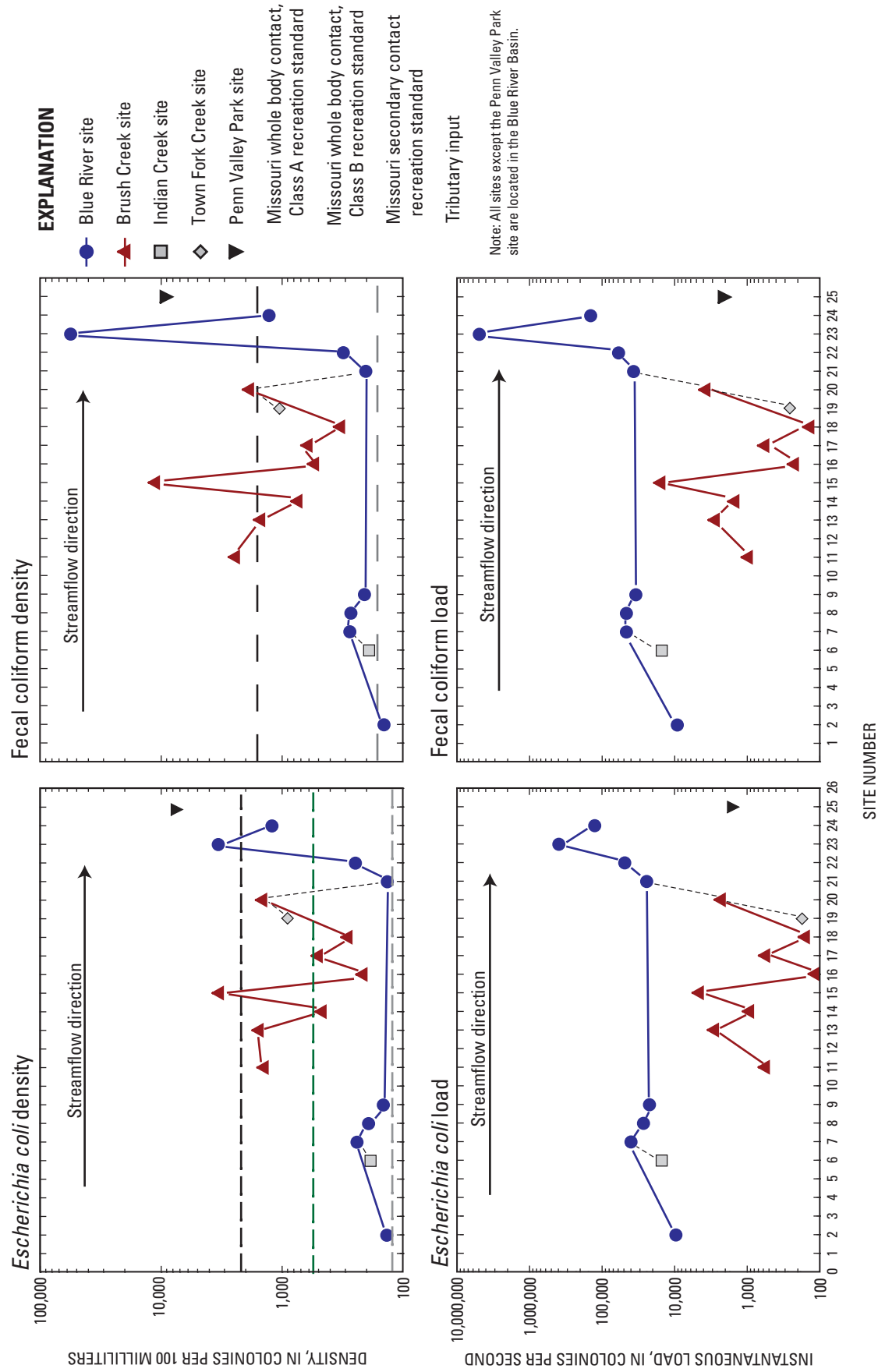


Figure 7. Average fecal-indicator bacteria densities and loads at study sites for samples collected during three synoptic base-flow sampling events between August 2004 and August 2005.

As previously reported (Wilkison and others, 2006; Rasmussen and others, 2008), a large percentage of the nutrients, total nitrogen and total phosphorus, in the Blue River downstream from the confluence of Indian Creek to the mouth, originate from WWTP effluents. There are three WWTPs that discharge into the basin—one that discharges into upper Blue River, one into upper Indian Creek, and one into Tomahawk Creek near its confluence with Indian Creek (fig. 1). A fourth plant, located near the confluence of the Blue and Missouri Rivers, discharges into the Missouri River. The plants vary in size and treatment technologies so effluent character varies between the plants. The smallest plant is located upstream from site 2, and discharges, on average, about 16 percent of the total effluent discharged into the basin (U.S. Environmental Protection Agency, 2008). Site 6 (fig. 1) downstream from the other two plants receives the bulk of the treated effluent in the basin. Previous work (Wilkison and others, 2006) indicated that at site 7, downstream from all three discharge points, treated effluent comprised over 90 percent of the flow about 85 percent of the time. As of 2009, population increases and planned increases in treatment capacity likely will raise these percentages.

Average nutrient concentrations and loads for the three synoptic base-flow sampling events (fig. 8) illustrate the role of these plants on downstream nutrient levels. During base flow, most nutrients in the middle and lower Blue River originate from the two WWTPs that ultimately discharge into Indian Creek upstream from site 6. Smaller amounts originate from the WWTP that discharges into the upper Blue River, and even smaller amounts originate from the basin tributaries Brush and Town Fork Creeks. Nutrient contributions to Brush Creek increased downstream in the basin, likely the result of increased nonpoint-source contributions in the middle and lower reaches of Brush Creek.

Previous work (Wilkison and others, 2006) estimated WWTPs contributions to stream reaches in the Blue River Basin for a 20-month period (July 2002 through September 2004). WWTPs contributions were compared to all the sources, including nonpoint-source runoff. This work compared median WWTPs loads to median downstream loads, which includes the combination of the point and nonpoint sources. Because of the difficulty of accurately characterizing contributions from WWTP bypasses that occurred during storm events, these loads were not included in these estimates. The percentage of the total nutrient load estimated to originate from treated effluent ranged from 28 to 61 for total nitrogen and 16 to 56 for total phosphorus loads in the Blue River Basin stream reaches. The upper Blue River reaches had the lowest nutrient contributions from WWTP effluents and Indian Creek had the largest. Differences in WWTPs contributions were related to the number of discharges upstream from sites, the volume of discharges, the proximity of sites to discharge points, and the treatment processes employed.

Rasmussen and others (2008) quantified treated effluent from WWTPs for 2005 and 2006 and determined that 40 to 90 percent of the total nitrogen and 25 to greater than 90

percent of the total phosphorus load in selected Blue River Basin stream reaches originated from WWTP effluent. As with a previous study (Wilkison and others, 2006), WWTP contributions were lowest in the upper reaches of the Blue River and greatest in the lower reaches of Indian Creek. During dry years, the relative contribution from WWTPs to basin streams generally increases because WWTP contributions remain relatively stable throughout the year, and nonpoint-source runoff contributions effectively diminish.

As nutrients are added to the Blue River Basin, important instream biogeochemical pathways and processes transform, remove, or add to concentrations. Biogeochemical pathways and processes include sediment deposition and resuspension, denitrification, microbial degradation, plant senescence, and assimilation into plant and animal matter. From the synoptic sampling events conducted between August through September 2004 and August 2005, there is evidence of nutrient loss in the approximately 20-km reach of the Blue River downstream from Indian Creek during this period. Between sites 7 and 9 and sites 21 and 24, there was a 13 percent decrease in total nitrogen and a 26 percent decrease in total phosphorus loads. Sedimentation may account for some of these losses; however, there were even more substantial losses of dissolved nutrients (33 percent for dissolved nitrate and 52 percent for dissolved orthophosphate) in this reach (fig. 8). These data indicate that assimilation by benthic plants and denitrification can sometimes play a role in dissolved nutrient decreases. Nutrient assimilation and denitrification would likely be greatly decreased in the winter at water temperatures below 10 °C, so these data, which were collected during warmer periods, likely represent a period of maximum nutrient removal. Previous data collected between May 1999 and June 2004 indicated that, although there were slight decreases in loads along this 20-km reach, the differences were not statistically significant (Wilkison and others, 2006), another indication that assimilation and denitrification processes are likely limited to selected periods during any given year.

Base flow nutrient sources are only part of the nutrient sources in the basin because during wet-weather events other sources, such as nonpoint-source runoff and CSOs, contribute nutrients to streams. During intense, or prolonged storms, sanitary sewer overflows and WWTP bypasses also contribute nutrients to streams. In some stream reaches, stormflow nonpoint-nutrient contributions are the principal component (Wilkison and others, 2006). These contributions are addressed in a later section (Annual Contribution of Constituents) of this report.

Metals are described in this report as the sum of the dissolved concentrations of cadmium, chromium, copper, lead, nickel, and zinc and loads at stream sites. Metals concentrations and loads are shown in figure 9 along with the concentration and load of dissolved zinc in stream samples. Wastewater effluent and nonpoint-source runoff would be expected sources of metals in an urban environment. The largest dissolved-metals concentration was observed at Indian Creek, site 6, the stream reach with the highest percentage of treated effluent.

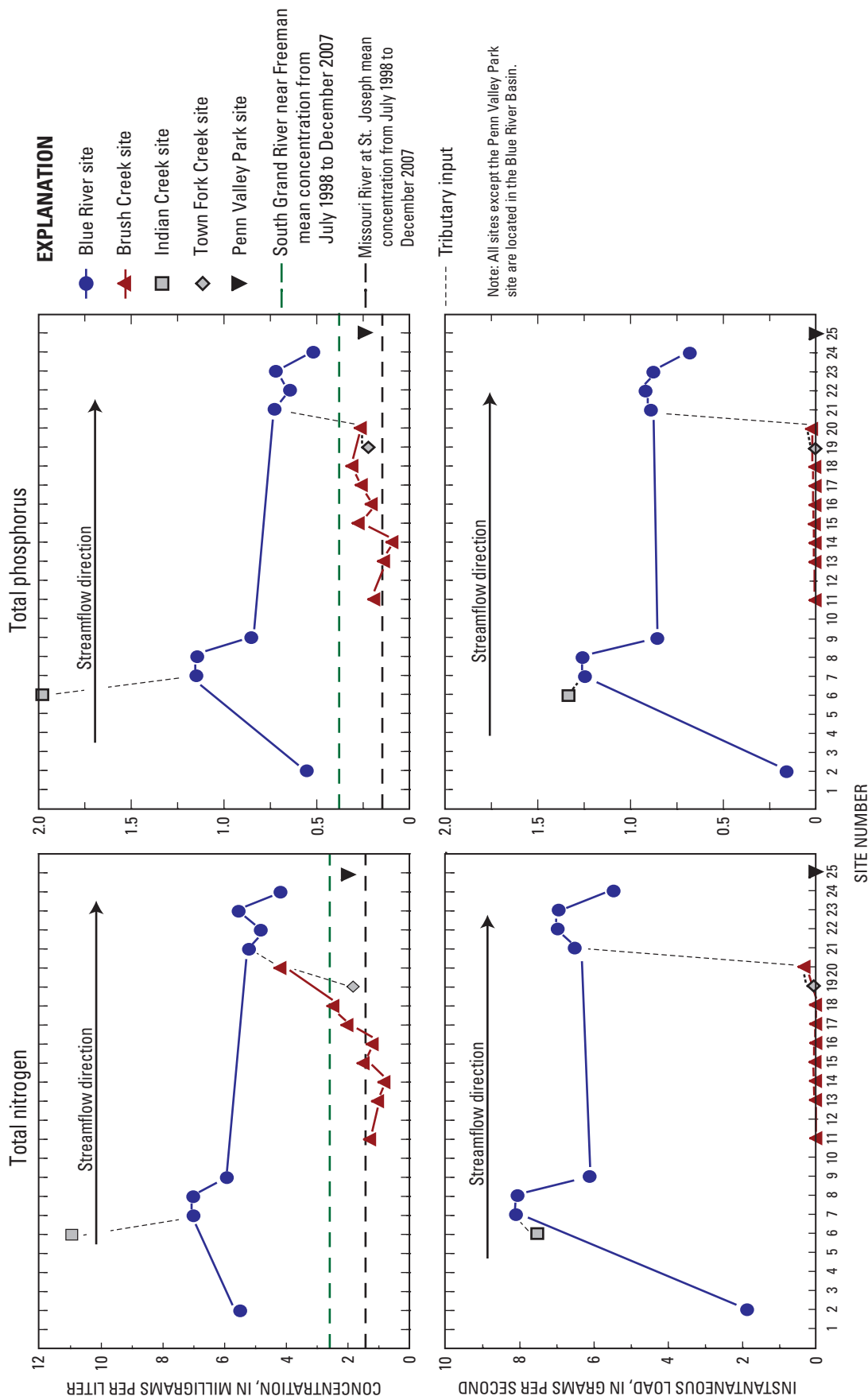


Figure 8. Average total nitrogen and total phosphorus concentrations and loads at study sites for samples collected during three synoptic base-flow sampling events between August 2004 and August 2005.

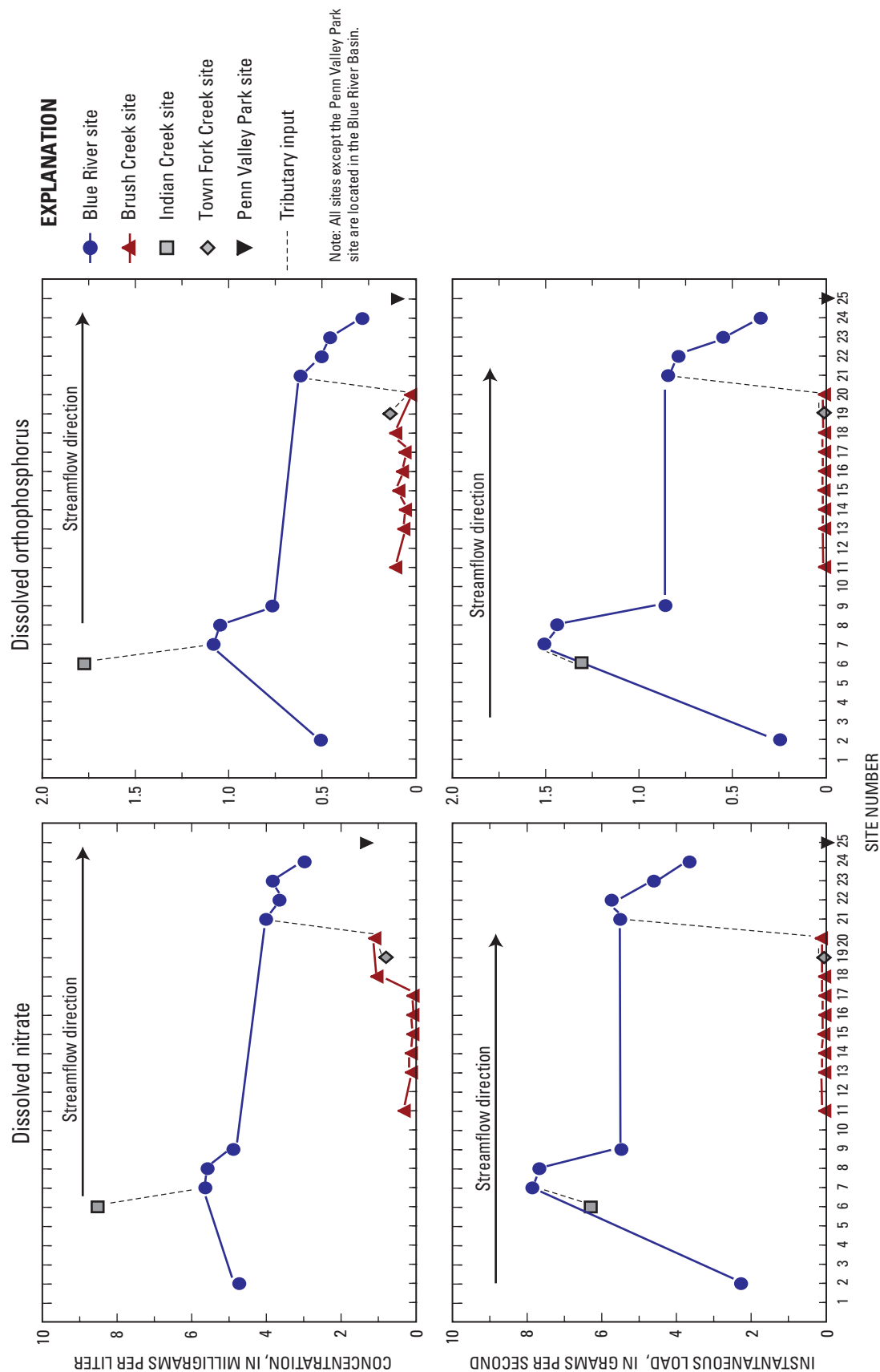


Figure 8. Average total nitrogen and total phosphorus concentrations and loads at study sites for samples collected during three synoptic base-flow sampling events between August 2004 and August 2005.—Continued

Zinc concentrations at site 6 also constituted the largest percentage of the total metals measured (71 percent) as compared to other sites. Concentrations of individual metals in base-flow synoptic samples were well below the standard for acute and chronic aquatic life protection (Missouri Department of Natural Resources, 2007). The solubility of metals is strongly linked to the source of the metals. Metals derived from the weathering of alumino-silicate materials, such as loess, have extremely limited solubility in streams; typically, only copper and zinc have solubilities that would provide concentrations above detection limits at the pH range of most surface waters (Desboeufs and others, 2005). By contrast, metals originating in urban areas are more likely to be adsorbed impurities or salts that are extremely soluble in the range of pH values observed in stream samples. Therefore, dissolved metals in stream samples in the Blue River Basin are likely to originate from anthropogenic sources during base-flow conditions.

In Brush Creek, there were general increases in dissolved metals and zinc concentrations from the most upstream (site 11) to the downstream site (site 20). These data are another indication of a shift toward nonpoint-source contributions in the middle and lower reaches of Brush Creek. The upstream Brush Creek site also had the lowest percent of zinc (17 percent) as compared to the total dissolved-metals concentration measured at all other sites in the basin.

Bacteria Densities and Sources

Bacteria densities are strongly linked to stormwater runoff in the basin. *E. coli* densities in stream samples collected from 1998 to 2007 are shown in figure 10. *E. coli*, a species of fecal coliform bacteria specific to human and other warm-blooded animals, is considered to be an important indicator of health risk from contact with recreational waters. *E. coli* densities measured in stream samples ranged over five orders of magnitude. Median *E. coli* density in base-flow samples was 185 colonies per 100 milliliter (col/mL) compared to median values of 100 times that amount in stormflow samples (18,200 col/mL). The range and variability of *E. coli* measured in base-flow samples was much greater than in stormflow samples, primarily because *E. coli* in stormflow samples largely are attached to sediment in the stream, which is largely a function of the discharge, whereas the bacteria density in base-flow samples is often related to a greater number of factors than discharge and sediment concentration. These include temperature, length of time since the last rainfall event, algal density, intensity and duration of sunlight, and bacteria regrowth. The median *E. coli* density for all samples, base-flow and stormflow combined, was 415 col/100 mL, which is near the median estimated value determined by Rasmussen and others (2008) for Indian Creek near the Kansas-Missouri State line (385 col/100 mL), the most urbanized site sampled as part of that study.

One site, Town Fork Creek (site 19), a tributary to Brush Creek, consistently had higher base-flow and stormflow fecal-

indicator bacteria densities than the overall median densities measured at other stream sites. The median *E. coli* density in base-flow samples from Town Fork Creek (825 col/100 mL) was nearly twice the median base-flow sample density in other parts of the basin. Stormflow samples collected at Town Fork Creek had *E. coli* densities (median value of 170,000 col/100 mL) about 10 times greater than the median value for all stormflow samples (18,200 col/100 mL). During a typical year, the CSO volume is estimated to be approximately 23 percent of the total storm runoff volume in Town Fork Creek (City of Kansas City, Missouri, written comm., 2008), a likely factor in the high fecal-indicator bacteria densities measured in this stream. In fact, median *E. coli* densities in Town Fork Creek stormflow samples were above the median density of samples collected from CSOs (fig. 10). By contrast, three samples collected at Brush Creek at Belinder Avenue, site 12, located upstream from the CSS area had median *E. coli* densities slightly less than the densities measured in stormwater outfall samples collected in the basin.

Town Fork Creek flows into an impounded reach near the lower end of Brush Creek. During runoff events, suspended sediments from Town Fork Creek and upstream Brush Creek reaches (Wilkison and others, 2006) and, therefore, bacteria—because bacteria are strongly associated with particulate matter—settle out in the lower reaches of Brush Creek. Previous bottom sediment samples from Brush Creek were enriched with organic wastewater compounds as compared to other stream reaches in the basin; however, fecal-indicator bacteria densities in bottom sediments were quite low—less than 50 colonies per 100 gram (g) of sediment (Wilkison and others, 2006).

The city of Kansas City, Missouri, maintained a sampling program at 10 sites in the CSS area over the period 2005 to 2006. These included sites sampled as part of this study (sites 8, 9, 13, 16, 18–20, and 25), as well as the outflow to Penn Valley Lake (site 26), and also included one site on the Missouri River. As part of this program, grab samples generally were collected weekly from April through November without regard to hydrologic condition. Samples were not collected at every site each week and fewer samples were collected in December and January of each year. These data generally fit the range of values seen in the base-flow and stormflow samples collected as part of this study. However, because weekly values were censored at 100 col/100 mL, the lower end of the data range is not clearly expressed in a boxplot (fig. 10). In reality, the lowest values from the weekly sampling would likely follow a random distribution pattern in the range from 1 to 100 col/100 mL similar to that observed in the base-flow samples collected as part of this study. Additionally, 60 percent of samples were collected during base-flow conditions compared to 40 percent collected during stormflow runoff. It is unknown how many of the weekly event samples were collected during or immediately following runoff events. Together these data are an indication of typical *E. coli* densities that occur not just in streams in the CSS area, but also in the most urban parts of the city.

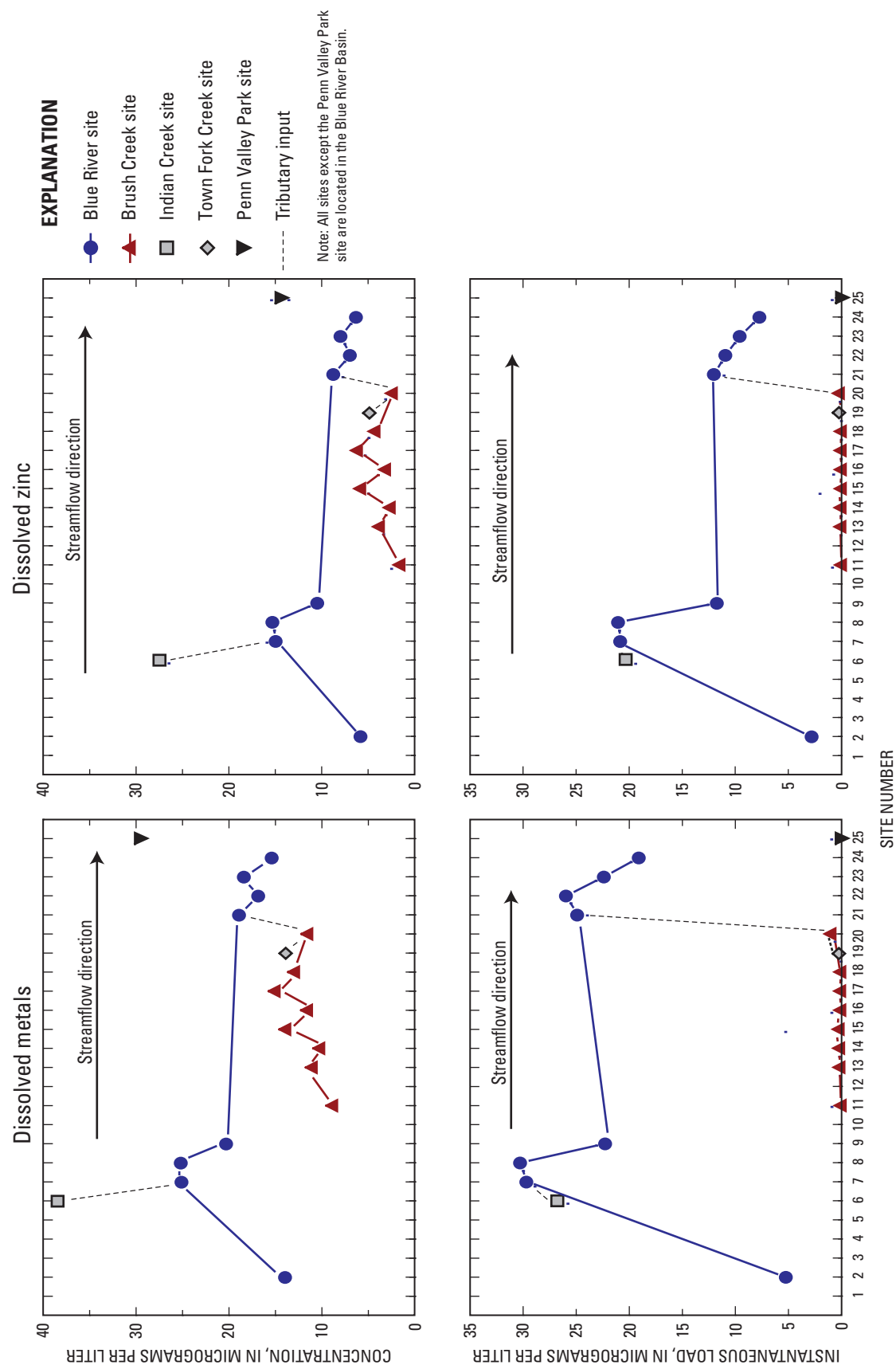


Figure 9. Average dissolved metal (sum of cadmium, chromium, copper, lead, nickel, and zinc) concentrations and instantaneous metal loads and average dissolved zinc and instantaneous zinc loads at study sites for samples collected during three synoptic base-flow sampling events between August 2004 and August 2005.

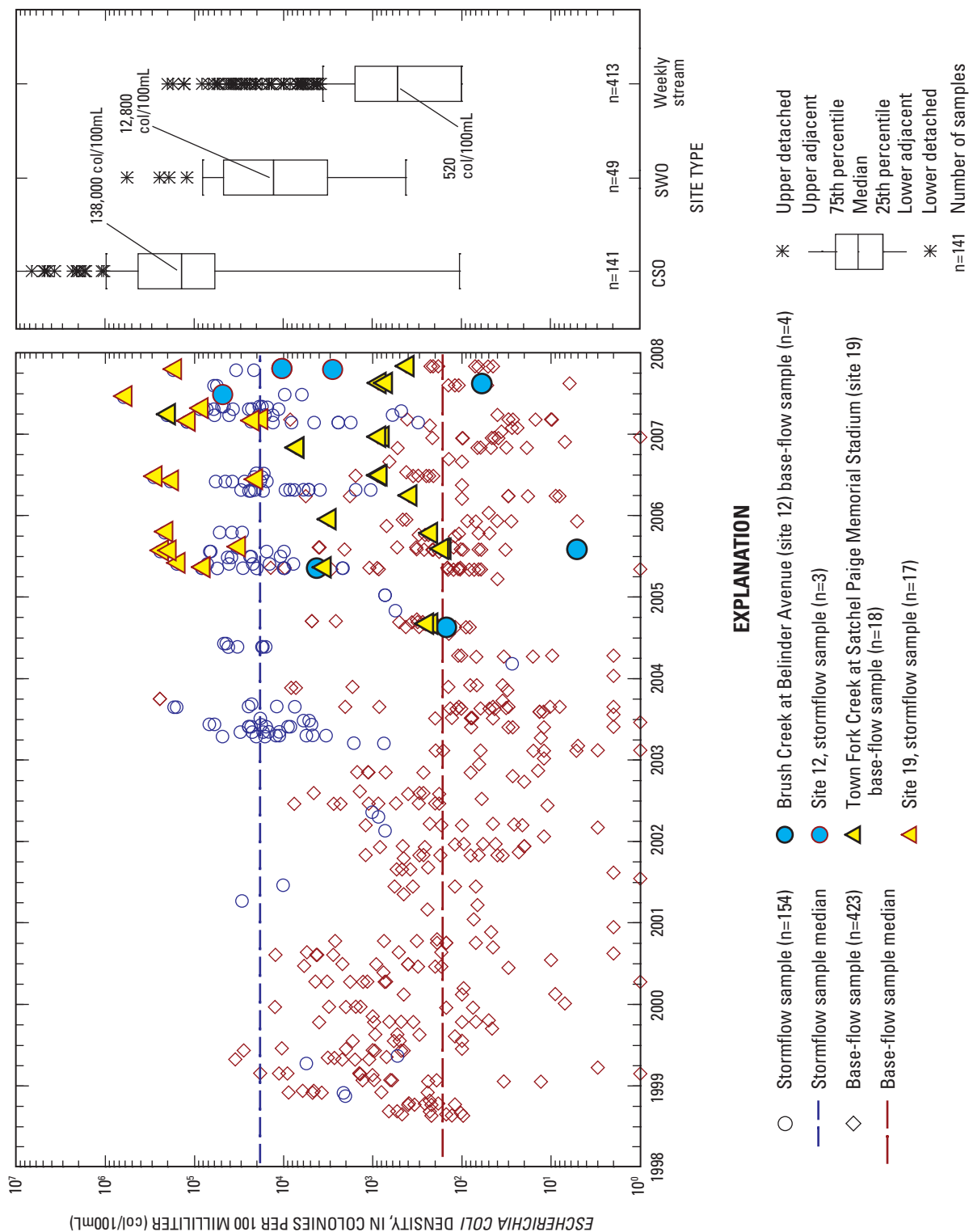


Figure 10. *Escherichia coli* densities in stream samples collected from 1998 through 2007 as part of this study compared to densities measured in combined sewer overflows (CSO), stormwater outfalls (SWO), and stream samples collected as part of the City of Kansas City, Missouri weekly sampling program in 2005 and 2006.

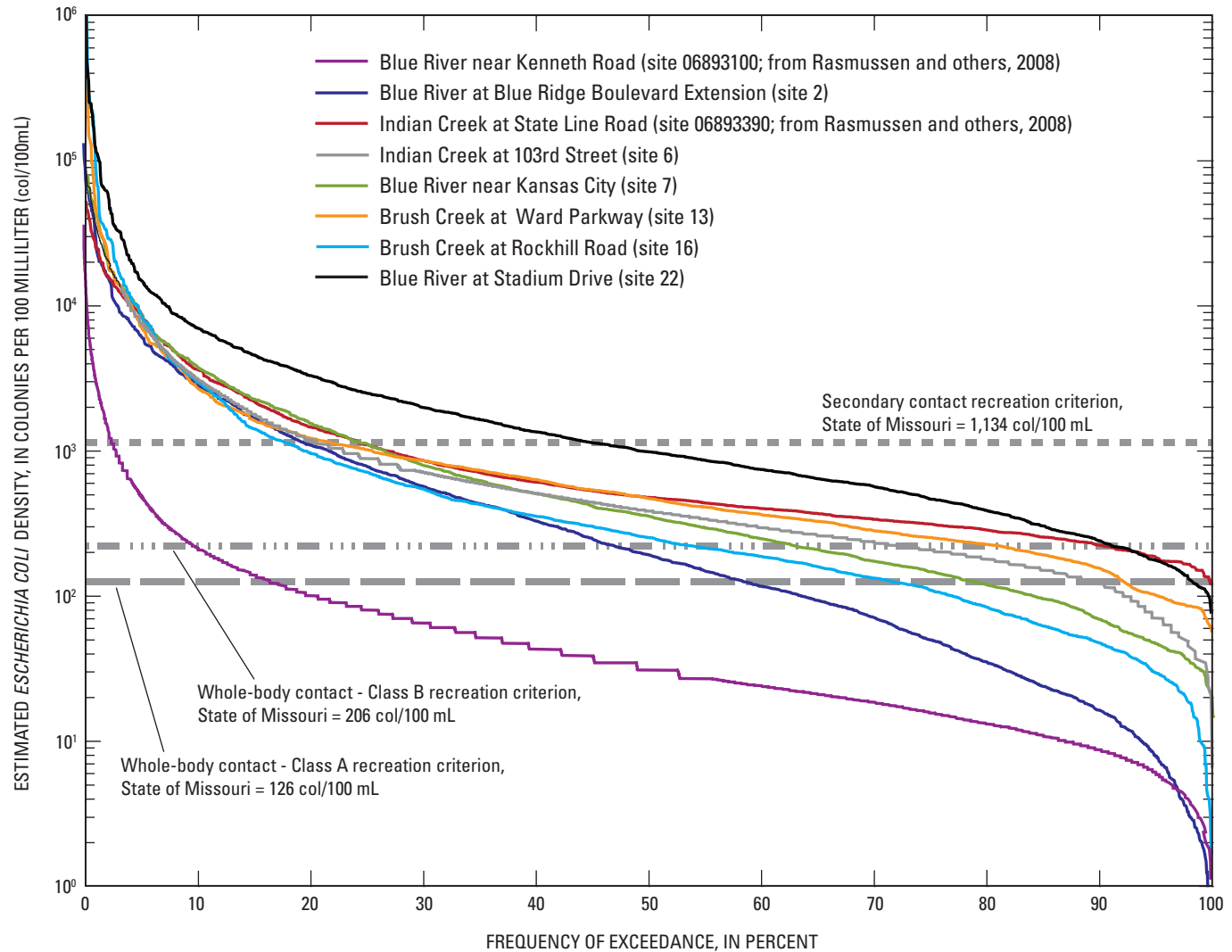


Figure 11. Estimated daily mean *Escherichia coli* density duration curves at water-quality sites in the Blue River Basin, October 2002 through September 2007.

In 2005, the city of Kansas City, Missouri, collected samples for *E. coli* determination (fig. 10) from nine CSOs or diversion structures and six stormwater outfalls. Stormwater outfall samples were collected during runoff events that drained predominantly commercial, industrial, or residential land use areas. Median *E. coli* densities from CSOs were 138,000 col/100 mL, more than 10 times the median value measured in stormwater outfall samples and about 7.5 times the median value measured in USGS stormflow samples from all sites in the Blue River Basin (18,200 col/100 mL). Median *E. coli* densities from stormwater outfalls located in residential land-use areas were 5 times higher than those in industrial areas and 15 times higher than those from areas where commercial land use predominated. These data indicate that large amounts of fecal-indicator bacteria in receiving waters originate as nonpoint-source pollution in residential areas. Additionally, these data indicate that leaks or compromised sewer lines may affect elevated instream fecal-indicator bac-

teria densities enumerated in more densely populated parts of the city. Sewer leaks would not likely be observed in the field directly discharging into receiving waters—especially because in many reaches of Brush Creek impoundment, water levels are higher than the surrounding sewer grade—unless the leaks were major or connected to a force main. Instead, because of sewer lines construction, small leaks would likely gravitate to the underlying gravel pack and from there, potentially migrate through the gravel pack and then downgradient to receiving waters. Backfilled trenches for placement and relocation of other infrastructure such as telephone, computer, and cable lines also likely have created numerous preferential pathways, many of which likely intersect zones where sewer lines have been placed. Although some biotransformation along these short-circuited, preferential flow paths likely would occur, it would probably amount to less biotransformation than possible when water migrates through unsaturated zone soils. Estimates of the percentage of annual contributions of

Table 14. *Escherichia coli* bacteria standards applicable to stream reaches of the Blue River, Missouri and Kansas, 2009.

[col/100 ml, colonies per 100 milliliters of water]

Criterion	Applies to	Description	Designated use and (applicable standard)
2,358 col/100 mL	Headwaters to State line	Geometric mean of at least five samples in 30-day period from November to March	Primary contact recreation in public waters (Kansas Department of Health and Environment, 2005)
2,358 col/100 mL	Headwaters to State line	Single sample at any time during the year	Secondary contact recreation in public waters (Kansas Department of Health and Environment, 2005)
262 col/100 mL	Headwaters to State line	Geometric mean of at least five samples in 30-day period from April to October	Primary contact recreation in public waters (Kansas Department of Health and Environment, 2005)
206 col/100 mL ¹	State line to Bannister Road (site 7)	Geometric mean during the recreational season from April 1 to October 31 in waters designated for recreation or at any time in losing streams	Whole body contact—Class B ¹ (State of Missouri, 2008)
126 col/100 mL	Bannister Road (site 7) to 59th Street (approximately 2.1 kilometers north of site 9)	Geometric mean during the recreational season from April 1 to October 31 in waters designated for recreation or at any time in losing streams	Whole body contact—Class A (Missouri Department of Natural Resources, 2007)
206 col/100 mL ¹	59th Street (approximately 1.3 miles north of site 9) to confluence with Missouri River	Geometric mean during the recreational season from April 1 to October 31 in waters designated for recreation or at any time in losing streams	Whole body contact—Class B ¹ (State of Missouri, 2008)

¹Emergency rule adopted December 15, 2008. Prior standard was 528 colonies per 100 milliliters.

fecal-indicator bacteria originating from point and nonpoint sources in the basin are discussed in the Annual Contribution of Constituents section of this report.

Cumulative duration curves for estimated daily mean *E. coli* densities at eight water-quality sites in the Blue River Basin from October 2002 to September 2007 are shown in figure 11. Estimates were determined by dividing the daily load estimates by the daily mean discharge at a given site. These curves show the amount of time estimated fecal-indicator bacteria densities were exceeded at eight sites in the basin. Thus, a frequency of 100 percent exceedance would indicate the lowest estimated density, and a frequency near zero would indicate the highest estimated density.

There are currently (2009) six separate *E. coli* bacteria standards that apply to the main stem of the Blue River (table

14), in part, because of the interjurisdictional nature of the basin, but also because designated uses for the stream change once it crosses into Missouri (Kansas Department of Health and Environment, 2005; Missouri Department of Natural Resources, 2007; State of Missouri, 2008). With the exception of the Kansas secondary contact recreation criterion, standard compliance is determined by comparison with the geometric mean of samples collected during specific timeframes throughout the year (table 14). In Missouri, standard compliance for fecal-indicator bacteria is assessed from the geometric mean of at least five samples collected during the recreational season (defined from April 1 to October 31) over a period of 3 years. If the geometric mean for any year exceeds the applicable standard, the stream is deemed impaired. However, to illustrate and provide an understanding of the frequency at which

Table 15. Percentage of days, by month, from October 2002 through September 2007 where estimated daily mean *Escherichia coli* densities in Blue River Basin streams would have met three levels of State of Missouri fecal-indicator bacteria criteria.

[<, less than]

Stream	Sites included	State of Missouri secondary contact recreation criterion: 1,134 colonies per 100 milliliters												Average	
		Janu-ary	Febru-ary	March	April	May	June	July	August	Septem-ber	October	Novem-ber	Decem-ber	Yearly	April–October
Blue River	2, 7, and 22	91	85	86	73	58	42	57	60	55	70	82	83	69	59
Indian Creek	6	85	74	75	73	70	62	74	75	79	77	83	81	75	73
Brush Creek	13 and 16	93	93	91	86	80	67	72	66	68	73	84	89	79	73
State of Missouri whole-body contact-Class B recreation: 206 ¹ colonies per 100 milliliters															
Stream	Sites included	Janu-ary	Febru-ary	March	April	May	June	July	August	Septem-ber	October	Novem-ber	Decem-ber	Yearly	April–October
Blue River	2, 7, and 22	57	51	35	29	17	5	21	26	14	27	46	37	30	20
Indian Creek	6	19	9	2	3	4	2	17	15	1	2	1	14	8	6
Brush Creek	13 and 16	50	59	48	40	26	20	22	16	23	12	17	30	30	23
State of Missouri whole-body contact-Class A recreation criterion: 126 colonies per 100 milliliters															
Stream	Sites included	Janu-ary	Febru-ary	March	April	May	June	July	August	Septem-ber	October	Novem-ber	Decem-ber	Yearly	April–October
Blue River	2, 7, and 22	39	40	22	17	9	2	15	18	9	19	36	28	18	15
Indian Creek	6	<1	<1	<1	<1	<1	<1	1	1	<1	<1	<1	<1	<1	<1
Brush Creek	13 and 16	29	43	35	30	14	10	10	10	11	3	6	19	17	12

¹Standard adopted by emergency rulemaking December 15, 2008. Prior standard was 528 colonies per 100 milliliters.

bacteria densities might have been expected to fall above or below a particular threshold from September 2004 through October 2007, whole-body and secondary contact criterion are plotted in relation to the estimated density duration curves on figure 11.

Estimated *E. coli* density graphs (fig. 11) illustrate a number of different things. *E. coli* densities are lowest throughout the entire range of densities at the least urban site [Blue River near Kenneth Road (site 06893100); Rasmussen and others, 2008.] A similar trend was seen with other Johnson County, Kansas, sites in that the lowest *E. coli* densities were observed at the most rural sites (Rasmussen and others, 2008). Slightly more than 80 percent of the time, *E. coli* densities at the Kenneth Road site were below the Missouri whole-body contact Class A recreation criterion of 126 col/100 mL; however, because the site lies immediately upstream from the Kansas-Missouri State line, State of Kansas standards apply (Kansas Department of Health and Environment, 2005). Under Kansas standards (262 col/100 mL), the estimated *E. coli* density would be below the standard approximately 90 percent of the time; both the State of Missouri and State of Kansas secondary contact criteria would be met more than 95 percent of the time at this site.

Applicable *E. coli* standards for the Blue River vary by stream reach based upon the designated use (table 14). Class A stream reaches are those reaches where free and open access by the public for swimming is allowed; Class B stream reaches are those reaches where other forms of whole-body-contact recreational use other than public swimming are allowed (Missouri Department of Natural Resources, 2007). Secondary contact recreation uses include fishing, wading, recreational boating, and incidental contact with the water. At site 2, for example, the estimated *E. coli* densities were less than the Missouri secondary contact recreation criterion (1,134 col/100 mL) about 85 percent of the time in October 2002 to September 2007 (fig. 11), with higher densities occurring primarily during stormflow runoff. However, during that same time, the whole-body contact B criteria would have been exceeded slightly more than one-half the time at site 2.

Stream segments of the Blue River downstream from the Kansas-Missouri State line are currently (2009) listed (table 14) for whole body contact—Class A (geometric mean of 126 col/100 mL) or whole body contact—Class B (geometric mean of 206 col/100 mL). Before December 15, 2008, the Missouri Class B standard was 528 col/100 mL. For the Class A reach of the Blue River from Bannister Road (site 7) to 59th Street (approximately midway between sites 9 and 10; fig. 1), estimated daily *E. coli* densities were below the Class A standard from 2002 to 2007 approximately 20 percent of the time, based on site 7 data (fig. 11). From 59th Street to the mouth at the Missouri River, where the less rigorous Class B standard is in place, estimated daily *E. coli* densities exceeded the Class B threshold value approximately 90 percent of the time from October 2002 through September 2007, based on site 22 data (fig. 11; table 15). If the Missouri secondary contact recreation criterion for *E. coli* of 1,134 col/100 mL were to be adopted

for all Missouri reaches of the Blue River Basin, this standard would be exceeded approximately 30 percent of the time, primarily during wet weather events (table 15).

Instream fecal-indicator bacteria were evaluated to determine presumptive *E. coli* sources through the use of genotypic microbial source-tracking methods. These methods compared the similarity of genetic markers from host species *E. coli* to those from instream *E. coli* to identify presumptive sources of *E. coli* at stream sites in the basin. Base-flow and stormflow-runoff samples from nine sites in the basin were analyzed for host sources. The amount of bacteria in a sample assigned to a presumptive host source was determined from the percentage that each host class represented of the total *E. coli* density enumerated from the sample. Because bacteria densities in stormwater runoff are much greater than in base-flow samples, sources that contribute most heavily during storms would constitute a much higher percentage of the total number identified. From the density weighted mean percent of all 56 samples collected from February 2000 to August 2007, 30 percent were assigned to presumptive dog sources, 5 percent were assigned to geese, 58 percent to human, and 7 percent were from unknown, or unclassifiable, sources (table 16). The overall percentages of human-derived bacteria are higher than those previously reported for base-flow samples (Wilkison and others, 2006).

Almost one-half (45 percent) of the human *E. coli* bacteria measured in stream samples originated from two storm events on Town Fork Creek (site 19). This was, in part, because site 19 had large densities of human-sourced bacteria and because stormflow densities were so much greater than base-flow densities (tables 7 and 8). When samples are viewed from the hydrologic event perspective, a higher percentage of the *E. coli* is derived from human sources during storm events than during base-flow events (table 16). This was expected because several human-source pathways are confined to storm runoff. During large storms, CSO and WWTP bypasses contribute large amounts of untreated wastewater bacteria to streams, although some bypass discharges are treated to remove bacteria.

Stormwater runoff also can mobilize previously deposited sediments, which may harbor fecal-indicator bacteria for extended periods (Van Kessel and others, 2007; Donovan and others, 2008). As evidenced by the high percentage of human bacteria in base-flow samples (43 percent), the environmental persistence of *E. coli* may be a concern in the basin. Infiltration and the subsequent migration of water through the unsaturated and saturated zones in areas with compromised sewer lines also may affect the high percentages of presumptive human *E. coli* observed in base-flow stream samples. The role of such phenomena, essentially a short-circuiting of the sewer system, likely represents a substantial, though as yet unquantified contribution to instream fecal-indicator bacteria.

Only a very small percentage of the total *E. coli* bacteria in basin streams in any given year was characterized using microbial source tracking methods. Consequently, the percentage of each host class can vary substantially from year to year

Table 16. Percentage of *Escherichia coli* measured in stream samples collected between February 2000 and August 2007 assigned to presumptive host sources.

[Numbers in bold are basin averages weighted by sample bacterial densities; <, less than]

Hydrologic condition	Stream name	Site(s) included (fig. 1)	Number of samples	Number of isolates	Presumptive host source			
					Dog	Goose	Human	Unknown or unclassified
	Brush Creek	13, 15, 16, 20	23	304	24	16	43	17
	Blue River	2, 7, 22	22	296	42	16	40	3
	Indian Creek	6	7	123	31	25	38	6
	Town Fork Creek	19	4	57	29	< 1	65	6
Base-flow		2, 6, 7, 13, 15, 16, 19, 20, 22	49	652	37	16	43	4
Stormflow		2, 6, 7, 13, 16, 19, 20, 22	7	128	30	5	58	7
	All samples (weighted by densities)	2, 6, 7, 13, 15, 16, 19, 20, 22	56	780	30	5	58	7

and, thus, caution should be exercised in assuming that these percentages are entirely representative of basin streams. Single storm events, because of their ability to mobilize large *E. coli* densities, can account for almost all the *E. coli* bacteria in any given year (Rasmussen and others, 2008). Host-source data indicate that while other animal sources can at times contribute the bulk of *E. coli* to streams, human bacteria frequently constitute a substantial part of the stream *E. coli* load.

Trends with Time

Trends are the changes, either increases or decreases, in measurements over a specific time period. Determination of whether or not significant changes are occurring in water chemistry with time is especially important if substantial changes are happening, or projected to happen, within the basin. The CSO control plan has components designed to alter selected stream reach hydrology and reduce contaminant inputs. Therefore, the plan has the potential to substantially alter stream water chemistry. Thus, an understanding of trends is important to providing a basis for understanding the effectiveness of mitigation strategies.

Flow-adjusted concentration trends were calculated because concentration trends are often strongly affected by streamflow trends. By removing streamflow trends that may

be present, flow-adjusted trends reflect changes that have occurred in the basin over time, such as land-use changes or implementation of best-management strategies designed to reduce either point or nonpoint-source contributions.

Discrete water samples collected over a range of hydrologic conditions were used to develop load-estimation models for selected constituents (table 17, at the back of this report). These load-estimation models then were used to determine daily, monthly, seasonal, and annual load estimates and to determine flow-adjusted trends with time. The monthly, seasonal, and annual loads were sums of daily loads over the appropriate time span. Flow-adjusted trends in water-quality data were determined for the period of 1998 through 2007 at four sites (sites 7, 13, 16, and 22) in the basin and for the period 2002 through 2007 at two sites (sites 2 and 6) in the basin. The time span was chosen based upon the length of data collection at each site and for each constituent modeled. Flow-adjusted trends were determined by use of fitted linear regression models that compared concentration to flow, time, and in some cases yearly or seasonal terms.

Table 18 (at the back of this report) lists flow-adjusted trend data determined at sites and model parameters used to fit the trend models. Where possible, monotonic (changing in one direction only) flow-adjusted trends were determined at stream sites for 22 constituents by fitting a model that met previously defined model-selection criteria. Constituents for flow-

Table 19. Summary of flow-adjusted concentration trends at sites in the Blue River Basin, 1998 through 2007.

[FAC, flow-adjusted concentration; n, number; p, significance level; --, not applicable; >, greater than; <, less than or equal to]

Site number (fig.1)	Period of analysis	Fitted FAC models	FAC models with no significant trend (p>0.05)		FAC models with significant trends (p< 0.05)		FAC models with significant and downward trends			FAC models with significant and upward trends		
		n	n	Percent-age of total fitted	n	Percent-age of total fitted	n	Percent-age of total fitted	Average annual decrease	n	Percent-age of total fitted	Average annual increase
2	June 2002–Sept. 2007	18	14	78	4	22	4	22	- 15	0	0	--
6	April 2002–Sept. 2007	20	13	65	7	35	6	30	-6.5	1	5	2.0
7	Oct. 1998 – Sept. 2007	20	11	55	9	45	6	30	-5.9	3	15	4.5
13	Oct. 1998–Sept. 2007	19	13	68	6	32	6	32	-7.1	0	0	--
16	Oct. 1998–Sept. 2007	19	15	79	4	21	4	21	-6.4	0	0	--
22	Oct. 1998–Sept. 2007	21	9	43	12	57	11	52	-6.7	1	5	7.0
Total or average		117	75	64	42	36	37	32	-8	5	4	5

adjusted trend analysis included total and dissolved nutrients, chloride, suspended sediment, fecal-indicator bacteria, and selected organic wastewater indicator compounds including caffeine, DEET, sterol, and triclosan. In this method, trends can rise and fall with time; however, the average flow-adjusted trend over the entire time period is reported (table 18). Flow-adjusted trends were considered significant only if the significance level of the time term was less than or equal to 0.05 ($p < 0.05$). Fitted models with time terms that have significance levels greater than 0.05 ($p > 0.05$) indicate that conditions in the basin have not significantly changed over time with respect to that particular constituent.

Approximately two-thirds (64 percent) of the fitted flow-adjusted models did not have a significant time trend. These data indicate that conditions generally remained stable with time in the basin over the period October 1998 through September 2007 (table 19). However, where significant flow-adjusted concentration trends were determined, most (88 percent) were declines and these were primarily associated with constituents strongly associated with suspended sediment.

Significant flow-adjusted declines in suspended-sediment concentration occurred at five of the six sites in the basin (table 18). Declines in flow-adjusted suspended-sediment concentrations from October 1998 through September 2007 were significant ($p < 0.001$) at sites 7, 13, and 22 and at sites 2 and 6 from October 2002 through September 2007. Flow-adjusted suspended-sediment concentrations also declined at site 16, Brush Creek at Rockhill Road, but the trend was not statistically significant. Flow-adjusted suspended-sediment concentrations declined at sites 7, 13, and 22 by an average 8 percent

per year over the 9-year period from October 1998 through September 2007. These data indicate that limiting sediment supply to streams reduce many other constituent concentrations in basin streams. Declines in suspended-sediment concentration are important because many constituents, such as bacteria, some nutrients, and a number of wastewater-derived compounds, have a strong affinity for sediment particles.

Although flow-adjusted declines in fecal-indicator bacteria were observed at five of the six sites, the declines were only significant at site 2 (table 18) for the period October 2002 to September 2007. Significant declines also were observed at some sites for a number of other constituents (DEET, sterol, plastic compounds, and the sum of organic wastewater compounds) that have a strong affinity for sediment.

Observed declines in flow-adjusted suspended-sediment concentrations may be the result of several initiatives that began around the year 2000 in the basin. The city of Kansas City, Missouri, began several initiatives, such as more rigorous street sweeping and catch basin cleaning programs, around this time. Between 1999 and 2007, approximately 17,000 catch basins were cleaned annually as part of this program and more than 5,000 older ones replaced (Richard Gaskin, Kansas City, Missouri, Water Services Department, written commun., 2008). New design criteria for sediment erosion and control were adopted in the metropolitan area beginning in 2003 (American Public Works Association, written commun., 2008). In the several years prior to that time, a number of watershed groups as well as governmental and nongovernmental agencies began concerted efforts to educate the public about methods to reduce runoff, erosion, and protect basin

water quality. Although exact numbers are not available, these presentations have numbered in the thousands over the last 10 years and have reached an audience expected to number in the hundreds of thousands (Larry O'Donnell, Little Blue River Watershed Coalition, oral commun., 2008; Wendy Sangster, Missouri Department of Conservation, oral commun., 2008). Additionally, parts of the upper Blue River Basin (primarily upstream from site 2) experienced substantial suburban growth and development over the last 10 years resulting in the transformation of some agricultural land to developed land, which may be less vulnerable to erosion.

Significant increases in flow-adjusted concentrations were observed for dissolved chloride at two sites on the main stem of the Blue River (sites 7 and 22, table 18). These increases likely were related to increased, or more frequent, use of road deicers in the basin during, and in anticipation of, severe winter weather. As previously discussed, chloride concentrations in streams can remain elevated for weeks following such applications. A small, but significant, increase in flow-adjusted dissolved nitrite plus nitrate and total nitrogen was observed at site 7. Generally, more than 80 percent of the total nitrogen at this site is in the form of dissolved nitrate; therefore, an increase in dissolved nitrate likely would be reflected in the total nitrogen trend. Increases in total and dissolved nitrogen at this site may reflect upstream population increases (22 percent; U.S. Census Bureau, 2008) in the period 1998 to 2007 and the resultant increases in WWTP discharges, changes in land-use practices as land use becomes more urbanized or suburbanized, or a combination of both.

Table 18 also lists the reference concentrations over the modeled time frame. The reference concentration represents a central tendency (median) of the modeled data over the range of hydrologic conditions during the modeled period. The reference concentration is similar to the median value of all discrete water-quality samples (which includes base-flow and stormflow samples) and provides another means of comparing central tendencies between sites or a benchmark for comparison to future concentrations or densities. The reference value integrates many more values than does the median value of discrete base-flow and stormflow samples because the model output includes daily values over a minimum 5-year timeframe (water years 2003–2007), but in most cases the timeframe was 9 years (water years 1999–2007). Water years are the 12-month period, October of one year through September of the next year.

A flow-adjusted model attempts to factor out the effect of trends in flow from trends in concentration. It is important to note that the flow-adjusted trends in concentrations or densities does not necessarily equate to the trend in actual observed loads. This would only be the case if streamflow remained constant with time, which it does not. Instead, the flow-adjusted concentration trend reflects the average change that has occurred in the basin, whereas trends in basin loads reflect the trend in concentration plus the variability in flow conditions that occurred over the same time interval (fig. 12). In some years, especially those with large storms, increased

sediment loads occur because flow is such a large component of loads.

Flows in the Blue River Basin were much greater than average during the first year of data collection (July 1998–June 1999) when compared to the long-term average; flows in some months were more than 700 percent of the long-term average (fig. 13). For example, on the Blue River (site 7), 30 percent of all the daily mean flows greater than 2,500 cubic feet per second (ft^3/s) between July 1998 and December 2007 occurred during the first year. Based upon the long-term record at this site, flows of this magnitude would have an expected annual probability of occurrence of 0.02 percent (fig. 14) in any given year. There were 12 occurrences of daily mean streamflow in excess of 2,500 ft^3/s at site 7 between July 1998 and June 1999, an indication of just how wet the initial year of observations was with regards to normal streamflow.

Streamflow greatly affects constituent concentrations in the basin (Wilkison and others, 2006). This is partly because most sediment in the basin is transported in extremely large storms (Rasmussen and others, 2008). Large storms also trigger more CSOs, and extended periods of wet weather would be expected to raise groundwater levels in the basin and increase the likelihood and magnitude of any issues associated with sewer leaks. Conversely, drought periods also have a pronounced effect on constituent concentrations. This is because, in part, as the number or intensity of storm events decrease, opportunities for nonpoint-source transport also diminish. However, in effluent-dominated reaches, the percent of streamflow composed of treated effluent frequently increases to more than 95 percent during droughts. The number and length of CSO events likely will decline during drought periods.

The wetter than average period July 1998 through June 1999 was immediately followed by several years, July 1999 through July 2003, of below normal streamflow. This large decrease in streamflow over a relatively short timeframe also may have contributed to flow-adjusted concentration trend declines observed between 1998 through 2007.

The effect of increased streamflow in the early part of the study also is reflected in the monthly total nitrogen, total phosphorus, caffeine, DEET, triclosan, and sterol (defined in this report as the sum of coprostanol plus cholesterol) loads (table 20, at the back of this report). For these constituents, an average of 23 percent of the total Blue River load (site 7) over the period 1998 to 2007 was contributed during the first water year (October 1998 to September 1999). For Brush Creek, the average percent contribution during the first year was even higher, 27 percent at site 13 (Brush Creek at Ward Parkway) and 32 percent at site 16 (Brush Creek at Rockhill Road). These data indicate that extremely wet periods contribute increasingly larger amounts of constituents, in part, because many sources in the basin are triggered by rainfall. These sources include increased CSOs and more frequent WWTP bypasses as well as increased contributions from nonpoint sources during large rain events.

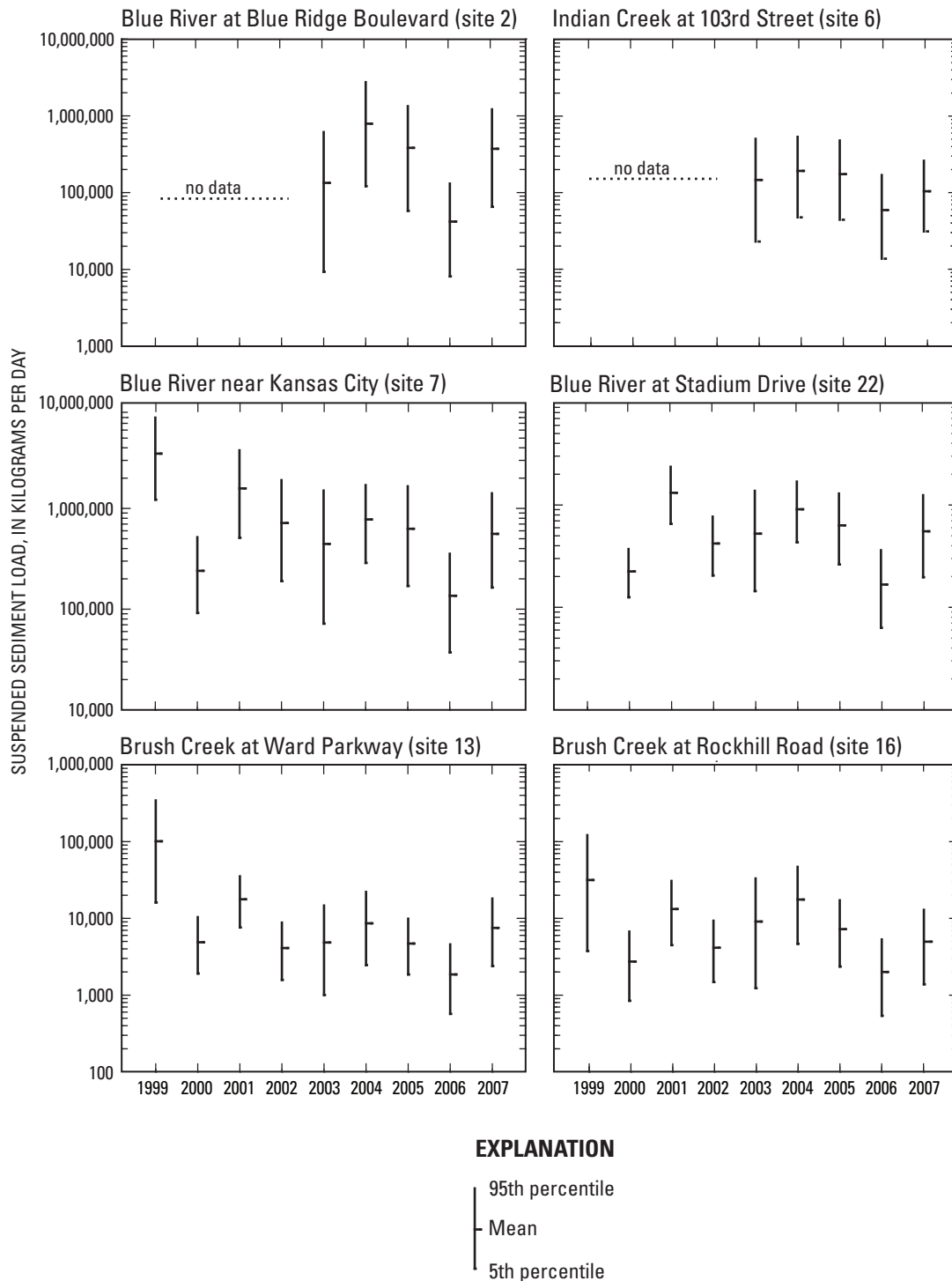


Figure 12. Daily mean load of suspended sediment at sites in the Blue River Basin for water years 1999 through 2007.

Estimated daily mean concentrations (or densities) for selected constituents at basin sites from the modeled data are shown in figure 15. Estimates are provided only for the period of record for sites where models met the previously defined model-selection criteria. Thus, for sites that began in 1998, data are shown for the period October 1998 to September 2007. At sites 2 and 6, where data collection began later,

data are shown from the spring of 2002 to September 2007. Estimated daily mean concentrations were determined by dividing the estimated daily load by the daily mean discharge; therefore, these estimates included the effects of flow on concentration and densities. Because plots (fig. 15) included daily estimates of values over many years, patterns that might not

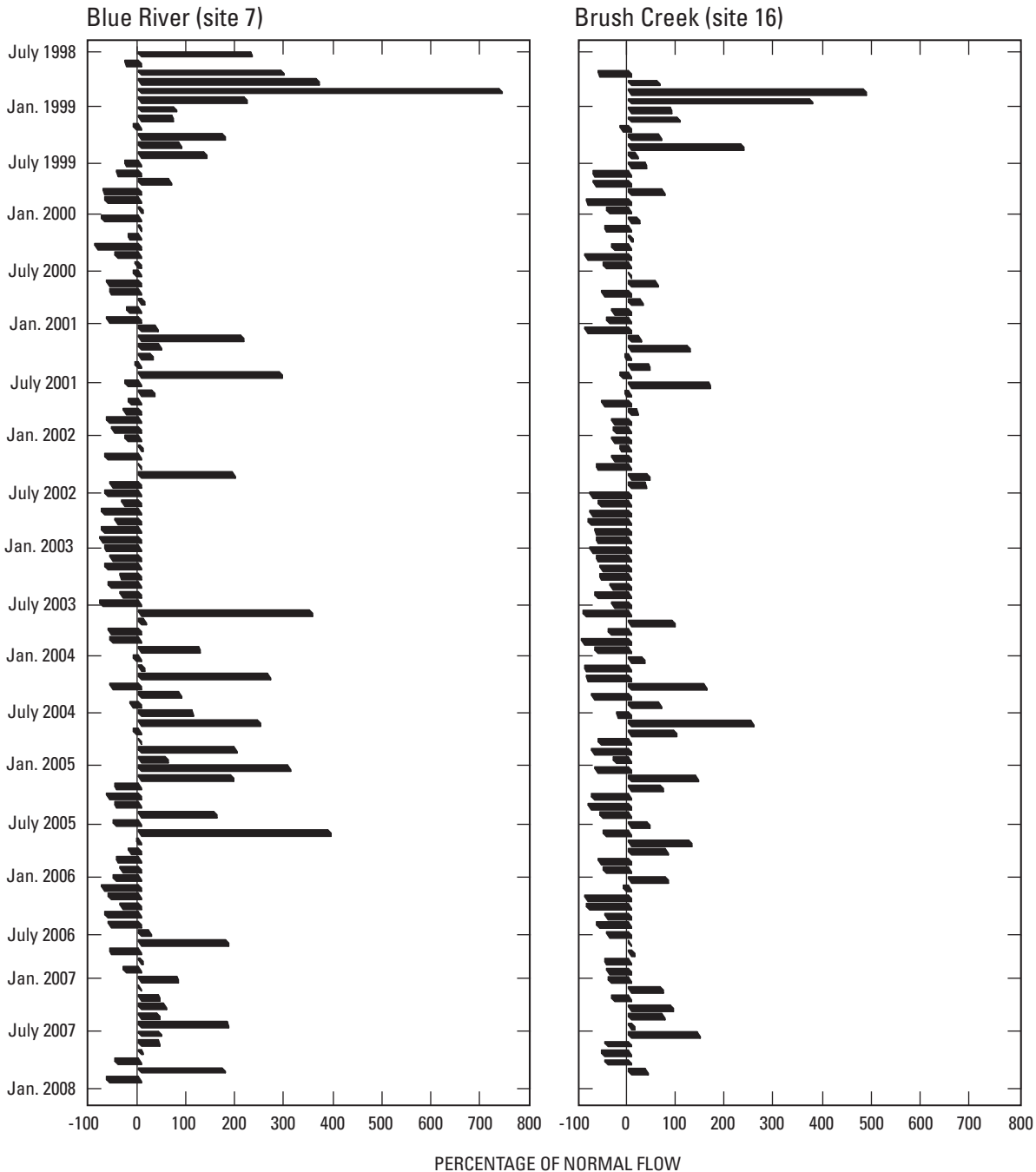


Figure 13. Monthly mean streamflow deviation from the long-term average on the Blue River (1939–2007) and deviation from the 10-year average (1998–2007) on Brush Creek from July 1998 through December 2007.

have been visible based solely upon examination of discrete values with time plots can be more readily observed.

There was considerable variation in the estimated daily mean concentration of constituents at any given site (fig. 15). Constituent concentration variations were affected by a variety of factors including streamflow, time of year, sources, the type of constituent, and combinations of these factors. For some constituents, the interannual concentration pattern changed in response to source differences. For example, at sites on the

Blue River (sites 2, 7, and 22) and Indian Creek (site 6) a part of the in-stream total nitrogen concentration resulted from WWTP inputs. These inputs occurred primarily in the dissolved phase (as dissolved nitrate) and resulted in increased total nitrogen concentrations during periods with the lowest streamflow (Wilkison and others, 2005). WWTP discharge permits for plants in the basin also allowed for increased concentrations of nutrients to be discharged during winter periods (U.S. Environmental Protection Agency, 2008) when

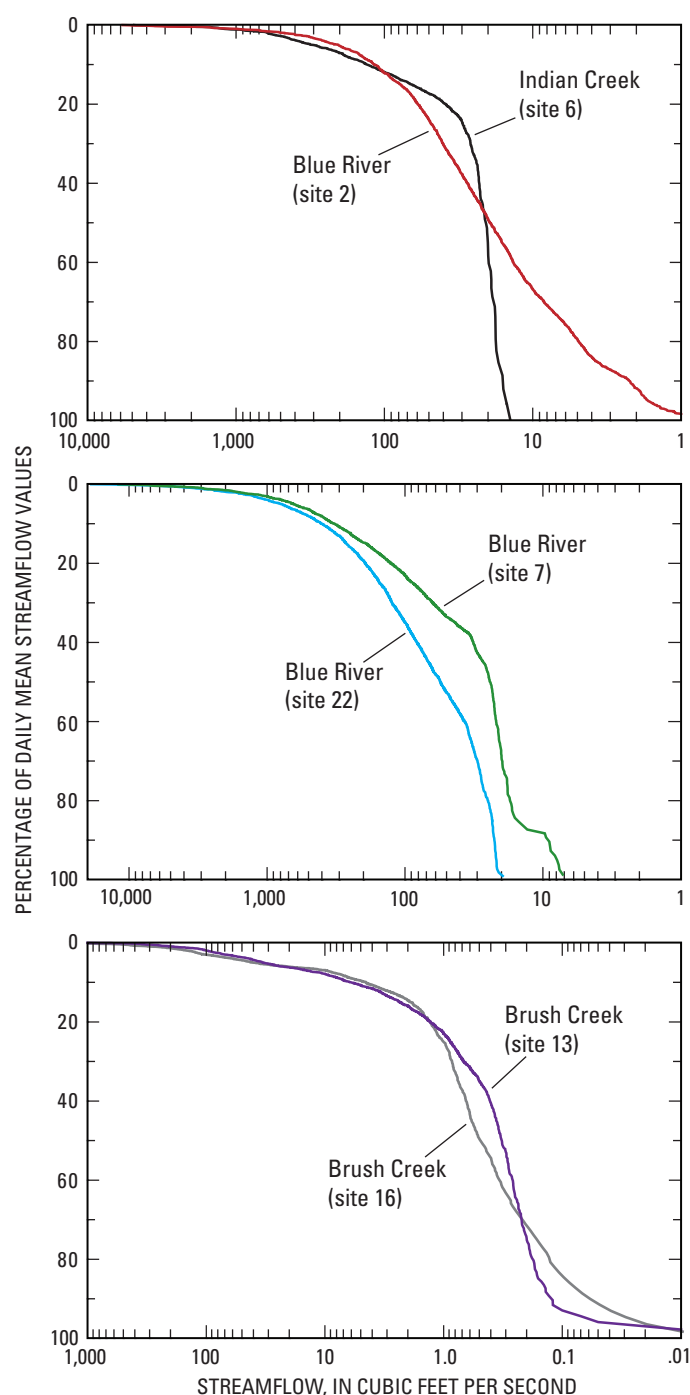


Figure 14. Flow duration curves for sites in the Blue River Basin from July 1998 through December 2007.

biogeochemical processes, which would be expected to help assimilate instream nutrients, are reduced by colder winter temperatures. Thus the greatest total nitrogen concentrations at sites 2, 6, 7, and 22 tended to occur during periods with the lowest flow and the coldest temperatures. This is most easily observed when values are graphed by month (fig. 16). For example, at Indian Creek (site 16; fig. 16), the median daily total nitrogen concentrations exceeded 10 mg/L for the months

November through March and the lowest median concentration (7.5 mg/L) occurred during June.

Total nitrogen concentration patterns in Brush Creek (site 16; fig. 16) were shifted slightly from the Indian Creek pattern and concentrations were lower in Brush Creek than in Indian Creek. The peak monthly median total nitrogen concentration at site 16 occurred in February and March (average of 2.96 mg/L) and the lowest median concentration occurred in August and September (average of 1.60 mg/L). The cycle of total nitrogen monthly values observed at site 16, with declining values throughout the summer months, indicated that changes in nutrient assimilation rates throughout the year also may have affected in-stream concentrations. Fertilizer applications to lawns and golf courses during the early part of the year (February through March) also may have contributed to increased median total nitrogen concentrations. Because of colder temperatures and less available solar energy, late winter periods also tended to coincide with periods of more limited nutrient assimilation by plants.

Daily plots of estimated daily mean concentrations also illustrate how the range and minimum value of concentrations differed between sites. For example, the estimated total phosphorus concentration in Indian Creek (site 6; fig. 15) from October 2002 through September 2007 ranged from 0.90 mg/L to 4.8 mg/L, but were below 1 mg/L only 6 percent of the time.

The minimum total phosphorus concentration at site 6 on Indian Creek (0.71 mg/L; fig. 15) was approximately double the average minimum concentration for site 2 on the Blue River (0.34 mg/L; fig. 15) and approximately 5 times the concentration at site 16 on Brush Creek (0.17 mg/L; fig. 15). The increases were largely attributable to the effect of WWTP effluents on stream total phosphorus concentrations as well as the size of the drainage area upstream from a site. Two WWTPs discharge in the 168-km² drainage area upstream from site 6, as opposed to one plant discharging in the 241-km² drainage area upstream from site 2 (Wilkison and others, 2005). Additionally, the two WWTPs upstream from site 6 had an average annual effluent discharge of more than four times that of the WWTP upstream from site 2 (U.S. Environmental Protection Agency, 2005; 2008).

Estimated daily mean suspended-sediment concentrations (fig. 15) show similar patterns as do the plots of estimated *E. coli* densities, partly because both constituents largely were determined by streamflow. The bulk of suspended sediment and bacteria originated during runoff events. Thus, increased *E. coli* densities for 2004 to 2005 largely were attributable to the larger than average streamflow that occurred during this period (fig. 13). Daily mean *E. coli* densities spiked during storms and remained elevated during runoff periods and increased streamflow; however, densities typically decreased substantially within a few days to prestorm levels. Because bacteria densities are responsive to storm runoff, the range of *E. coli* densities at sites typically covered a large span. For example, bacteria densities at several sites (sites 2 and 22)

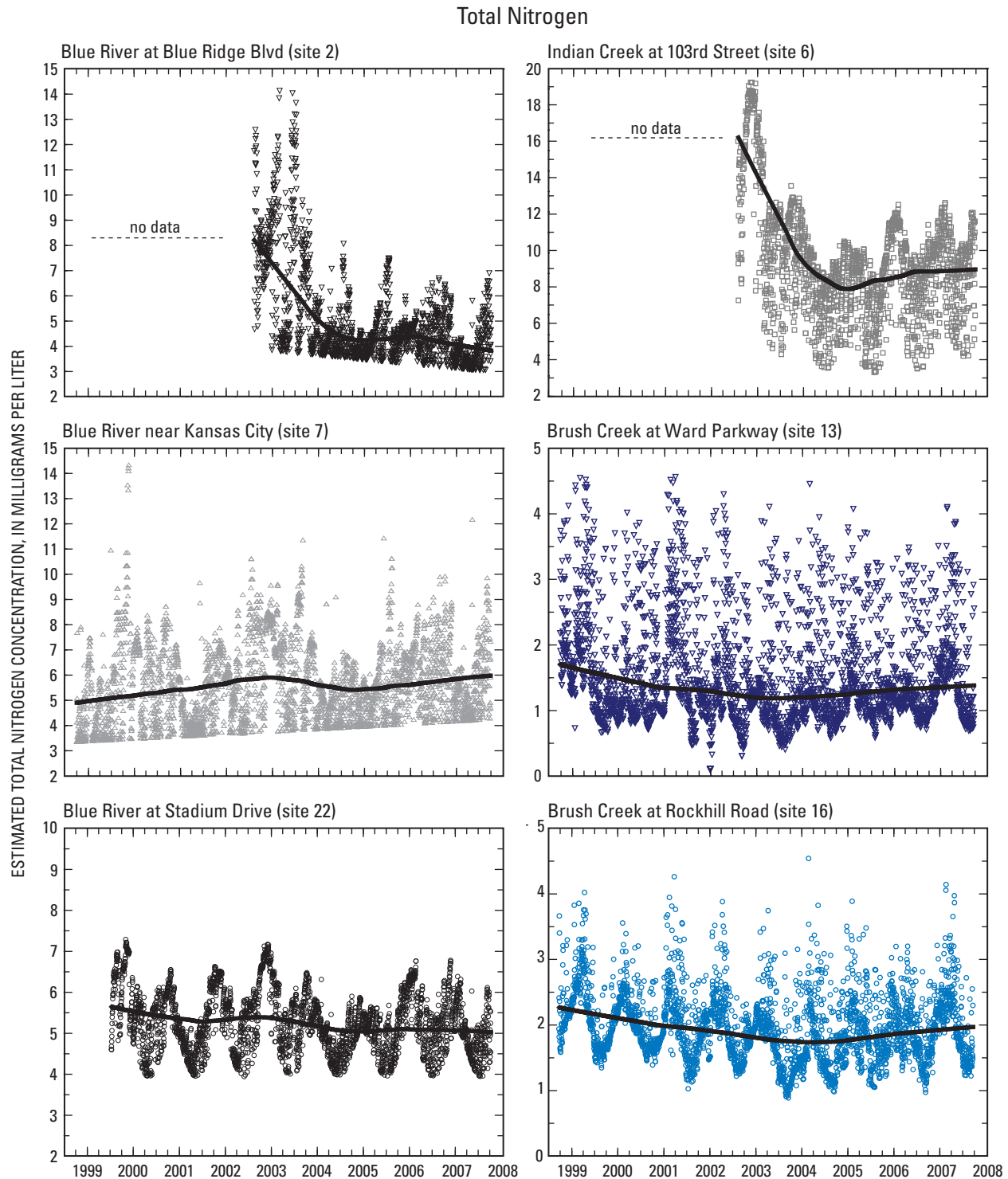


Figure 15. Estimated daily mean concentrations from October 1998 through September 2007 at sites in the Blue River Basin. Solid lines are locally weighted linear regression (LOWESS) curves through the data points. (Note scale change between plots)

frequently spanned four to five orders of magnitude during any given year (fig. 15).

At all sites, daily mean *E. coli* densities followed a cyclical pattern throughout the year, with the lowest median densities occurring during the midwinter months and the peak median densities occurring during late spring to summer

months (fig. 16; table 20). As previously noted, fecal-indicator bacteria standards are not uniform for stream segments in the basin (table 14) and stream *E. coli* densities in excess of the various State of Missouri fecal-indicator criteria occurred in every month (table 15). June, the month with the greatest average precipitation, had the highest median *E. coli* densities and

Total Phosphorus

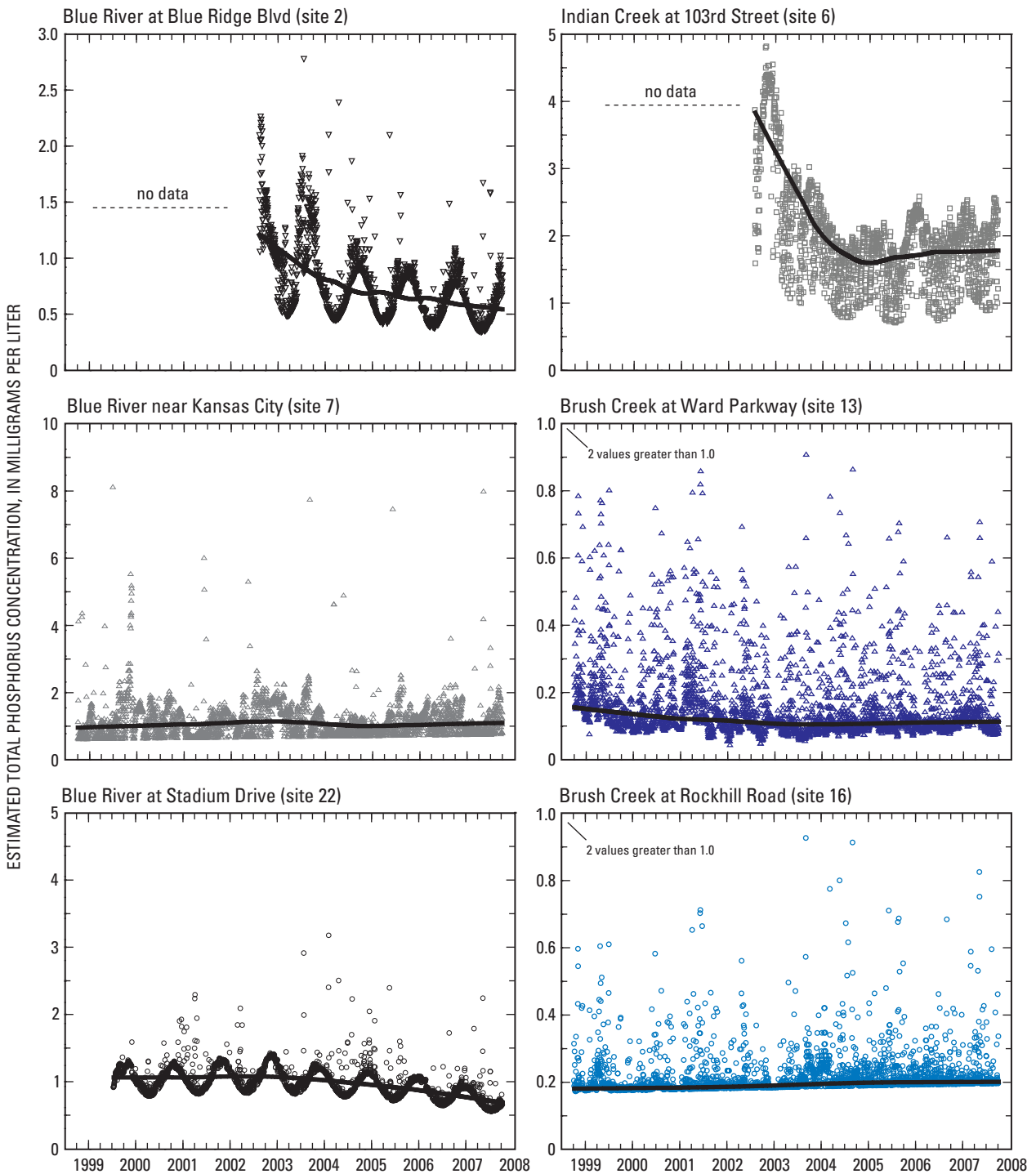


Figure 15. Estimated daily mean concentrations from October 1998 through September 2007 at sites in the Blue River Basin. Solid lines are locally weighted linear regression (LOWESS) curves through the data points. (Note scale change between plots)—Continued

the fewest number of days in which bacteria criteria would have been met (fig. 16; table 15).

Daily mean caffeine concentration patterns reflected the primary differences in sources at sites as well as the effects of temperature on instream concentrations. For example, sites 7 and 22 on the Blue River are located downstream from three

WWTPs. The monthly median caffeine concentration in the Blue River peaked during December and January (average of 1.13 $\mu\text{g/L}$; fig. 16) when temperatures were the coldest and the percentage of streamflow consisting of effluent was the largest. Monthly median caffeine concentrations then declined to their lowest levels during June and July (average of 0.37

Suspended Sediment

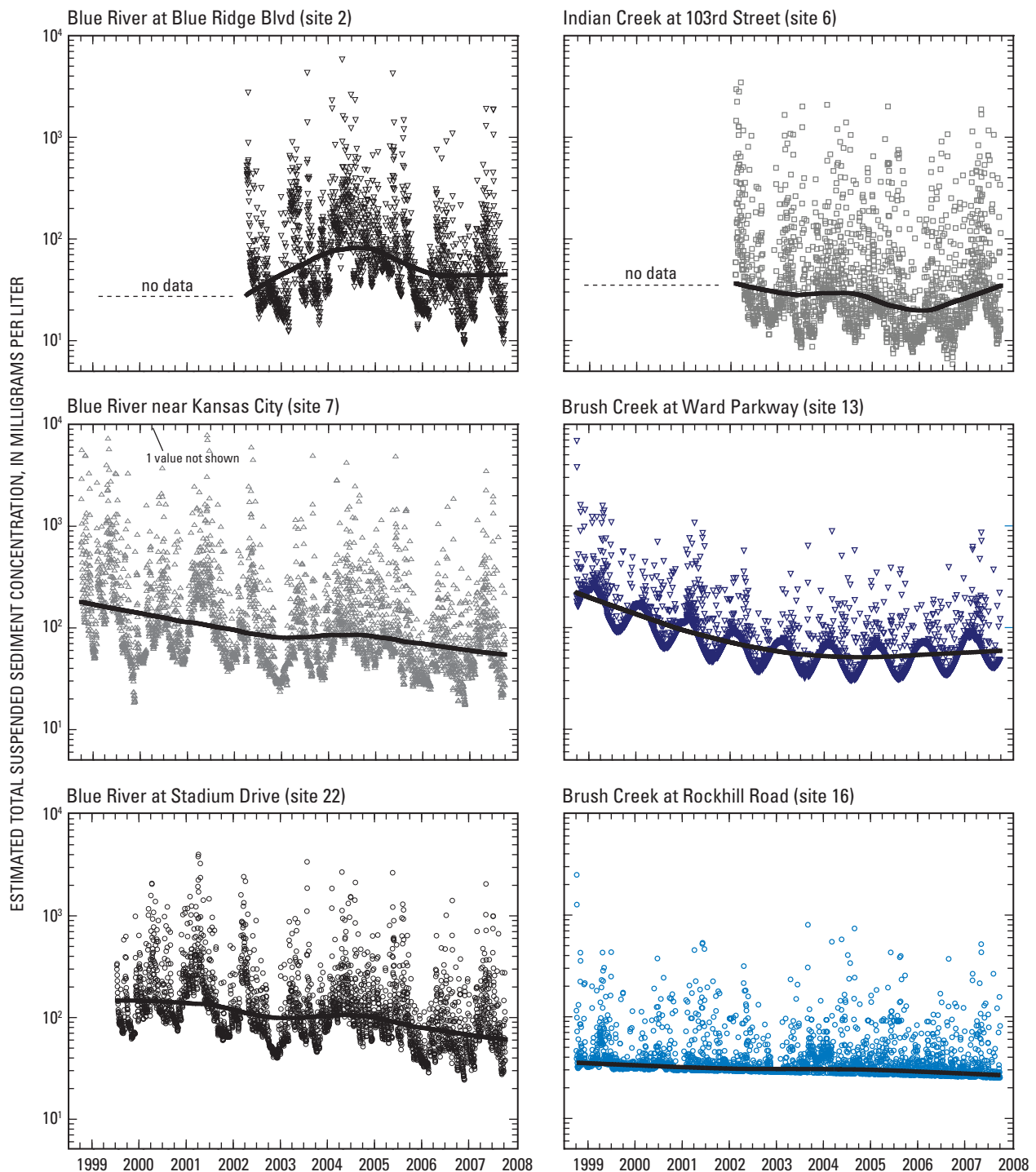


Figure 15. Estimated daily mean concentrations from October 1998 through September 2007 at sites in the Blue River Basin. Solid lines are locally weighted linear regression (LOWESS) curves through the data points. (Note scale change between plots)—Continued

$\mu\text{g/L}$; fig. 16), which was probably because of the effects of increased WWTPs removal efficiencies during the summer. Once released to the environment, biodegradation and photolysis would remove additional caffeine from streams; these processes would be expected to peak in midsummer (Buerge and others, 2003). By contrast, the monthly median concen-

trations on Brush Creek (site 16) peaked from March to May (average concentration, $1.14 \mu\text{g/L}$), and the lowest monthly median concentration occurred in August and September (average concentration, $0.56 \mu\text{g/L}$).

Concentrations of the insect repellent DEET would be expected to peak during early to mid-summer when targeted

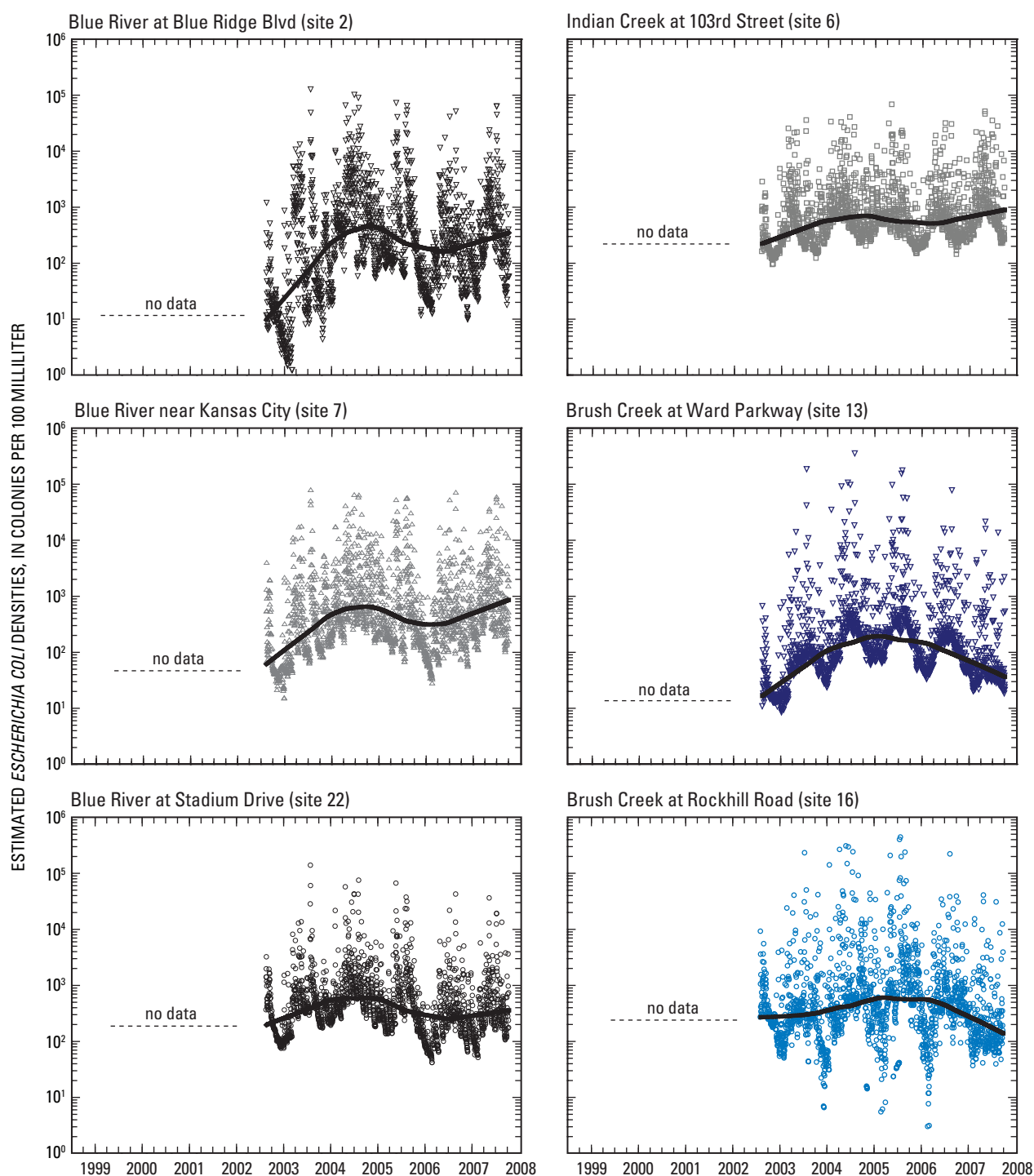
Escherichia Coli

Figure 15. Estimated daily mean concentrations from October 1998 through September 2007 at sites in the Blue River Basin. Solid lines are locally weighted linear regression (LOWESS) curves through the data points. (Note scale change between plots)—Continued

nuisance insect populations—such as ticks and mosquitoes—hatch. Monthly plots of DEET concentrations indicate that peak DEET concentration occurred in the months of May and June or June and July (fig. 16). For Indian Creek (site 6), the largest median monthly concentrations of DEET occurred in June and July with the average concentration (0.704 $\mu\text{g/L}$),

approximately double the largest median concentration for the Blue River (sites 2, 7, and 22; average concentration, 0.296 $\mu\text{g/L}$) and Brush Creek (sites 13 and 16; average concentration, 0.36 $\mu\text{g/L}$), which occurred in May and June (fig. 16). The lowest concentrations of DEET occurred during January. Monthly median DEET concentrations in January ranged from

Caffeine

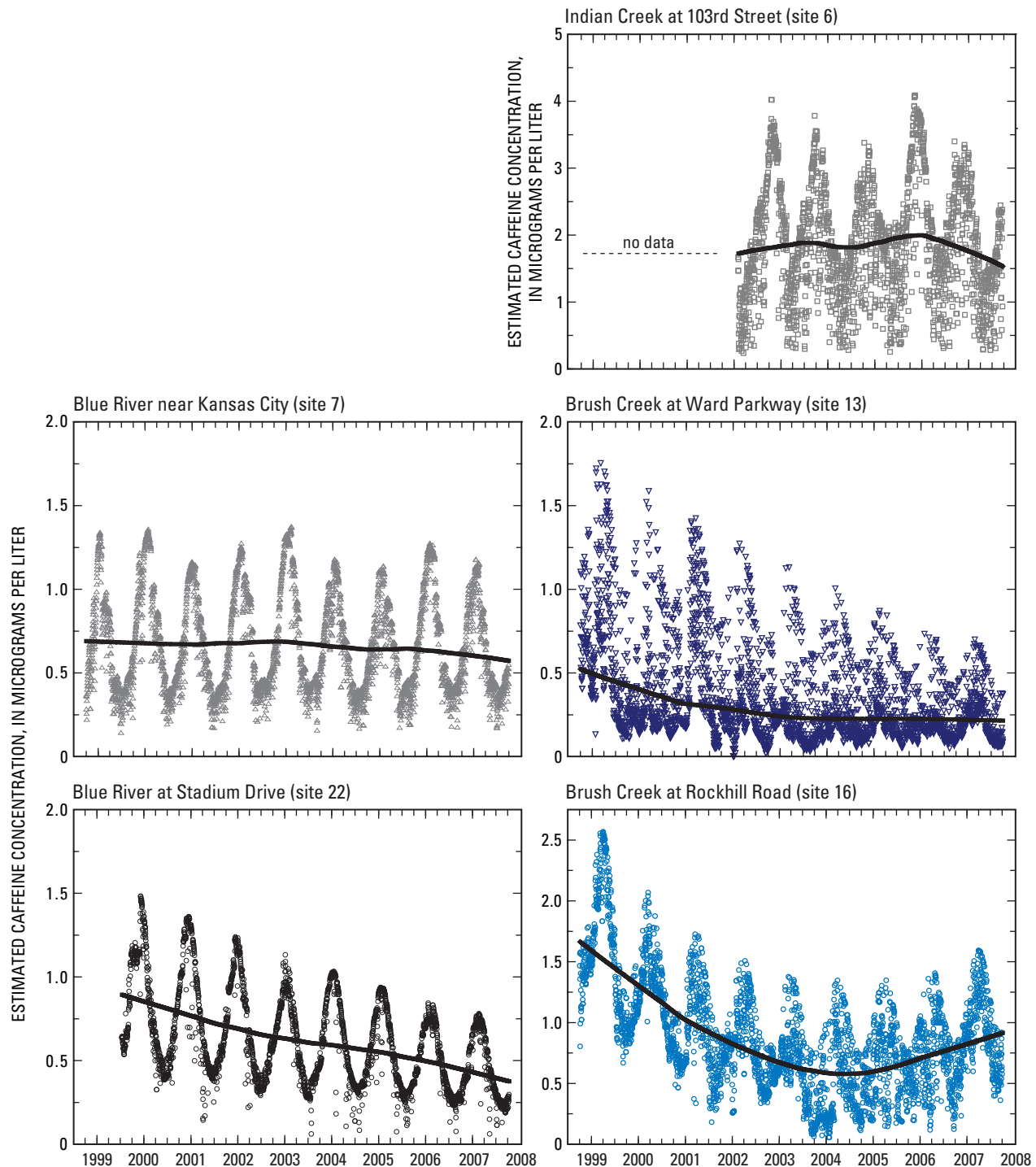


Figure 15. Estimated daily mean concentrations from October 1998 through September 2007 at sites in the Blue River Basin. Solid lines are locally weighted linear regression (LOWESS) curves through the data points. (Note scale change between plots)—Continued

0.115 µg/L at Indian Creek (site 6) to 0.202 µg/L for the Blue River (sites 2, 7, and 22) to 0.117 µg/L for Brush Creek (sites 13 and 16).

For the antimicrobial triclosan, the strongest cyclic variation in concentration with time was observed at site 7, downstream from 3 WWTPs (fig. 15). Triclosan concentrations at

all sites typically varied over a narrow range of values—less than 1 microgram—throughout the year. When viewed by month (fig. 16), monthly median triclosan concentration on the Blue River (sites 7 and 22; fig. 16) peaked during the winter months and declined to the lowest values of the year during the summer. On Brush Creek (site 16), monthly median triclosan values

DEET

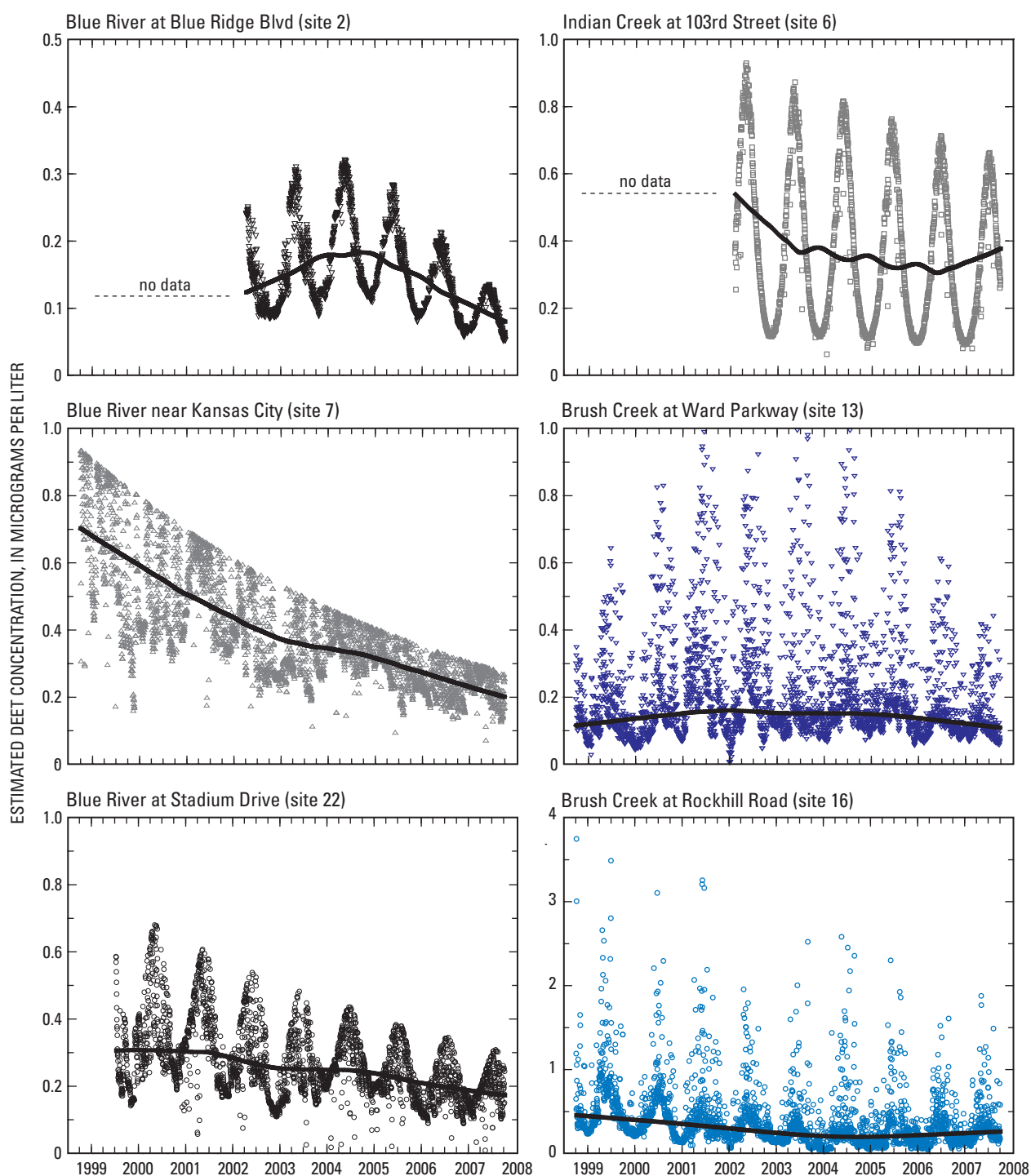


Figure 15. Estimated daily mean concentrations from October 1998 through September 2007 at sites in the Blue River Basin. Solid lines are locally weighted linear regression (LOWESS) curves through the data points. (Note scale change between plots)—Continued

peaked in March through May with an average concentration of $0.158 \mu\text{g/L}$, and then declined to approximately one-half that value in August and September (average concentration, $0.086 \mu\text{g/L}$).

Concentrations of sterol followed a strong seasonal pattern at sites on Indian Creek and the Blue River (fig. 15).

Monthly median concentrations on Indian Creek (site 6; fig. 16) peaked in January and December (average concentration, $13.7 \mu\text{g/L}$) and fell to approximately one-third that level in June (average concentration, $4.28 \mu\text{g/L}$). Although the monthly median concentrations on the Blue River (sites 2, 7, and 22) typically were only about 30 percent of the concen-

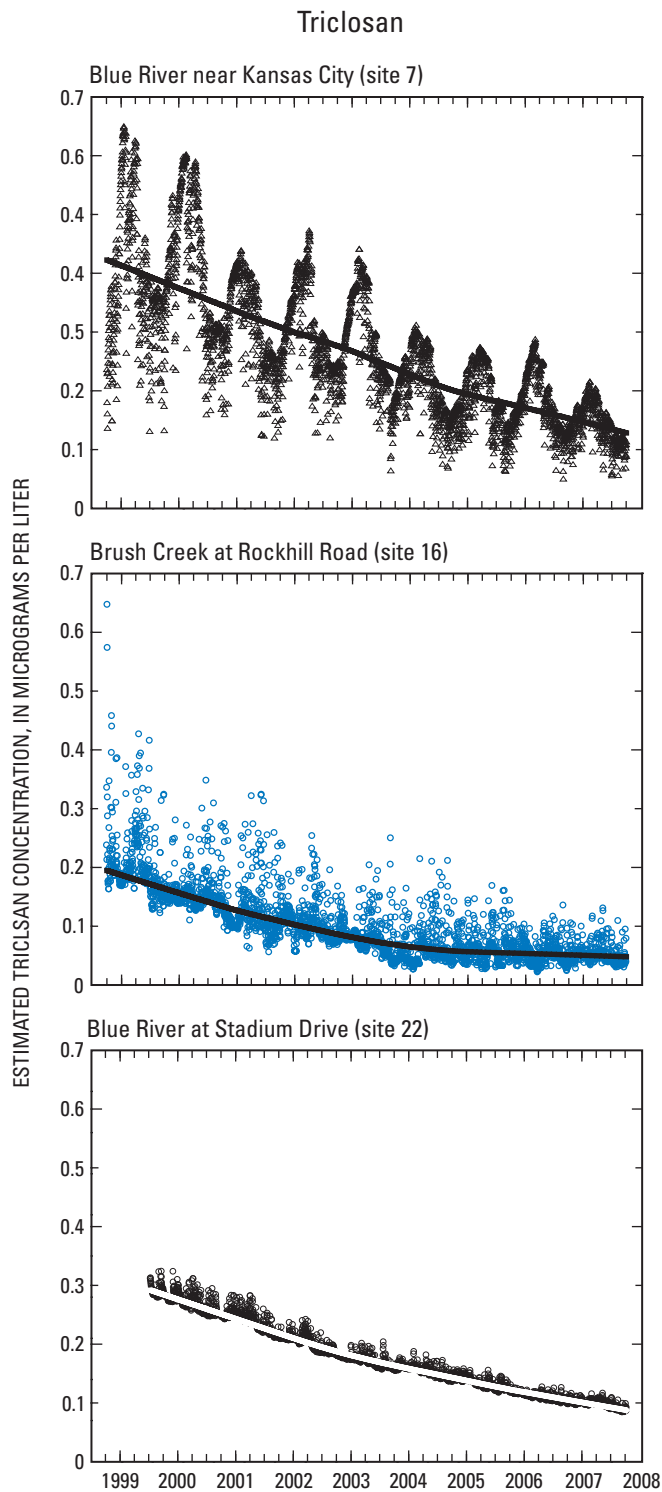


Figure 15. Estimated daily mean concentrations from October 1998 through September 2007 at sites in the Blue River Basin. Solid lines are locally weighted linear regression (LOWESS) curves through the data points. (Note scale change between plots)—Continued

trations in Indian Creek, the pattern—peaks in the winter and lower values in the summer—was similar. Monthly median sterol concentrations at Brush Creek sites (sites 13 and 16; fig.

16) were greatest from April through May (average concentration, 1.78 µg/L) and declined to their lowest values in August and September (average concentration, 1.57 µg/L).

Modeled estimates of daily mean concentrations were used to develop concentration duration curves for a number of selected constituents (fig. 17). The curves show the frequency at which estimated concentrations occurred at any given site from 1998 through 2007. For example, at the Indian Creek site (site 6), the estimated total nitrogen concentration exceeded 10 mg/L about 50 percent of the time. At sites on the Blue River (sites 7 and 22) the estimated total nitrogen concentration exceeded 10 mg/L only a few days from 1998 through 2007. This corresponded to days in which flows were almost exclusively from treated effluent. For Brush Creek sites (sites 13 and 16), the range of total nitrogen concentrations was much narrower and never exceeded 5 mg/L. All sites in the basin were affected by nonpoint source runoff; however, these data indicate that sites affected by WWTP effluent had a greater range of nutrients supplied to them. The estimated total nitrogen concentration at most sites almost always exceeded the U.S. Environmental Protection Agency (USEPA) ecoregional total nitrogen criterion of 0.69 mg/L (Code of Federal Regulations, 2003). The nutrient criteria are not regulatory criteria but instead reflect representative levels whereby human activities would be expected to have minimal effect on surface waters as well as the baseline levels needed to prevent surface-water eutrophication and subsequent water-quality degradation (U.S. Environmental Protection Agency, 2000).

Estimated total phosphorus concentration duration curves show a pattern similar to total nitrogen curves, primarily because the principal sources and mechanisms behind the occurrence of phosphorus is the same as for total nitrogen delivery (fig. 17). Sites on Indian Creek and the Blue River under the dominant affect of WWTP effluent had greater ranges and median concentrations than Brush Creek sites. When compared to the USEPA ecoregional total phosphorus criterion of 0.037 mg/L (Code of Federal Regulations, 2003), concentrations at sites on Indian Creek and the Blue River were greater than the criterion 100 percent of the time. For Brush Creek sites, estimated concentrations were greater than the criterion less than 10 percent of the time and occurred specifically during storm runoff.

With the exception of site 16, Brush Creek at Rockhill Road, estimated suspended-sediment concentrations from 1998 through 2007 ranged more than three orders of magnitude. The greatest concentrations in suspended sediment occurred during the largest flows. Because large concentrations occurred during extremely large flows, almost all of the total annual sediment transport occurred in a few storms. At site 16, because of trapping in upstream impounded reaches, suspended-sediment concentrations varied little between lower and medium range flows.

Where enough data are available, estimated daily concentrations for four wastewater organic compounds also are shown in figure 17. Where model fits are determined primarily by seasonal components, such as for total nitrogen at sites 16

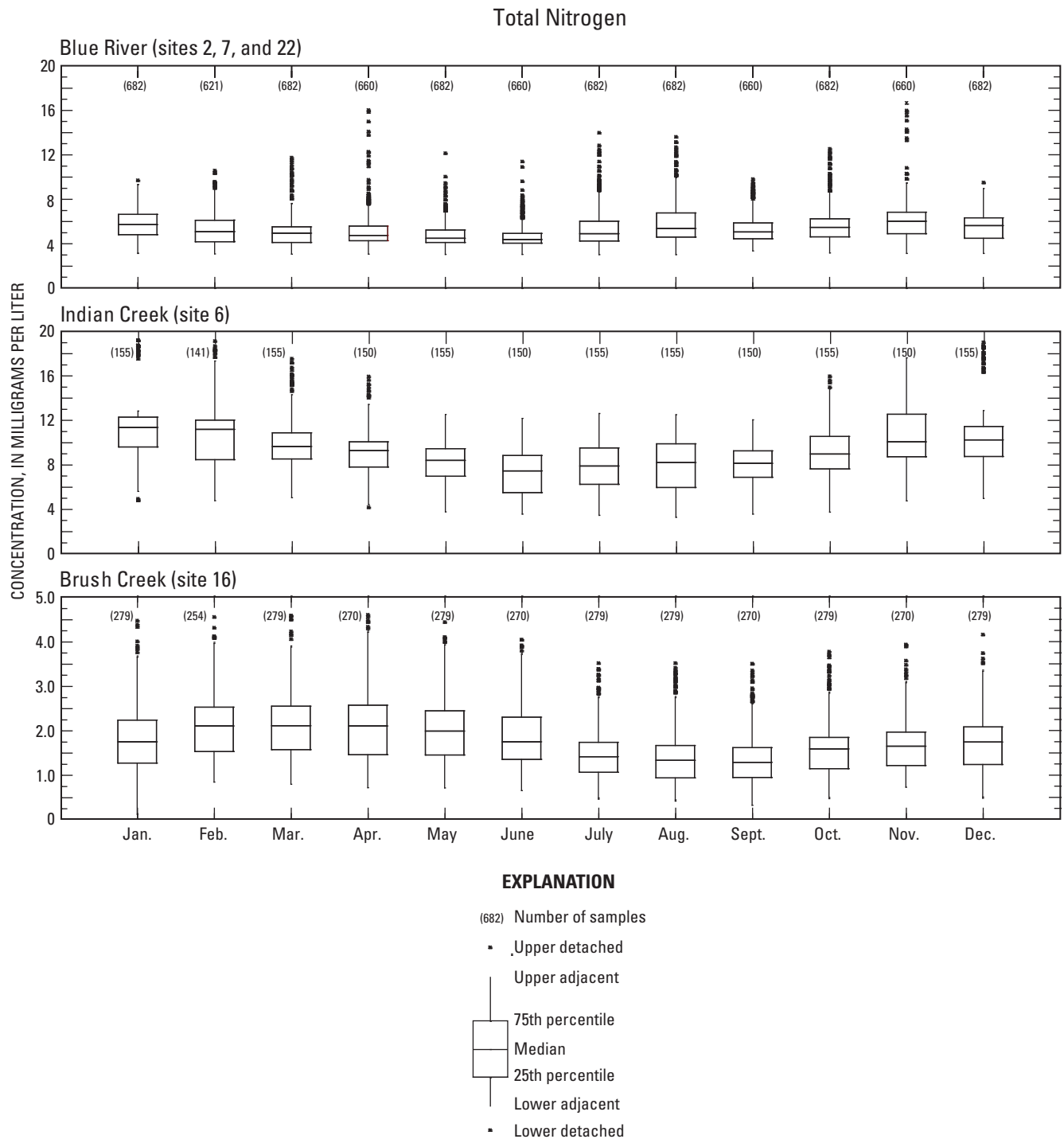


Figure 16. Estimated daily mean concentration, by month, in stream samples from October 1998 through September 2007.

and 22, the estimated concentrations follow a clear sinusoidal pattern (fig. 15). At other sites, such as 6 and 13, the sinusoidal pattern is still visible, but masked to some extent because concentrations, although still determined, in part, by seasonality in the fitted model, respond more to flow. Caffeine is one compound where the fitted model included a strong seasonal component at every site. For some compounds, such as DEET

and triclosan (fig. 15), the maximum estimated concentrations gradually declined with time partly because the levels of contaminants detected in streams tended to decline, but also because discharges in the early part of the study were greater than average (fig. 13).

In general, the concentration duration curves for these constituents followed a pattern similar to those seen for

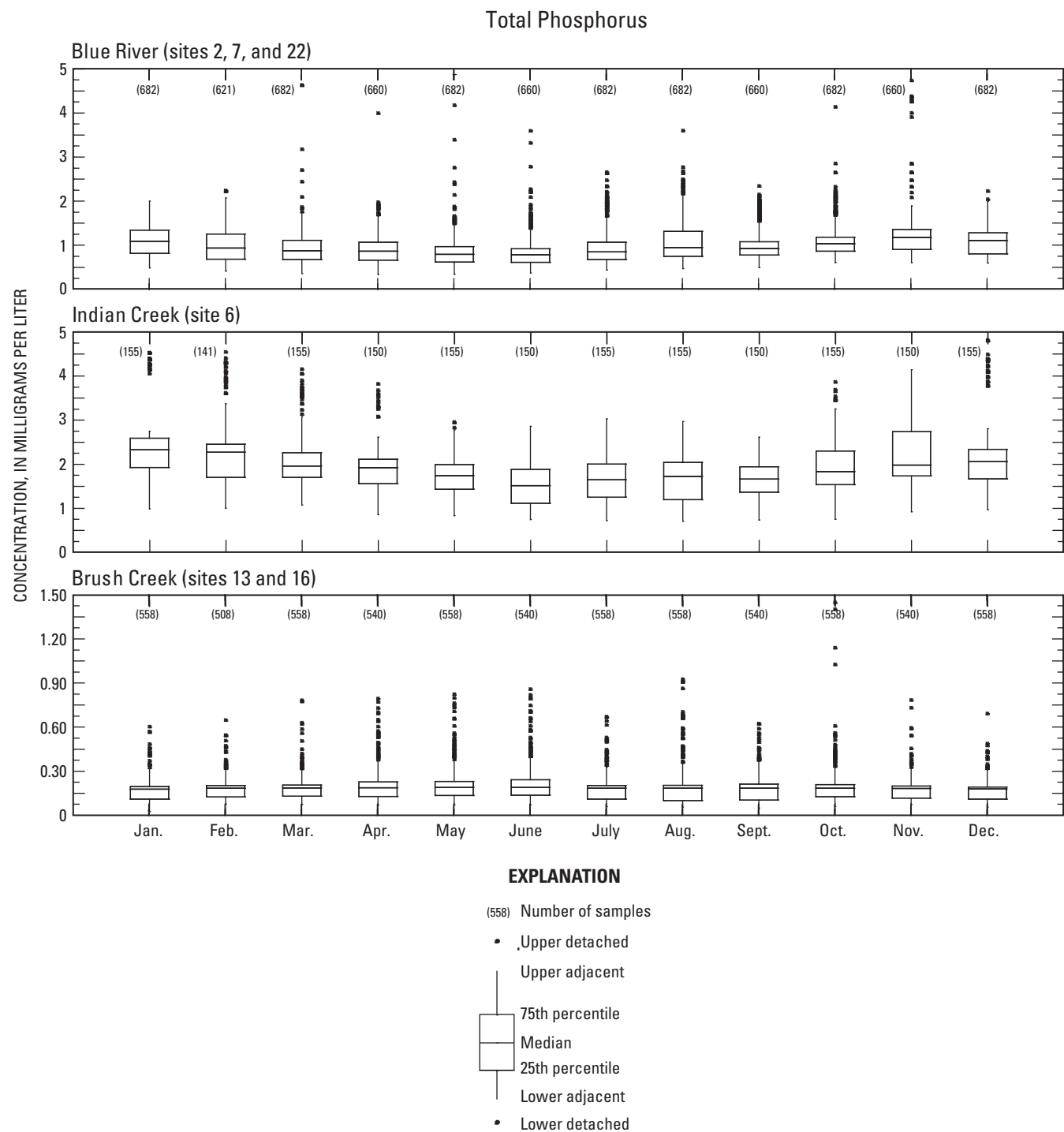


Figure 16. Estimated daily mean concentration, by month, in stream samples from October 1998 through September 2007.—
Continued

estimated nutrient concentrations, although there are a couple of exceptions. The range of estimated caffeine and DEET concentrations was greatest at site 16, Brush Creek at Rockhill Road. The largest concentrations corresponded with larger flow periods in the spring and summer. Also, the Blue River and Indian Creek sites had larger concentrations during winter

months when flows were lowest. A similar pattern was seen in the estimated concentrations of triclosan and sterol. At site 16, which receives CSOs, the largest concentrations were observed during storm events in the spring and summer. At sites on Indian Creek and the Blue River, the largest concentrations were observed during winter low flows. These data

Suspended Sediment

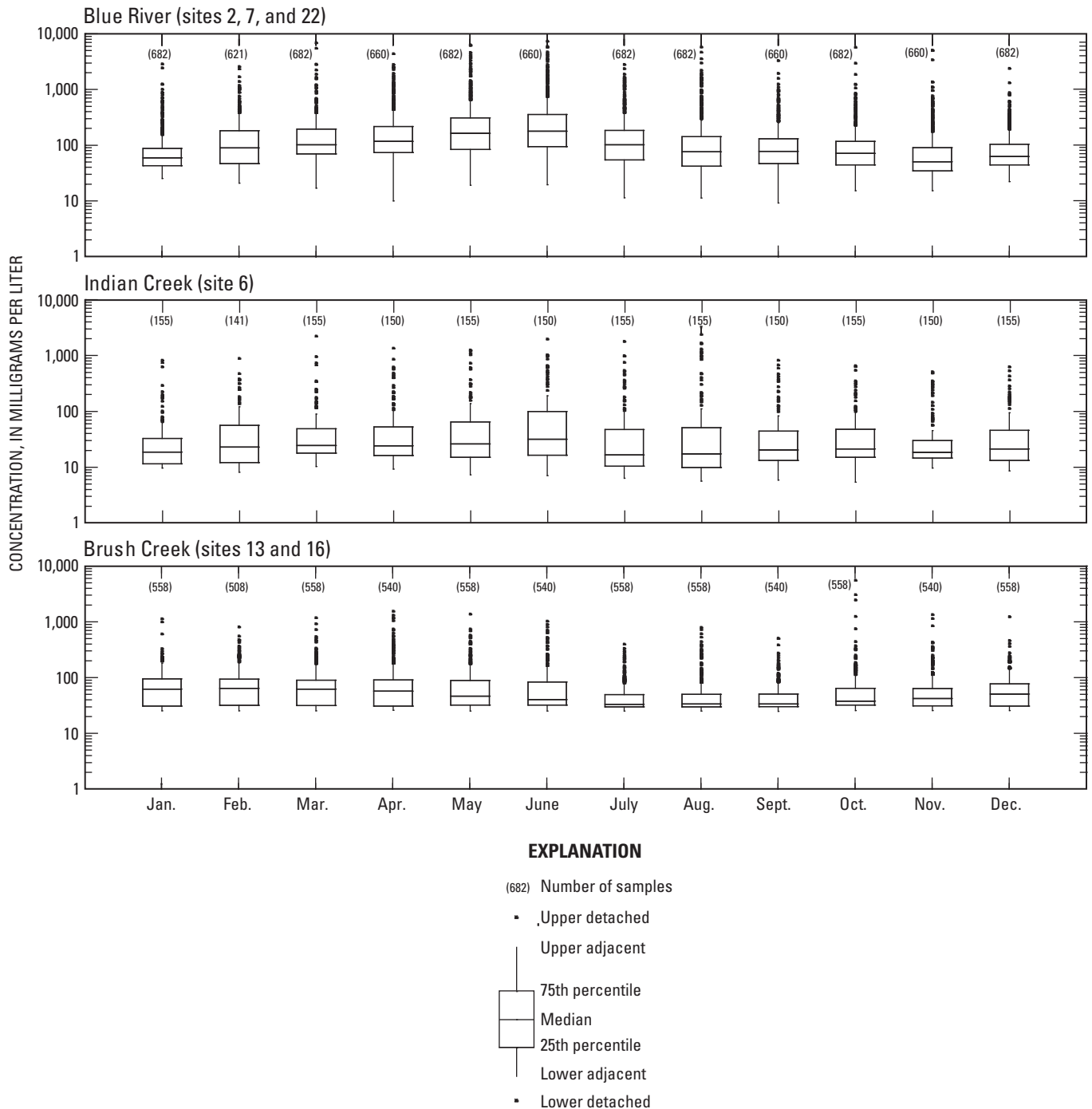


Figure 16. Estimated daily mean concentration, by month, in stream samples from October 1998 through September 2007.—
Continued

underscore that the primary mechanism for transport of many constituents in Brush Creek is stormwater runoff. While these same processes occur in other reaches in the Blue River Basin, the highest concentrations frequently are related to the percent of streamflow attributable to WWTP effluent and the time of year.

Seasonal Contribution of Constituents

Constituent concentrations and pollutant loadings change during any given year in response to a number of factors including seasonality. Season affects water temperature, which can mediate biogeochemical processes, use rates (for example, applications of fertilizers and insect repellants), precipita-

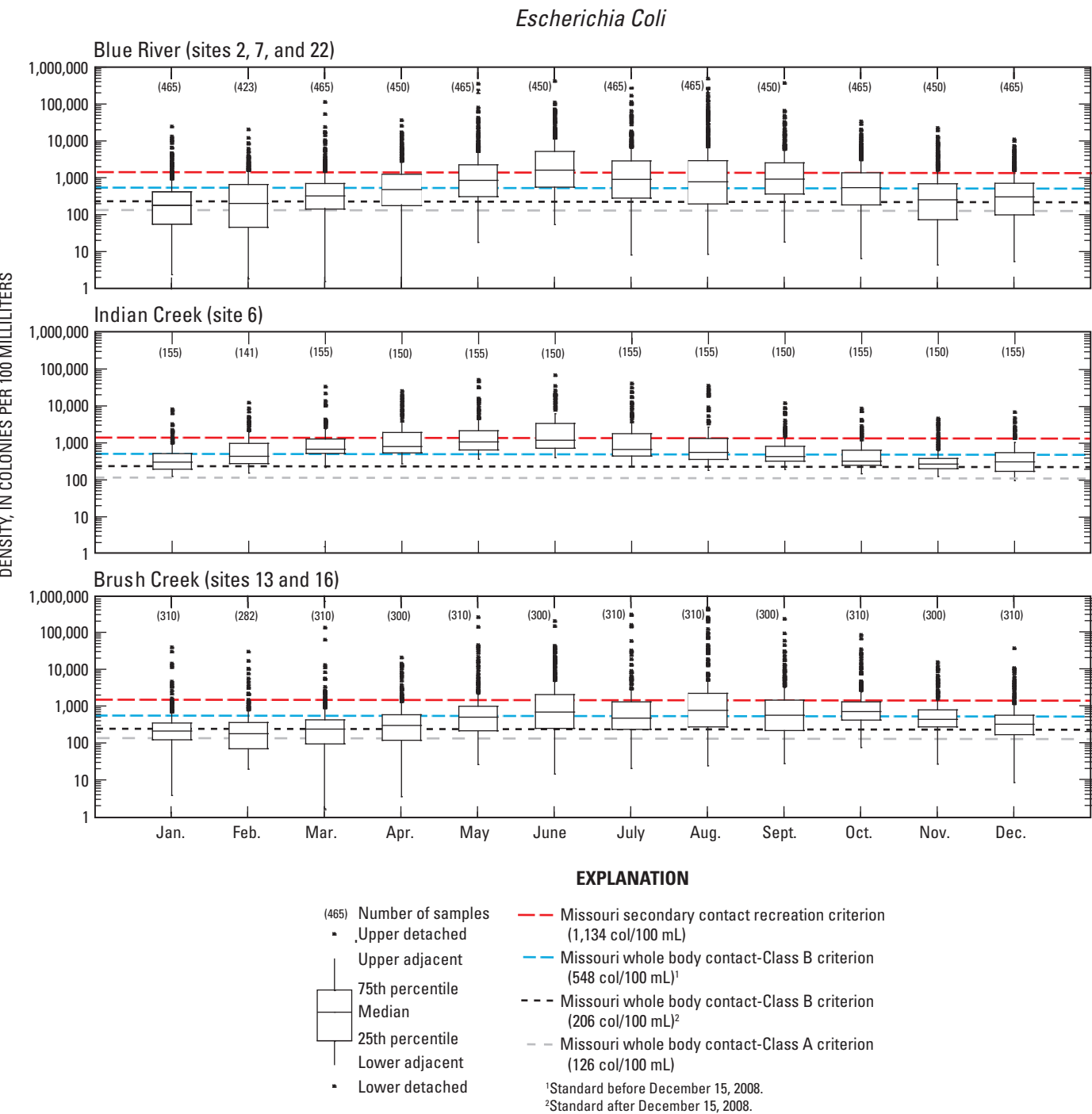


Figure 16. Estimated daily mean concentration, by month, in stream samples from October 1998 through September 2007.— Continued

tion, and streamflow. Constituent loads (concentration times discharge) frequently are affected more by streamflow than concentration because the discharge usually spans a larger range than does concentration. These data provide information and insight about when to implement management practices designed to reduce instream contaminants, and how some pro-

cesses and factors may affect constituent concentrations and loads observed in streams.

Seasonal (sum of the daily loads for a 3-month time-frame) loads of total nitrogen, total phosphorus, caffeine, DEET, sterol, and triclosan for the Blue River near Kansas City (site 7) and Brush Creek at Rockhill Road (site 16) are shown in figure 18. Seasonal loads of total nitrogen typically

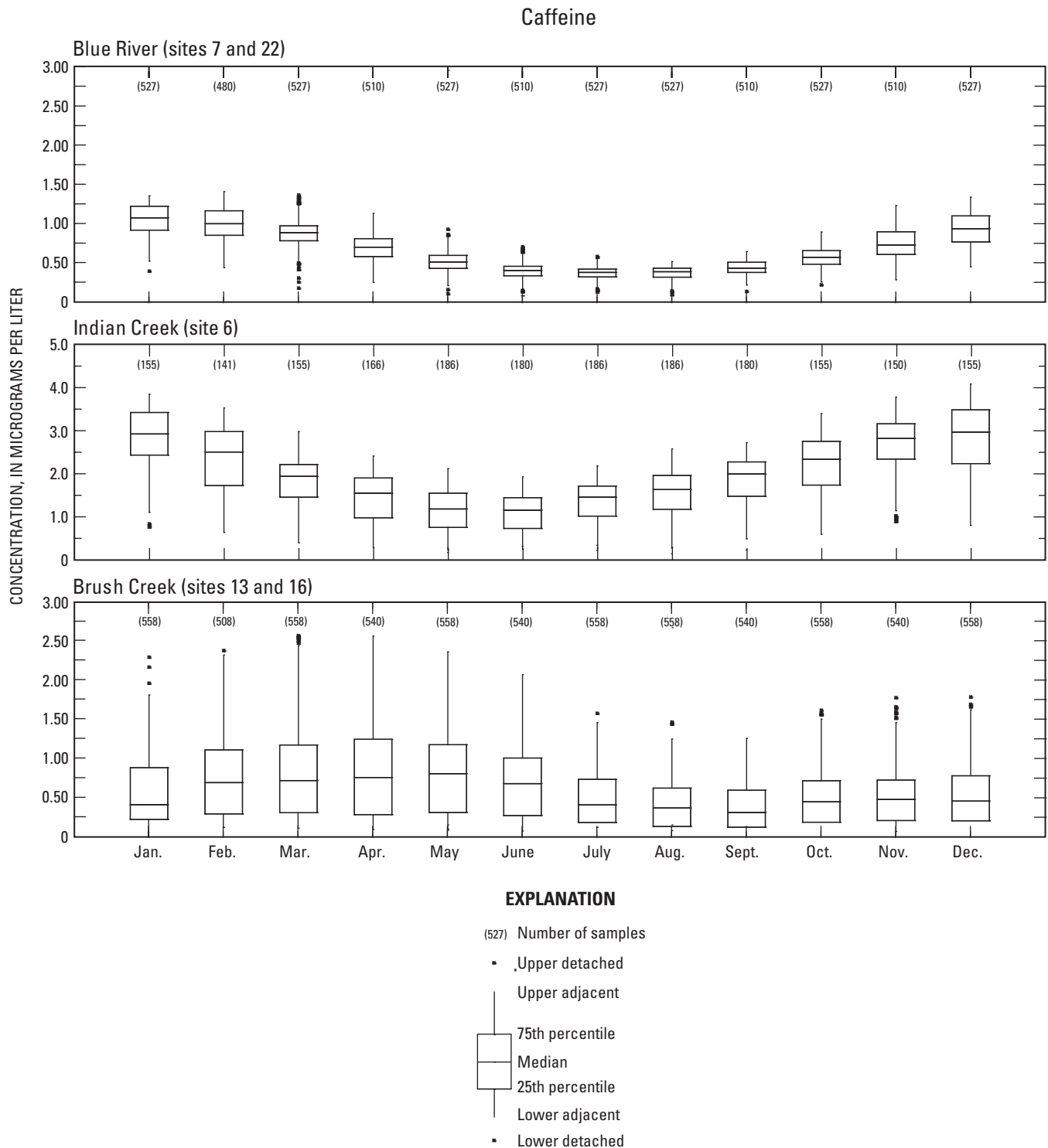


Figure 16. Estimated daily mean concentration, by month, in stream samples from period October 1998 through September 2007.—Continued

were about 10 times greater than total phosphorus loads at both sites. Loads of caffeine, DEET, and triclosan at site 7 typically were about 10,000 times less than those for total nitrogen and 1,000 times less than that for total phosphorus at both sites as a result of the much smaller concentrations

of these constituents when compared to nutrient concentrations. Seasonal loads of sterol generally were about 10 times greater than those for triclosan, another organic wastewater compound, primarily because of concentration differences between the two. In general, concentrations of caffeine, DEET,

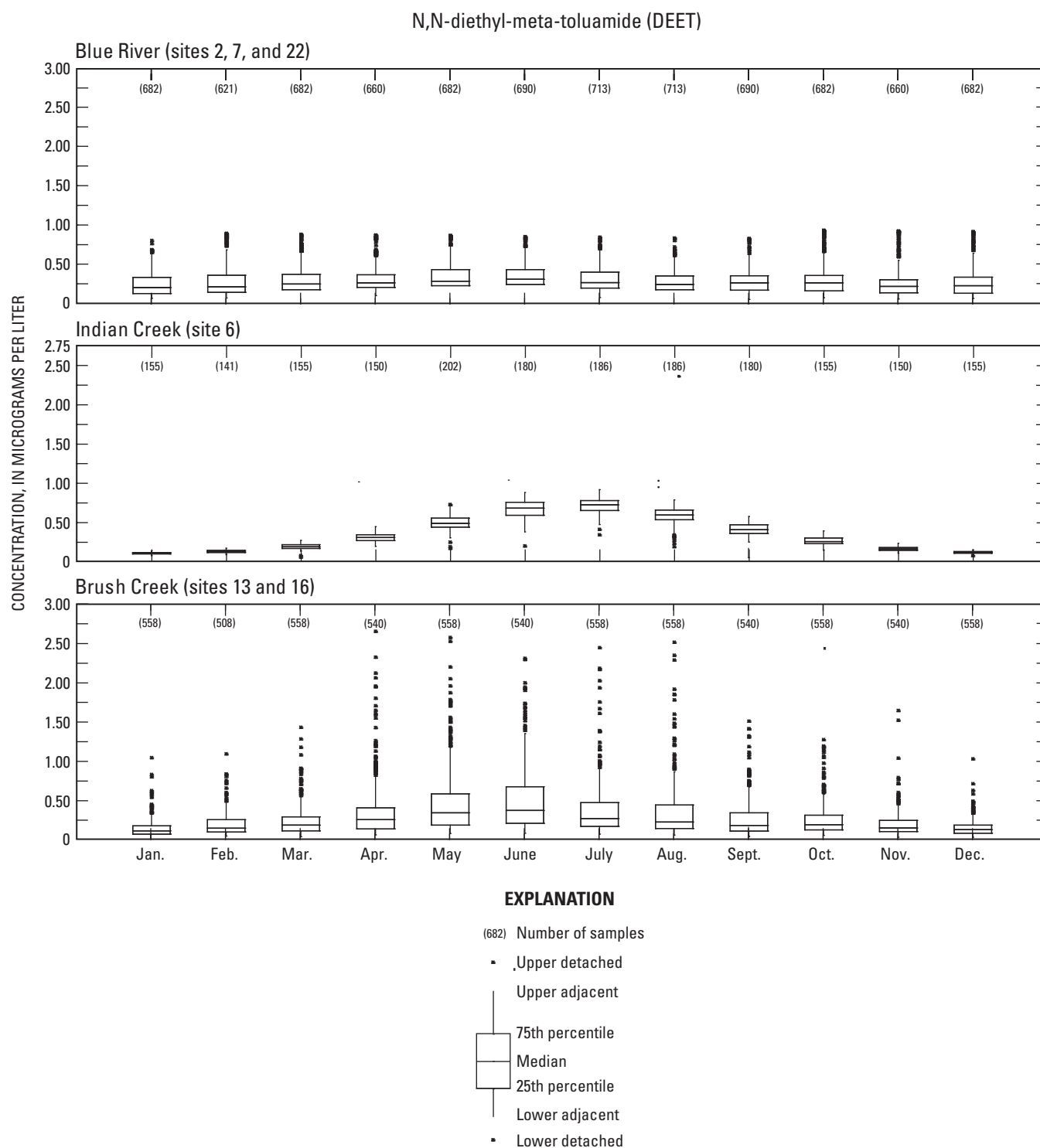


Figure 16. Estimated daily mean concentration, by month, in stream samples from October 1998 through September 2007.— Continued

sterol, and triclosan in streams are much less than those for total nitrogen and total phosphorus because the sources for these compounds are more limited than for nutrients. In many stream reaches, a significant part of nutrients originates from nonpoint source runoff, whereas the bulk of caffeine, DEET,

and triclosan are contributed by point sources, such as treated effluent or CSOs. Although data are sparse, average removal rates measured at WWTP plants in the basin for caffeine (94 percent), sterol—cholesterol (80 percent) and coprostanol (83 percent), DEET (76 percent), and triclosan (68 percent)

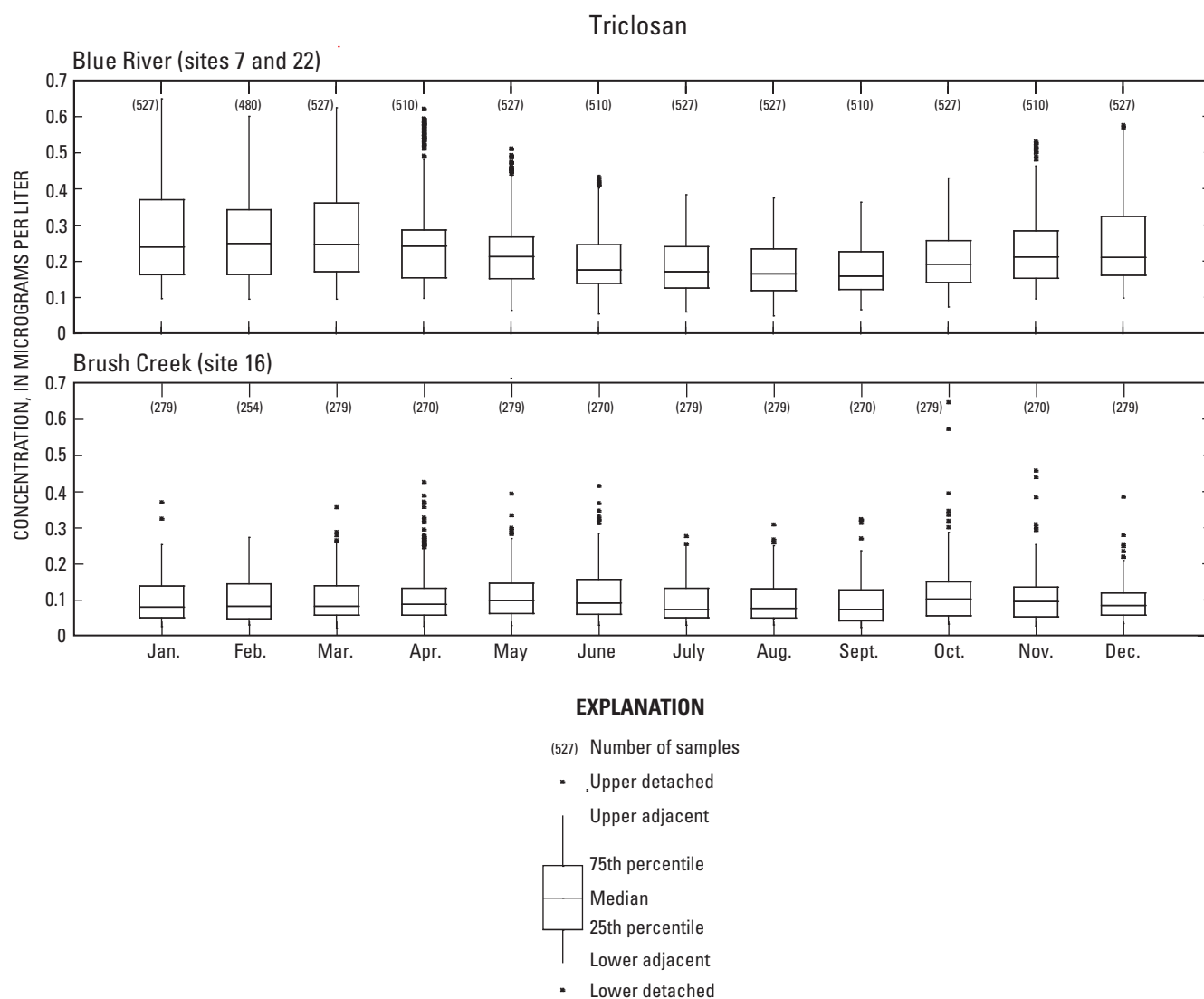


Figure 16. Estimated daily mean concentration, by month, in stream samples from October 1998 through September 2007.—
Continued

indicate that substantial amounts of these constituents are removed during treatment (Wilkison and others, 2002). Nutrient removal rates for WWTPs in the basin are unknown, but even the most advanced biological treatment processes are not designed to remove all nutrients. Nutrients passing through WWTPs primarily are soluble and more bioavailable forms of nitrogen and phosphorus, which are discharged to receiving streams (Wells, 2006; Wilkison and others, 2006). Also, influent nutrient concentrations are several orders of magnitude greater than organic wastewater compound concentrations; therefore, even if nutrient removal rates approached 90 percent, nutrient effluent concentrations would still be expected to be much greater than caffeine, DEET, sterol, and triclosan concentrations. On average, the loads of nutrients, caffeine, DEET, sterol, and triclosan on the effluent-dominated Blue River were 20 times greater than those on CSO-dominated

Brush Creek, although flows were only 10 times greater (fig. 18).

When grouped by season, the largest contributions of nutrients to the Blue River Basin occurred from March through August of each year (fig. 19) primarily because this period corresponded with the highest flows and a substantial part of nutrient concentrations occurred during storm runoff. Additionally, storm-runoff loads include point- and nonpoint-source contributions. There were some slight differences between seasonal load patterns on the Blue River and Brush Creek as nutrient loads from March through August accounted for 70 percent of the total annual contributions on the Blue River and 77 percent of the total annual contributions on Brush Creek from 1998 through 2007 (fig. 19). Increased loads during the spring and summer corresponded with a period of prolonged and more intense precipitation that would

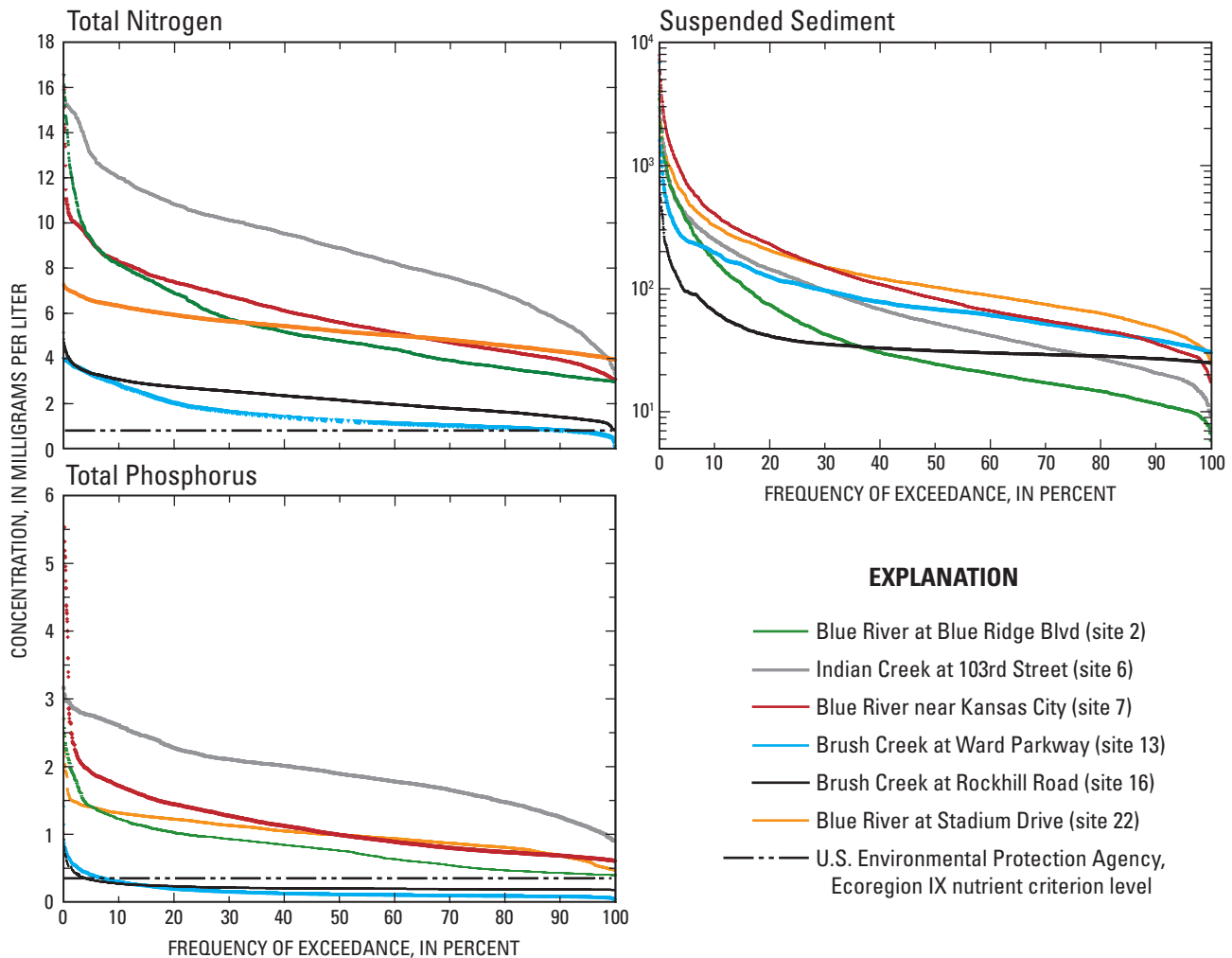


Figure 17. Estimated daily mean concentration duration curves for selected water-quality constituents in the Blue River Basin, October 1998 through September 2007.

be expected to produce large runoff events as well as more frequent CSOs.

With a couple of exceptions, seasonal loads followed the precipitation patterns in the basin (fig. 19). These differences are largely the result of the effluent-dominated nature of the Blue River during low-flow periods compared to the effects of CSOs on constituent loads in Brush Creek, which occur during storm runoff events.

Flows throughout the year on the Blue River and Indian Creek are augmented by effluents from three upstream WWTPs; each effluent stream provides part of the total downstream flow and load. During low-flow periods, such as December through February, the ratio of treated wastewater effluent compared to the total streamflow increase, which contribute to larger relative loads in streams when compared to the precipitation patterns (fig. 19). Also, because most wastewater-treatment processes are biological, the removal rates for many compounds decline during the colder periods and increase during the warm periods (Wells, 2006). This may

account for the relatively increased caffeine (30 percent of annual load) and sterol (25 percent of annual load) loads in the Blue River during the December to February periods and declining loads during the summer (June to August) and early fall (September to November). Caffeine consumption rates also may vary throughout the year with the greatest intake occurring during the winter and the lowest during the hotter summer months. However, any naturally occurring component of cholesterol, such as from plants, that may have contributed to the overall sterol load would have been expected to be greatest during midsummer, which is not the case. The greatest percentage of DEET loads in the Blue River (site 7) and Brush Creek (site 16) occurred from June to August, the period expected to coincide with the greatest use of insect repellent. These data also indicate that caffeine, DEET, and triclosan are persistent compounds in streams throughout the year, and that sources other than the discharge of treated wastewater effluent into receiving waters likely contribute to some of the observed loads, especially during storm runoff. Other potential sources

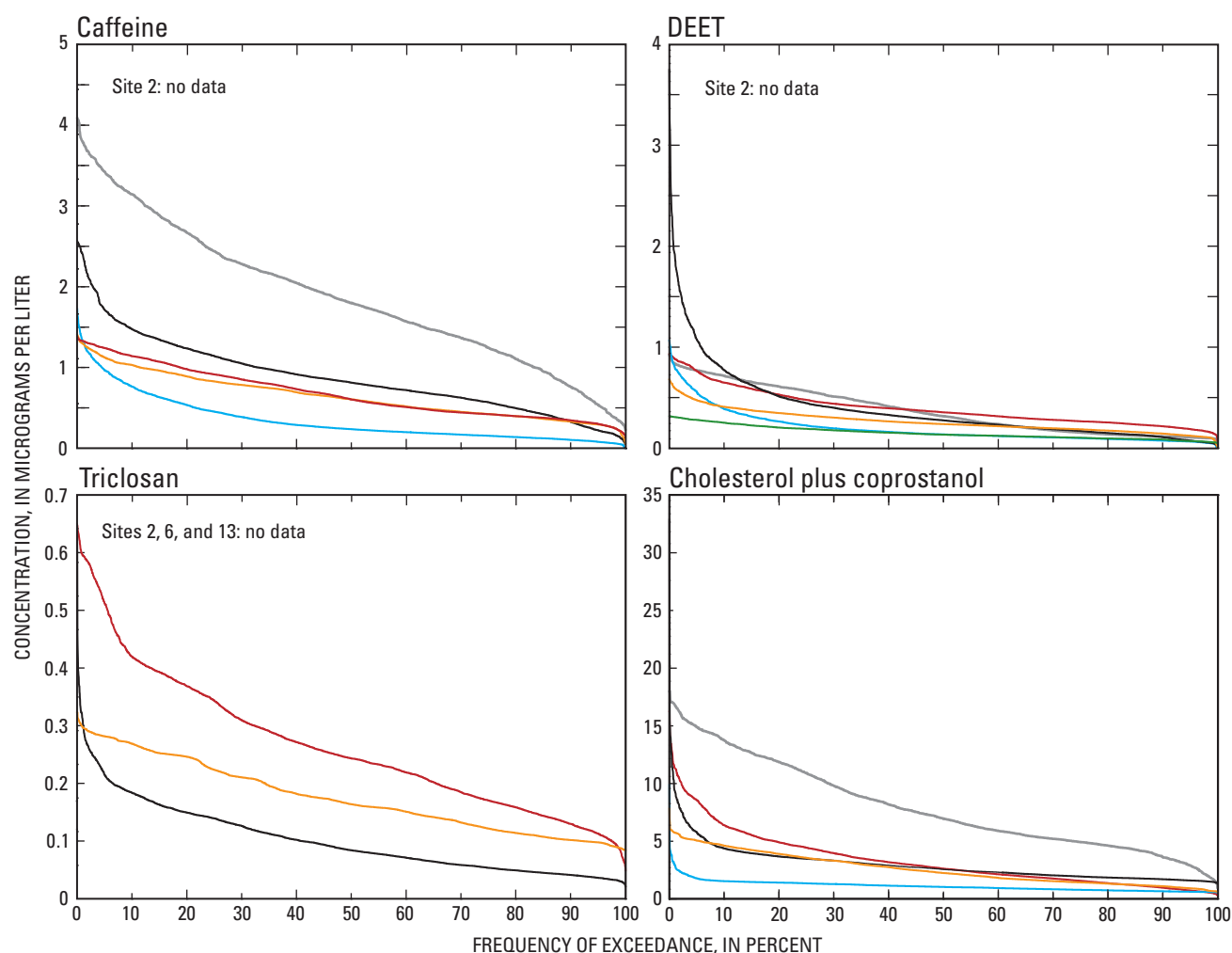


Figure 17. Estimated daily mean concentration duration curves for selected water-quality constituents in the Blue River Basin, October 1998 through September 2007.—Continued

of these compounds include leaks from sewer lines and WWTP bypasses triggered during large or prolonged storm events. Atmospheric deposition also may contribute some DEET to streams during runoff events, although this pathway is thought to be a minor component (Weigel and others, 2002; Costanzo and others, 2007).

On Brush Creek (site 16), loads of nutrients, caffeine, DEET, sterol, and triclosan were approximately 10 percent of the average annual loads during the winter, which is consistent with the decreased winter precipitation. Precipitation during the fall period is 25 percent of the annual total but constituent loads were approximately 10 percent of the annual total. A decline in loads also was observed in the Blue River (site 7), which likely indicates the effects of greater biological activity in the fall as compared to the winter months. Higher temperatures in the fall would be expected to increase the biological breakdown, transformation, and assimilation of constituents in streams and, thereby, reduce their concentrations.

Annual Contribution of Constituents

Understanding the relative annual contribution of point and nonpoint sources in the basin is important to understanding the efficacy of strategies designed to reduce inputs. The principal point-source contributions in the basin are discharges from CSOs and WWTPs. Nonpoint-source contributions include a wide variety of sources including runoff from sidewalks, streets, roofs, lawns, parks, golf courses, and agricultural lands. The annual loads from all sources at selected basin sites, along with loads originating from CSOs and upstream WWTPs, and estimates of nonpoint-source contributions from 1999 to 2007 are listed in table 21 at the back of this report. From 2002 through 2007, annual total nitrogen and total phosphorus loads originating from three WWTPs that discharge in the upper basin were determined by summing the average monthly loads of each constituent as reported by the plant (Wilkison and others, 2006; U.S. Environmental Protection Agency, 2008). Data before 2002 were unavailable. Extremely

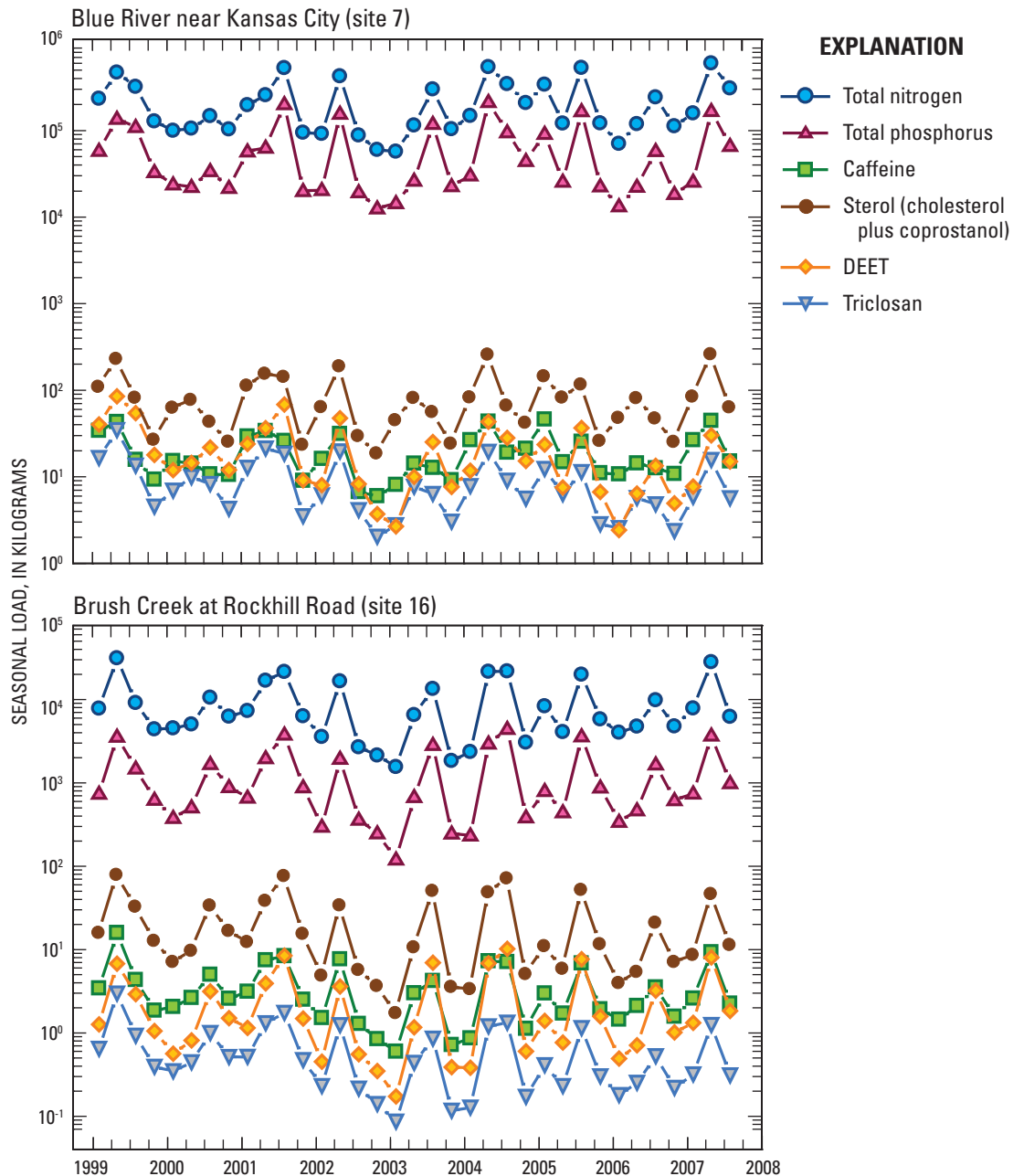


Figure 18. Seasonal total nitrogen, total phosphorus, caffeine, sterol (cholesterol plus coprostanol), DEET (n,n-diethyl-meta-toluamide), and triclosan loads at two stream sites from 1999 through 2007.

intense or prolonged storms can cause some wastewater to bypass all, or part, of the WWTP processes. These bypasses result in the discharge of untreated or partially treated sewage to streams. However, the total nitrogen and total phosphorus load estimates reported for 2002–07 and fecal coliform load estimates for 2002–04 and 2006 do not account for WWTP bypass contributions; therefore, amounts from WWTPs listed in table 19 for those years would be considered minimums. Fecal coliform load estimates from WWTPs for 2005 and 2006 were reported previously by Rasmussen and others (2008). These data included bypass contributions as part of

the total. Estimates of *E. coli* contributions from WWTPs were not available but would be expected to be less than those derived for fecal coliform. Upstream nonpoint source contributions were determined by subtracting known point source loads (from WWTPs and CSOs) from the total annual load at a site for a given year. For years in which WWTP bypasses were not calculated as part of the total WWTP contribution, a part of the nonpoint-source load allocation listed in table 21 originated from bypasses.

Water-quality data from CSOs were available only for 2005. Total nitrogen, total phosphorus, *E. coli*, and fecal

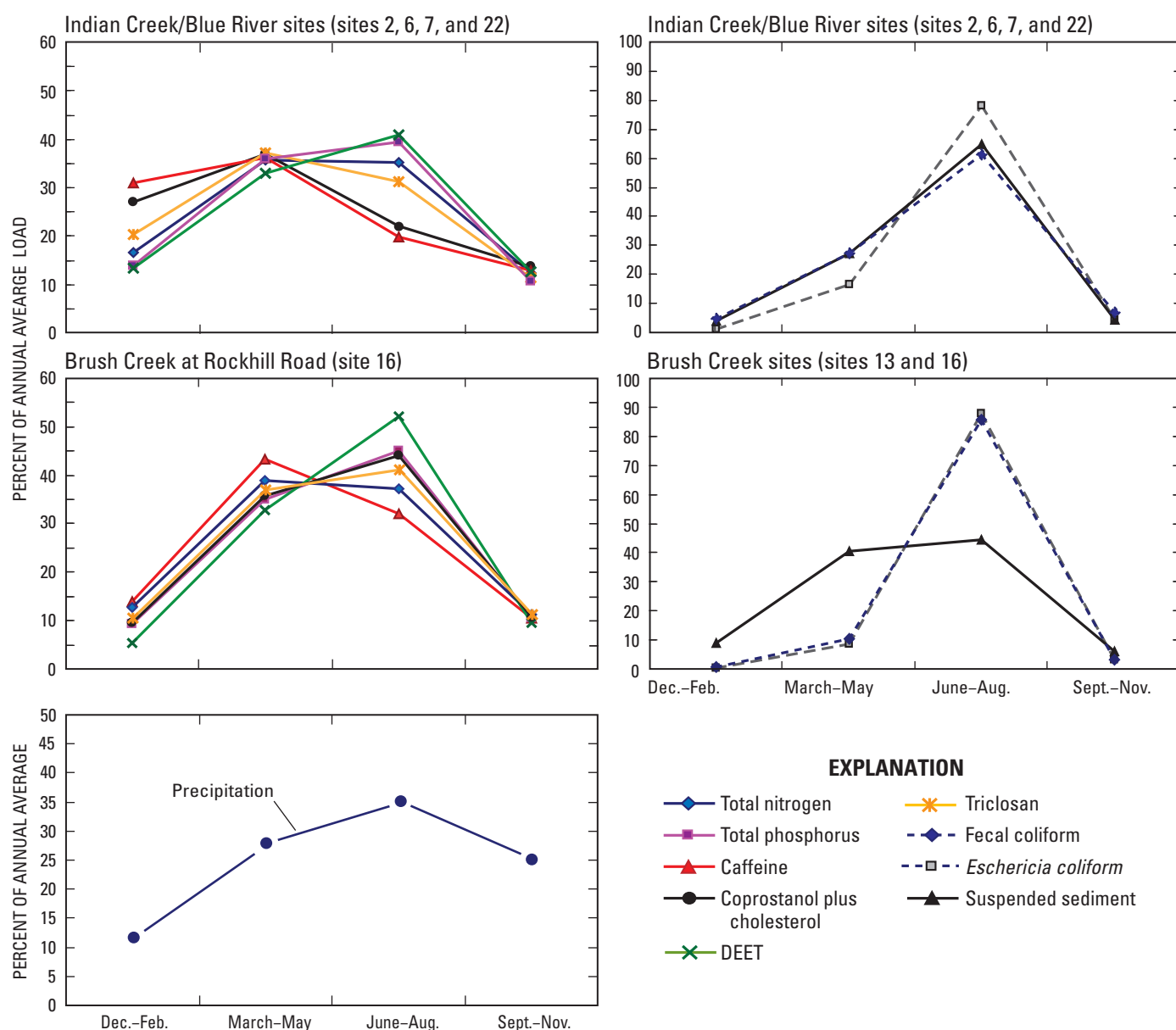


Figure 19. Seasonal contributions of nutrients, selected organic wastewater compounds, fecal-indicator bacteria, suspended sediment, and precipitation from 1998 through 2007 in the Blue River Basin.

coliform loads originating from CSOs were estimated from the median concentration or density measured in overflow samples and the estimated annual CSO volume for a given stream reach (City of Kansas City, Missouri, 2007).

Nonpoint-source estimates were calculated by subtracting the sum of the point sources discharging upstream from a site from the total estimated load from all sources for a given. Attributions to Kansas and Missouri sources were based solely on the relative drainage areas upstream from site 2 and site 6 in each respective State, assuming that runoff conditions remained constant throughout these reaches and that in-stream biotransformation and removal were negligible. At site 2, 84 percent of the upstream drainage lies in Kansas and 16 percent

in Missouri. At site 6, 99 percent of the upstream drainage area lies in Kansas and only 1 percent in Missouri.

Source allocations vary year-to-year, primarily in response to annual variations in precipitation and hydrology. Average contributions from sources based upon the available period of data for a given source category are listed in table 21. However, because of unequal periods of data and rounding errors, the average sum of nonpoint sources, WTP, and CSO contributions may not equal the total estimated load from all sources, and the sum of the average percent contributions from individual sources, may not equal 100.

Nutrients and Source Allocations

Nutrient contributions at a given site on the main stem of the Blue River or the tributary Indian Creek are in large part driven by nonpoint source runoff, the proximity of the site to WWTPs, and the number of facilities upstream from the sites. The bulk (on average 69 percent of the total nitrogen and 82 percent of the total phosphorus from 2003 through 2007) in the upper Blue River (site 2) originated from nonpoint source runoff (table 21). Conversely, on average, 31 percent of the total nitrogen and 18 percent of the total phosphorus in the upper Blue River (site 2) originated from the upstream WWTPs.

At site 6 on lower Indian Creek, nonpoint-source runoff contributed only 38 percent of the total nitrogen and 42 percent of the total phosphorus to lower Indian Creek. An estimated 63 percent of the total nitrogen and two-thirds of the total phosphorus at site 6 originated from upstream WWTPs (table 21). There are no CSOs upstream from site 2 or site 6.

Site 7, located on the middle Blue River and downstream from three WWTPs, has a drainage area (477 km²) approximately four times that of site 2 (118 km²) and about three times greater than site 6 (168 km²). Because of this, the relative contributions from nonpoint sources and WWTPs are between the values at sites 2 and 6. At site 7, more total nitrogen (an average of 59 percent) originated from nonpoint sources than from WWTPs (average of 41 percent). Average total phosphorus contributions from nonpoint sources at site 7 were slightly larger (73 percent; table 21), with 29 percent originating from WWTPs. Although there are no CSOs upstream from site 7, there are CSOs along the Blue River reach downstream from site 7 to the confluence with Brush Creek. Estimated contributions from these CSOs are included with site 7 for comparison purposes and indicate, that given the magnitude of nonpoint and point sources in that reach, nutrient contributions from CSOs in the middle Blue River likely are only a small part (1 percent or less) of the average total load.

Further downstream on the main stem of the Blue River (site 22), nutrient contributions from nonpoint sources become more substantial relative to those from upstream WWTPs because the drainage area (671 km²) at site 22 increases by 41 percent from that at site 7 (Wilkison and others, 2006). Additionally, there may be base-flow periods, especially during the summer months when a part of the WWTPs load is removed through biogeochemical processes in downstream reaches. In addition to the WWTPs that discharge upstream from this site, numerous CSOs, most of which are located along the tributaries Town Fork Creek and Brush Creek, also contribute to the nutrient load in the lower Blue River (site 22). However, in 2005, CSOs from all sources that ultimately discharge into the Blue River contributed just 1 percent of the total nutrient load to the lower Blue River. Approximately three-fourths of the nutrient contributions in the lower Blue River originated from nonpoint sources (74 percent of the total nitrogen and

82 percent of the total phosphorus) with the remainder having originated from WWTPs.

These data indicate that on the main stem of the Blue River and the tributary Indian Creek, the primary sources of nutrients were nonpoint-source runoff and WWTPs effluent discharges. The relative contribution of these two sources varied somewhat from year to year based upon annual precipitation and the number of upstream WWTPs. Load fluctuations occurred between years, primarily in response to hydrologic changes, but other factors also may have contributed to these differences. Wet years increase the volume (and loads) from WWTPs because increased infiltration results in increased flows to plants and ultimately to higher discharges. However, increases from infiltration were not as pronounced as the increases that resulted from increased runoff into streams, so during wet years the percent contribution from WWTPs to streams typically declines. Conversely, during dry years, although streamflow may have declined dramatically, WWTPs contributions remained fairly stable; therefore, the percent contribution from WWTPs to streams typically increased during drier periods. Nutrient contributions from CSOs to the Blue River are minor when compared to those from nonpoint sources and from WWTPs.

The two principal sources of nutrients on Brush Creek (site 16) in 2005 were nonpoint source contributions and CSOs, with approximately two-thirds of the nutrient contributions originating from nonpoint sources and the remaining one-third from CSOs (table 21). There are no WWTPs that discharge into Brush Creek, but on occasion—during heavy or prolonged storm events—three WWTP bypasses discharge partially treated wastewater into upper Brush Creek (upstream from site 13). Bypass contributions were not individually measured in this study; any contribution from them are included in the nonpoint source estimates. However, bypass contributions are believed to constitute only a small part of the overall nonpoint-source contribution.

Fecal-Indicator Bacteria and Source Allocations

Annual contributions of fecal-indicator bacteria in the basin follow a much different pattern than nutrients. WWTPs remove, by design, substantial amounts of nutrients and bacteria by settling the particulate matter from the waste stream. A number of different processes and techniques then are used to reduce or transform concentrations. In the case of nutrients, a substantial part of the nutrients are oxidized into more soluble forms of nitrogen and phosphorus, which are discharged into receiving waters. Although these discharges and amounts are regulated under State and Federal permits, the result is that large amounts of nutrients are discharged into streams, especially where multiple plants operate in the same basin. However, because of potential human health risks associated with the discharge of bacteria to streams, WWTPs are required to greatly reduce the level of bacteria in treated effluent. This

is done by a number of different techniques including solids removal (to which the bacteria are largely attached), chlorination, and ultraviolet radiation. Consequently, fecal-indicator bacteria levels in treated effluent typically are extremely low, and in many cases, lower than the receiving waters into which they are discharged (Lee and others, 2005).

CSOs currently (2009) do not receive any treatment. Although the annual volume of CSO water discharged into streams compared to treated effluent may be small, the amount of bacteria in CSOs can be large. This is because CSOs contain a mixture of untreated sewage and storm runoff each of which can contain large bacteria densities.

On the main stem of the Blue River and Indian Creek, almost all of the bacteria contributions originated from nonpoint sources (table 21). Nonpoint-source contributions to these stream reaches were 96 percent or greater of the total annual contributions in the years 2003 through 2007 (table 21). During that same time period, bacteria contributions from WWTPs were estimated to be 4 percent or less of the total annual load. Although CSO contributions to Blue River reaches in 2005 were sometimes more than 100 times the WWTP fecal coliform contributions, CSO contributions were still only 2 percent or less of the average total annual fecal coliform and *E. coli* load measured at Blue River sites 7 and 22.

On Brush Creek (site 16), fecal-indicator bacteria contributions from CSOs accounted for 39 percent of the total fecal coliform load and 24 percent of the total *E. coli* load in 2005 (table 21). The remainder, approximately two-thirds, of fecal-indicator bacteria contributions to Brush Creek originated from nonpoint sources—61 percent of the fecal coliform bacteria load and 76 percent of the *E. coli* load. An unknown part of the estimate attributed to nonpoint sources comes from partially treated wastewater discharged into upper Brush Creek by occasional WWTPs bypasses. However, beginning in 2002, high-rate disinfection treatment was installed to reduce the bacteria concentration in these bypasses (John Metzler, Johnson County Wastewater, 2007, oral commun.). Because of that and their infrequent nature, bacteria loadings from WWTP bypasses are expected to comprise only a small part of the total load. The average annual *E. coli* load measured in Brush Creek compared to downstream reaches of the Blue River was 7 percent (table 21). This estimate of the percent contribution from the tributary Brush Creek to the Blue River was similar to previous determinations (10 percent) during base-flow conditions (Wilkison and others, 2006).

Taken together, these data indicate that water quality in the basin could be improved by incorporating multiple strategies in order to reduce stream loads. Nonpoint-source reductions in the basin have the potential to decrease nutrient quantities and bacteria densities in area streams. Strategies designed to reduce or eliminate CSOs would substantially decrease the annual loads of nutrients and bacteria to Brush Creek but have minimal effect on total Blue River loadings. However, annual loads of nonpoint nutrients and fecal-indicator bacteria to Brush Creek (site 16) were about twice the CSO

loadings; therefore, nonpoint-source reduction potentially could have an equivalent, if not greater, effect on water quality. Methods designed to reduce nutrient loads from WWTPs that discharge into the basin could substantially reduce the overall nutrient load in Indian Creek and the Blue River.

Biological Assessments

Biological assessments included sampling of benthic macroinvertebrate communities for diversity and abundance, habitat assessments, and toxicity screenings. Macroinvertebrate samples were collected from 11 stream sites in 2002 through 2004 and from 7 stream sites in 2006 and 2007. Habitat assessments were conducted at 11 sites in 2006. Toxicity evaluations were conducted at 14 sites in 2007.

Previous work (Wilkison and others, 2006; Poulton and others, 2007) has shown that biological communities within the Blue River Basin follow an urban gradient with the greatest diversity and highest abundance of aquatic organisms occurring in headwater reaches. Similar studies in nearby basins (Poulton and others, 2007) also have demonstrated that as human disturbance and urban land-use factors increase, macroinvertebrate diversity and abundance decline.

Macroinvertebrate Community Assessments

Macroinvertebrate community assessments were conducted annually from 2002 through 2007 with the exception of 2005. In 2002, one assessment was conducted in the spring and another one in the fall. In the remaining years all assessments were conducted in either the last week of February or the first week of March to avoid spring runoff events that might render sites inaccessible, and to collect samples before the significant emergence of hatching organisms occurred that might bias sample results.

During the 5 years of sampling for this study, 155 different macroinvertebrate taxa were collected. A similar study in adjacent Johnson County, Kansas, detected 188 taxa at 16 sites in the years 2003 and 2004 (Poulton and others, 2007). The reasons for the increased number of taxa present at the Johnson County sites likely are related to a combination of factors including increased number of sample sites, less urbanization, and slightly different sampling approaches between the studies.

Five calculated metrics and the Missouri Stream Condition Index Score (SCI) for Blue River Basin stream reaches from 2002 through 2007 are shown in figure 20. The SCI score is determined from four core metrics: total taxa richness; Ephemeroptera, Plecoptera and Trichoptera (EPT) taxa richness; Shannon Diversity Index; and the Missouri Biotic Index (MOBI). A value for each metric is assigned on the basis of how the core metric scores relate to the range of values at reference sites. The sum of these scores is the SCI, and this value is used to determine the aquatic life use support status

(ALUS). SCI scores in the range of 4 to 8 are considered biologically nonsupportive of aquatic life, those with scores in the range of 10 to 14 are considered partially supportive, and SCI scores between 16 and 20 are considered fully supportive (Sarver and others, 2002). Poulton and others (2007) developed a human disturbance index for Johnson County, Kansas, and classified sites as having either a low, moderate, or high degree of human disturbance. The average value for each Johnson County, Kansas, human disturbance category for the years 2003 and 2004 are plotted on the graphs (fig. 20) to allow comparisons between the two data sets. Metrics calculated at individual sites for years 2002 to 2005 previously were reported (Wilkison and others; 2005; 2006). Data for sites sampled in 2006 and 2007 are reported in table 22.

Total taxa richness, the number of distinct taxa in a sample, was greatest at sites 1 and 2 in the upper Blue River (fig. 20). Total taxa richness at the outside control, South Grand River near Freeman (site 27), was less every year than at the upper Blue River sites, although values from the South Grand River site and the upper Blue River sites generally were in the same range as the Johnson County sites with a low degree of human disturbance. Total taxa richness declined in downstream reaches, with the lowest values typically associated with the lower Brush Creek and lower Blue River reaches (sites 20 and 22). Total taxa richness at these sites tended to be slightly less than values for sites in Johnson County that have experienced a high degree of human disturbance.

The metric EPT taxa richness can be useful in biological assessments because this metric is believed to be more stable than total taxa richness and many EPT genera are considered to be pollution intolerant (Lenat, 1983; 1988). ETP taxa richness generally followed the same pattern as total taxa richness with greatest values in the upper stream reaches and declining values in downstream reaches. EPT taxa richness values in the upper Blue River and at the South Grand River were similar to those observed at the least disturbed Johnson County, Kansas, sites. The South Grand River site had a greater percentage of grassland, forests, and cropland and a lower percentage of urban land than the Blue River Basin sites (Wilkison and others, 2006). Values at other stream reaches were below the range of Johnson County, Kansas, sites with a high degree of human disturbance.

The Shannon Diversity Index provides a measure of the diversity and evenness of population distributions at a site. Thus, the greater number of organisms and the more evenly they are distributed across all taxa, the greater the Shannon Diversity Index. As with the two previous metrics, the greatest scores occurred in the upper Blue River and the control site (sites 1, 2, and 27), and the lowest scores occurred at downstream sites (sites 20 and 22; fig. 20). Shannon Diversity Indices in the upper Blue River and South Grand River were in the range of scores of the Johnson County, Kansas, sites with a low degree of human disturbance. Scores in the lower reaches were even lower than those for the Johnson County, Kansas, streams with a increased degree of human disturbance.

The MOBI is a measurement of the average pollution tolerance of organisms at a site. Higher MOBI scores at a site indicate an overall composition of organisms that are more pollution tolerant; therefore, a lower score indicates better water quality or habitat. In general, sites sampled in this study largely consisted of organisms that were at least moderately pollution tolerant. Sites in the lower part of the Blue River Basin had the highest MOBI scores (fig. 20), which reflected a preponderance of organisms at these sites that were capable of surviving higher pollution levels than organisms at upstream sites and the outside control site.

Sites in the lower part of the Blue River Basin with the highest MOBI scores tended to have aquatic communities primarily composed of only a few organisms. For example, more than 95 percent of the organisms at sites 20 and 22 consisted of only five taxa in 2002 (fig. 20). These taxa also tended to be dominated by the more pollution tolerant oligochaeta, chironomidae, and diptera taxa. At sites 1 and 2 in the upper part of the basin, the five most dominant taxa composed a smaller percentage of the total aquatic community than at downstream basin sites. In the years when these tended to account for a fairly substantial part of the total taxa (greater than 70 percent), it was largely because of the preponderance of moderately pollution tolerant trichoptera (net-spinning caddisflies) together with more pollution sensitive coleopteran (riffle beetle) and mayfly taxa (Wilkison and others, 2006; U.S. Geological Survey, Lee's Summit, Missouri, unpub. data, 2008).

Based upon the SCI scores, no stream segments met the criteria for fully supporting aquatic life. The upper Blue River and the South Grand River control sites were classed as partially biologically supportive. Stream reaches of Indian and Tomahawk Creek and the lower Brush Creek and Blue River were between partially supporting and nonsupporting or in the nonsupporting category. Values for the Johnson County, Kansas, sites are included for comparison purposes only and indicate that even stream reaches considered to have minimal human disturbances would have been considered, at best, to be partially supportive of aquatic life as determined by the SCI score. The Johnson County sites were determined to be partially supportive when evaluated using the State of Kansas criteria for aquatic life support (Poulton and others, 2007). These data indicate that even in the least disturbed parts of the basin, the aquatic community structure has developed in response to some degree of water-quality and habitat degradation.

Habitat Assessments

Stream physical habitat assessments were conducted in 2006 at all 11 sites sampled for benthic macroinvertebrates in 2002 through 2004 (table 23). The assessments evaluate 10 different measures of the physical stream aquatic habitat expected to affect the condition of stream biota. Such measures incorporate information about the riparian vegetation, flow and channel characteristics, sedimentation, and substrate.

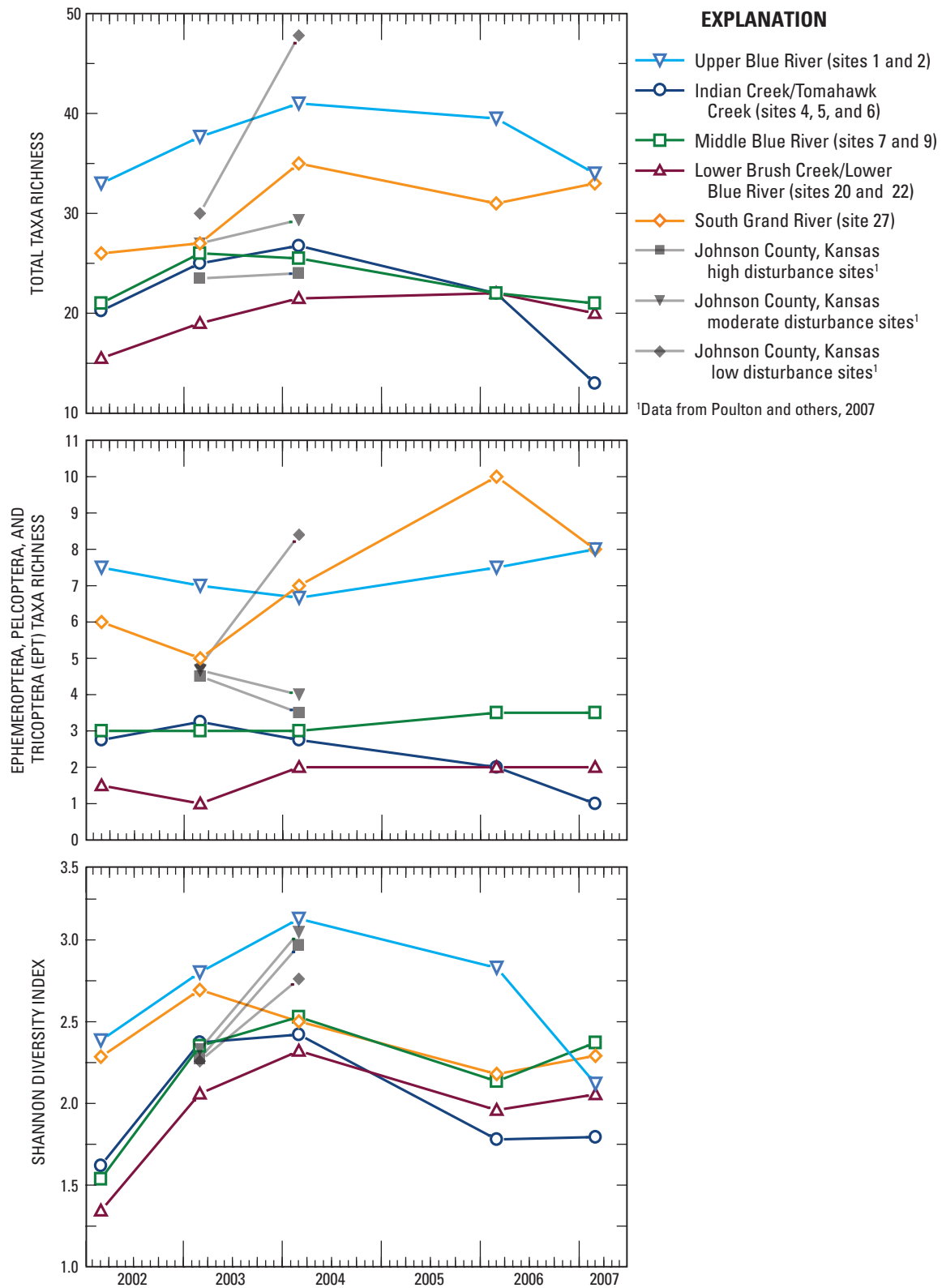


Figure 20. Selected biological metrics, including Missouri Department of Natural Resources core-metrics, Stream Condition Index (SCI) scores, and Aquatic Life Use Support Status (ALUS) for sites sampled in the Blue River Basin from 2002 through 2007.

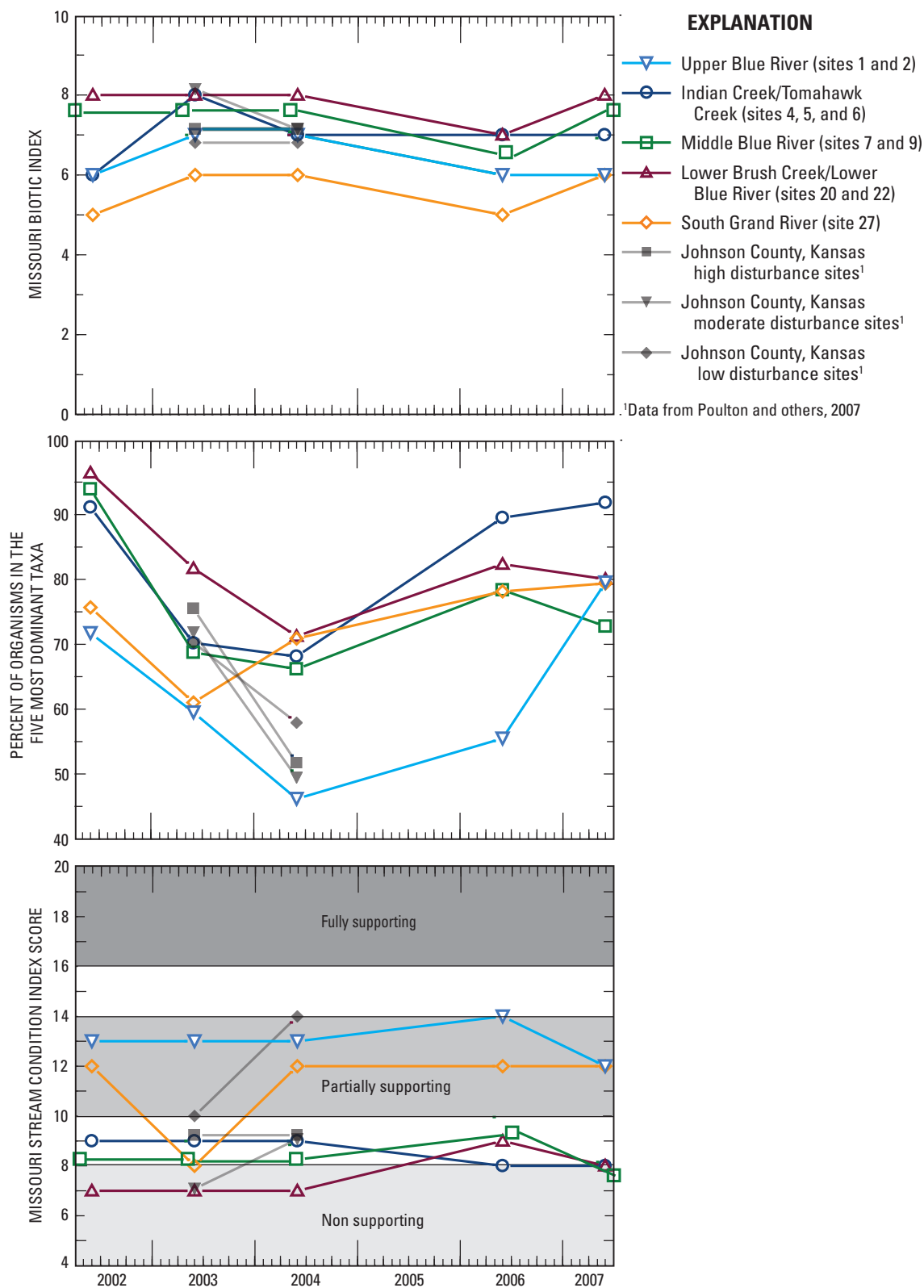


Figure 20. Selected biological metrics, including Missouri Department of Natural Resources core-metrics, Stream Condition Index (SCI) scores, and Aquatic Life Use Support Status (ALUS) for sites sampled in the Blue River Basin from 2002 through 2007.—Continued

Table 22. Benthic macroinvertebrate metric values, stream condition index scores (SCI) for Missouri Department of Natural Resources core metrics, and aquatic life use support (ALUS) status for sites sampled in 2006 and 2007 in the Blue River Basin.[EPT, Ephemeroptera-Plecoptera-Trichoptera; MO-BI, Missouri Biotic Index; SDI, Shannon Diversity Index; $\geq$, greater than or equal to; M, March; $>$, equal to or greater than; PBS, partially biologically supporting; NBS, non-biologically supporting]

Site number (table 1)	Sample period	Total Taxa Richness			EPT Taxa Richness			MO-BI		SDI		Percent scrapers	Percent chironomidae	Percent tanytarsini midges	Percent MO-BI $\geq$ 6.5	EPT to Oligochaeta Ratio	Percent dominant intolerant taxa	Total SCI score	ALUS status
		Metric value	SCI score		Metric value	SCI score		Metric value	SCI score		Metric value								
2006																			
2	M	25	1		6	3		5.8	5	2.16	3	4.9	46.9	4.2	37.4	1.3	92	12	PBS
6	M	22	1		2	1		7.3	3	1.78	3	1.6	26.9	0	92.7	0	63	8	NBS
7	M	22	1		3	1		6.4	5	2.23	3	5.1	42.0	2.1	73.1	0	80	10	PBS
9	M	22	1		4	1		6.3	5	2.05	3	5.5	26.7	1.1	71.4	.14	85	10	PBS
20	M	15	1		1	1		7.6	3	1.73	3	2.0	69.0	0	81.8	0	32	8	NBS
22	M	29	1		3	1		6.4	5	2.19	3	2.5	32.7	.47	73.5	0	81	10	PBS
27	M	31	1		10	3		4.7	5	2.18	3	3.4	19.0	.52	7.2	25	93	12	PBS
2007																			
2	M	34	1		8	3		5.6	5	2.12	3	36	41.5	2.0	17.6	3.29	89	12	PBS
6	M	13	1		1	1		7.2	3	1.79	3	.3	25.4	0	88.5	0	42	8	NBS
7	M	21	1		4	1		7.0	3	2.40	3	14	33.6	0	70.4	.19	43	8	NBS
9	M	21	1		3	1		6.8	3	2.35	3	3.1	39.7	.20	69.3	.04	50	8	NBS
20	M	16	1		0	1		7.7	3	2.18	3	.8	30.9	.11	89.3	0	26	8	NBS
22	M	24	1		4	1		7.5	3	1.93	3	1.5	18.1	.14	85.5	0	35	8	NBS
27	M	33	1		8	3		6.0	5	2.29	3	15	52.3	.27	38.0	2.5	73	12	PBS

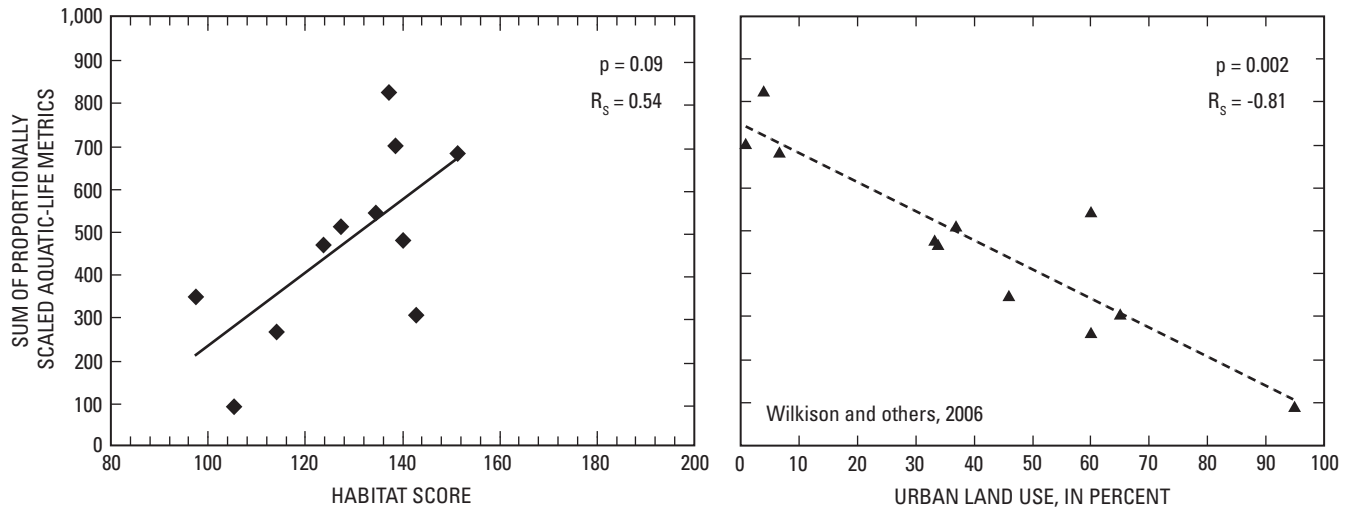


Figure 21. Relation between aquatic life metric scores and stream habitat assessment scores and urban land use at stream sites.

Scores for each measure then are summed to provide the habitat assessment score.

Habitat scores ranged from a high of 151 at site 2 to a low of 97 at site 22 with an average score of 128 for all sites sampled (fig. 1). Total scores typically were higher at stream sites in the upper part of the basin and lower in downstream reaches and, in general, the overall scores were reflective of the increased levels of channel disturbance in downstream reaches. Differences between higher habitat scores observed at sites in the upper, least disturbed parts of the basin and lower habitat scores observed at downstream, more disturbed sites primarily were attributed to channel alteration, loss of riparian vegetation, and sedimentation (table 23). Channel alteration and loss of riparian vegetation accounted for almost two-thirds of the difference in these scores. Factors related to instream habitat (embeddedness, epifaunal substrate, riffle quality, and sediment deposition) were secondary determinants for the lower scores at downstream sites.

These data indicate that channel alterations, which affect numerous stream reaches in the basin but more so in downstream reaches (Wilkison and others, 2005), result in reduced stream physical habitats. This partly is because of the loss of much of the native stream vegetation, loss of many natural pool and riffle sequences, and replacement of lotic (free-flowing) reaches with lentic (impounded) reaches. In some cases, altered flow regimes have resulted in channel scouring, which has reduced the amount and quality of riffles and, therefore, available habitat for benthic organisms. In other cases, in-stream habitat has been lost as sediment deposition has embedded or covered coarse-grained materials that would serve as substrate for bottom-dwelling organisms.

The relation between habitat scores and proportional multimetric macroinvertebrate scores at sites (Wilkison and others, 2006) is shown in figure 21. The habitat scores are a sum of 10 measures of a site's habitat (table 22) and the

multimetric macroinvertebrate aquatic life scores are a sum of 10 measures of the diversity, composition, tolerance, and feeding characteristics of the macroinvertebrate communities at each site (Wilkison and others, 2006; Poulton and others, 2007). Spearman's Rho correlation coefficients between habitat scores and proportional macroinvertebrate scores ($Rho = 0.54$) were only marginally significant ($p=0.09$), indicating that habitat assessment scores were not robust indicators of macroinvertebrate communities at urban sites in the Blue River Basin and that other factors, such as basin land use/land cover and water quality, may impose stronger limitations on invertebrates.

By contrast, there was a statistically significant relation between aquatic-life metric scores and percent urbanization—defined as the roadway surface area plus the commercial, industrial, and residential land use—at sites ($Rho = -0.81$; $p = 0.002$; fig. 21). Several factors likely contribute to the difference between the relations between aquatic-life metrics and urban land use compared to aquatic-life metrics and habitat scores. These data indicate aquatic community health and diversity declined as the percent of urbanization increased, and site water quality is affected by the upstream land use and land cover. These factors may be more important than stream-channel habitat in determining the health of aquatic communities.

Habitat scores are designed to measure the nearby habitat and not the overall land use upstream from sites. Most sites sampled in this study were located in parklands; therefore, habitat scores may not accurately reflect the overall land use upstream from a site. Although the stream physical habitat at a site affects the quality of stream biota, larger scale land-use patterns, such as the amount of vegetation and impervious cover upstream from a site, may play a more substantial role in the health of aquatic communities. As previously noted (Wilkison and others, 2006), urbanization patterns result in increased point- and nonpoint-source inputs in downstream

Table 23. Stream habitat assessment scores for sites sampled in 2006 in the Blue River Basin.

Site number	Site name	Bank stability	Channel alteration	Channel flow status	Embeddedness	Epifaunal substrate	Riffle quality	Riparian vegetation	Sediment deposition	Vegetative protection	Velocity-depth regime	Total score
1	Blue River near Stanley, Kansas	13.0	20	11.8	16	17	7.8	18.2	11	12.4	10.0	137
2	Blue River at Blue Ridge Boulevard Extension	14.6	20	13.2	18	19	15.0	18.2	14	9.4	10.0	151
3	Indian Creek near 69 Highway	12.8	20	10.	14	16	12.2	19.4	10	13.0	4.4	132
4	Indian Creek at Farley Boulevard	17.2	17.2	11.8	15	17	15.0	15.4	13	11.6	9.6	143
5	Tomahawk Creek at Tomahawk Creek Greenway	14.0	20	6.2	13	10	15.0	18.8	6	9.8	10.0	123
6	Indian Creek at 103 Street	15.4	8.4	13.2	14	17	15.0	5.6	12	3.2	10.0	114
7	Blue River near Kansas City, Missouri	11.2	18.2	11.2	16	17	15.8	20	11	9.0	10.8	140
9	Blue River near Gregory Boulevard, Kansas City Missouri ¹	7.2	18.2	13.2	16	10	6.2	20	14	16.0	6.6	127
20	Brush Creek at Elmwood Avenue	8.8	12.6	9.4	11	13	9.8	19.4	6	5.2	10.2	105
22	Blue River at Stadium Drive	20	0.0	10.6	12	11	9.4	0.0	10	15.8	8.6	97
27	South Grand River near Freeman, Missouri	14.0	16.8	10.2	18	16	15.0	20	13	5.6	10.0	139
Average of all sites		13.5	15.6	11.0	15	15	12.4	15.9	11	10.1	9.1	128

¹Sampled at 63rd Street

basin reaches and additionally affect the health and diversity of aquatic communities.

Toxicity Screenings

Water and bottom-sediment samples were screened for acute and short-term acute toxicity using a tiered approach to evaluate the response of the three major trophic levels – primary producers, consumers, and decomposers. Samples were evaluated using a standard series of tests that included *Daphnia magna*, unicellular green algae, and bioluminescent bacteria. In general, organisms were exposed to test waters or sediments, and growth or mortality was measured against that of controls for each test. Base-flow samples from 13 sites, stormflow samples from 8 sites, and bottom-sediment samples from 12 sites were evaluated (table 24). The tiered approach was used to better capture the full range of responses that might be expected to be seen in the environment and because singular approaches sometimes fail to capture these responses.

Primary Producers

None of the algal toxicity samples tested using the green algae *Psuedokirchneriella subcapitata* indicated decreased growth when measured against the controls. In fact, about one-half of the algal toxicity samples indicated increased growth rates when compared to the control samples. These data indicate that water samples from the basin acted to stimulate plant growth, which would be expected given that most stream reaches in the basin receive excessive amounts of nutrients. In many samples, nutrient concentrations were several orders of magnitude greater than what might be expected from background conditions (Wilkison and others, 2006).

Consumers

No sample data indicated any evidence of toxicity using *Daphnia magna*. Other studies have shown *Daphnia magna* to be less sensitive than other methods for evaluating toxicity. Expressions of toxicity in higher trophic-level organisms may not have acute but rather chronic expressions in organisms. Long-term chronic effects were not measured in any of these tests.

Decomposers

Bioluminescent bacteria, *Vibrio fischeri*, were used to evaluate the toxicity of stream samples and bottom sediments to decomposers. Aliquots of *Vibrio fischeri* were exposed to samples, and the response was compared to that measured in controls. Luminescence declines (inhibition) of greater than 50 percent in stream samples compared to the control were considered toxic responses. No sample data indicated toxic responses for the 5-minute test, although three stormflow

samples from Brush Creek and one from Town Fork Creek did exhibit toxicity in the 20-minute tests. Four snowmelt samples with large specific-conductance values, two from the Blue River (site 7) and two from Brush Creek (site 16), did not exhibit toxicity for either test. Based on specific-conductance values, these samples had estimated dissolved-chloride concentrations from 450 to 650 mg/L (fig. 5), which are below the 860 mg/L acute threshold for support of aquatic life, but above the chronic threshold of 230 mg/L (Missouri Department of Natural Resources, 2007) indicating that chronic, rather than acute, effects of road salt would be expected at these concentrations. Bottom sediment samples collected from two sites (site 13, Brush Creek at Ward Parkway and site 26, Penn Valley Park Lake) exhibited toxicity in the 20-minute test but not in the 5-minute test. All together, approximately one-fourth (24 percent) of the stormflow and bottom sediment samples exhibited some level of chronic toxicity in the *Vibrio fischeri* test (table 24). These data indicate that in some instances, storm runoff and bottom sediments may contain constituents that can potentially harm lower trophic-level organisms. Total polycyclic aromatic hydrocarbons (PAH) concentration in the Penn Valley Lake bottom sediment sample (11,900 µg/kg) was less than the consensus-based probable effects concentration of 22,800 µg/kg (MacDonald and others, 2000). However, previous studies (Wilkison and others, 2006) indicated that bottom sediment PAH concentrations in Brush Creek impoundments exceeded the consensus-based probable effects concentration about 40 percent of the time with an average concentration of 30,000 µg/kg. Other studies (Parvez and others, 2005) have shown that bioluminescent bacteria tests tend to be more sensitive than tests that rely on higher trophic-level organisms. In particular, lower-weight PAHs, those common in stormwater runoff from roads and impervious surfaces in urban areas, have been demonstrated to be more toxic to aquatic organisms than are higher weight PAHs of more limited solubility (Black and others, 1983).

Acute toxicity screenings that were performed using a series of tests that included primary producers, consumers, and decomposers indicated that although water and sediments in the basin typically do not pose an acutely toxic threat to biota, runoff events occasionally may pose such a threat, primarily to decomposers. These data indicate that any acutely toxic effects from exposure to stream waters or sediments are more likely to be expressed at the cellular, rather than at the organismal, level. However, screenings conducted during this study were not designed to determine the potential of long-term chronic effects on aquatic organisms. Such effects are possible given the high concentrations of dissolved chloride in streams during winter periods and the concentrations of PAHs measured in bottom sediments, both measured at levels expected to be harmful to aquatic life. The possibility still exists that concentrations of some constituents may pose chronic effects to organisms over longer exposures.

Table 24. Toxicity screening results for water and sediment samples collected in the Blue River Basin, October to December 2007.

[=, sample response within 10 percent of control response; >10, sample response stimulated greater than 10 percent of control ; <25–50, sample response inhibited between 25 and 50 percent of control; <50, sample response inhibited by more than 50 percent of control; KS, Kansas; Blvd, Boulevard; min, minutes,--, no data]

Site number (fig. 1)	Station name	Test (duration)				
		<i>Psuedokirchneri- ella subcapitata</i> (72 hours)	<i>Daphnia magna</i> (24 hours)	<i>Daphnia magna</i> (48 hours)	<i>Vibrio fischeri</i> (5 min)	<i>Vibrio fischeri</i> (20 min)
Base flow samples						
1	Blue River near Stanley, Kansas	=	=	=	=	=
2	Blue River at Blue Ridge Boulevard Extension	=	=	=	=	=
5	Tomahawk Creek near 111th Street	=	=	=	=	=
6	Indian Creek at 103rd Street	=	=	=	=	=
7	Blue River near Kansas City, Missouri	>10	=	=	=	=
8	Blue River near Gregory Blvd	>10	=	=	=	=
12	Brush Creek at Belinder Ave.	=	=	=	=	=
13	Brush Creek at Ward Parkway	>10	=	=	=	=
16	Brush Creek at Rockhill Road	>10	=	=	=	=
19	Town Fork Creek	>10	=	=	=	<25–50
20	Brush Creek at Elmwood Ave.	>10	=	=	=	=
22	Blue River at Stadium Drive	>10	=	=	=	<25–50
27	South Grand River near Freeman	>10	=	=	=	=
Stormflow samples						
2	Blue River at Blue Ridge Blvd Extension	=	=	=	=	=
6	Indian Creek at 103rd Street	=	=	=	=	=
7	Blue River near KCMO	=	=	=	=	=
7	Blue River near KCMO (snowmelt)	--	--	--	=	=
7	Blue River near KCMO (snowmelt)	--	--	--	=	=
8	Blue River at 63rd Street	=	=	=	=	=
12	Brush Creek at Belinder Ave.	>10	=	=	<25–50	<50
13	Brush Creek at Ward Parkway	=	=	=	<25–50	<50
16	Brush Creek at Rockhill Road	>10	=	=	<25–50	<50
16	Brush Creek at Rockhill Road (snowmelt)	--	--	--	=	=
16	Brush Creek at Rockhill Road (snowmelt)	--	--	--	=	=
19	Town Fork Creek	=	=	=	<25–50	<50
22	Blue River at Stadium Drive	>10	=	=	=	=
Sediment samples						
2	Blue River at Blue Ridge Blvd Extension	--	=	=	=	=
5	Tomahawk Creek near 111th Street	--	=	=	=	=
6	Indian Creek at 103rd Street	--	=	=	=	=
7	Blue River near KCMO	--	=	=	=	=
8	Blue River near Gregory Blvd	--	=	=	=	=
12	Brush Creek at Belinder Ave.	--	=	=	=	=
13	Brush Creek at Ward Parkway	--	=	=	<25–50	<50
16	Brush Creek at Rockhill Road	--	=	=	=	=
20	Brush Creek at Elmwood Ave.	--	=	=	=	=
22	Blue River at Stadium Drive	--	=	=	=	=
26	Penn Valley Lake	--	=	=	<25–50	<50
27	South Grand River near Freeman	--	=	=	=	=

Impounded Sediments

Previous work (Wilkison and others, 2002; 2006) indicates that as sediment is transported downstream from the upper reaches of Brush Creek, it encounters lower stream gradients and reduced stream velocities in impoundments. Lower stream velocities limit the stream's carrying capacity for suspended sediment, which results in bottom sediment accumulation in impoundments. This phenomenon is most pronounced in the lower reach of Brush Creek adjacent to site 20, known locally as Lake of the Enshriners, which has the largest impounded area. As particulates settle from the water column, they carry attached constituents that can accumulate with time. Although a number of biogeochemical processes may act to degrade a part of these constituents, data have shown that the streambed sediments frequently are enriched in a number of organic wastewater compounds including detergents, fragrance compounds, plasticizers, and sterols as well as PAHs and pesticides (Wilkison and others, 2006). Over-the-counter and prescription medications also have been detected in these bottom sediments (Wilkison and others, 2006).

Some of the smaller upstream impoundments (such as adjacent to site 16) were designed to scour sediment during large runoff events, and these reaches tend to remain relatively free of accumulated sediment. Additionally, sediment supply is limited in this reach as the upstream impoundment (adjacent to site 15) traps a part of the suspended sediment, which acts to starve downstream reaches (Wilkison and others, 2002). Sediment also is removed every couple of years from the impoundment just upstream from site 15, which further limits the potential for downstream transport. The shallow upstream impoundments allow sunlight to penetrate throughout the entire water column, which can degrade compounds. Concentrations measured in the upper impoundments were less than those measured in Lake of the Enshriners sediments (Wilkison and others, 2006).

An estimate of the sediment accumulation in Lake of the Enshriners was conducted by comparing the lake bathymetry against the elevation profile of the lake bottom at the time of construction. The net difference between these two elevation profiles constituted the accumulated sediment volume that had occurred from 1996 to 2006. Based upon these data, approximately 1.5 million cubic feet (34 acre-feet) of sediment accumulated in Lake of the Enshriners during this time. However, the mean net sediment yield (the average annual lake sedimentation volume divided by the drainage area over the lifespan of the lake) for Lake of the Enshriners was quite small (0.12 acre-feet per square mile per year) when compared to other lakes in the region (values ranged from 0.03 to 2.04 acre-feet per square mile per year; Kyle Juracek, U.S. Geological Survey, written commun., 2008). Sediment inputs have displaced approximately 16 percent of the original lake volume in 10 years.

Bottom sediments in Penn Valley Park Lake (site 26) were collected in August 2006 and analyzed for 62 organic

wastewater compounds (OWCs; table 10). Concentrations of PAHs accounted for 75 percent of the total OWCs measured in this sample. The total PAH concentration (11,900 µg/kg)—determined by the sum of the 1-methylnaphthalene, 2-methylnaphthalene, anthracene, benzo (α) pyrene, fluoranthene, naphthalene, para-cresol, phenanthrene, and pyrene concentrations—was near the lower range of values previously observed in bottom sediments at Brush Creek sites 15, 16, and 20 where values ranged from 11,300 to 68,000 µg/kg (Wilkison and others, 2006). The total PAH concentration measured in Penn Valley Park Lake was about one-half the consensus-based probable effects concentration (PEC) for total PAHs in freshwater sediments (MacDonald and others, 2000). However, fluoranthene, phenanthrene, and pyrene concentrations exceeded the PEC guidelines as they have in previous samplings of other sites (sites 4–6, 15–16, and 20) in the Blue River Basin (Lee and others, 2005; Wilkison and others, 2006). Total PAH concentrations determined from sediments collected near the mouth of the Blue River near site 24 (Echols and others, 2007) were three times less than concentrations determined in Penn Valley Park Lake, and concentrations in bottom sediments collected in Blue River headwater reaches upstream from site 2 generally were 50 to 200 times less than those observed in Penn Valley Park Lake.

There are numerous sources of PAHs in the environment, including atmospheric deposition, sewage, and runoff. However, studies have demonstrated that PAH concentrations are strongly linked to the level of nearby automobile traffic (Van Metre and others, 2000). Concentrations of PAHs measured in bottom sediments throughout the course of this study were similar to those reported elsewhere for urban lakes (Van Metre and others, 2002). PAHs bind to particles on road surfaces, which are rapidly transported to receiving waters during runoff events. Renewed accumulation on surfaces begins almost immediately once precipitation ends (Krein and Schorer, 2000), resulting in a nearly continuous source of materials ready for available transport to receiving waters.

As with PAHs, concentrations of detergent metabolites, pesticides, plastics, and solvents in Penn Valley Park Lake sediments (table 10) were near the lower range of concentrations previously measured in Brush Creek impoundments (Wilkison and others, 2006). Two classes of compounds, disinfectants and sterols, which are thought to be strong indicators of wastewater contamination, were not detected in the Penn Valley Park Lake sample. Bottom sediment OWCs concentrations tended to decrease with the size of the impoundment. Penn Valley Park Lake's surface area is approximately one-tenth as large as the smallest impoundment on Brush Creek, which may have affected detection levels as well as the fact that there is only one CSO discharge point upstream from Penn Valley Park Lake. The predominate source of OWCs affecting the quality of bottom sediments in Penn Valley Park Lake likely are runoff from impervious surfaces.

Summary and Conclusions

A study was conducted in the Blue River Basin, Kansas City Metropolitan area, in cooperation with the City of Kansas City, Missouri Water Services Department to characterize water quality from a basin perspective, identify constituent sources, and evaluate spatial and temporal trends from 1998 through 2007. The water quality of streams in the Blue River Basin have been affected by CSOs, other point and nonpoint source pollution, physical stream conditions, and complex water-quality processes; an understanding of the myriad of sources, conditions, and processes was critical for a complete evaluation of stream-water quality. These data were needed to provide a baseline for evaluating the effectiveness of long-term combined sewer overflow control and basin management plans to meet water-quality standards and protect designated stream uses.

A network of 27 streamflow and water-quality sites was established and sampled from 1998 through 2007. Discrete and continuous measurements of streamflow and water-quality properties combined with nutrient, fecal-indicator bacteria, suspended sediment, organic wastewater, and pharmaceutical compound data from base-flow and stormflow samples were used to examine spatial and temporal trends occurring in the basin, develop load estimation models at selected sites for seasonal and annual trend analysis, and evaluate contaminant sources. The biological integrity at stream sites was assessed using measurements of benthic aquatic macroinvertebrates, stream physical habitats, and toxicity screenings.

Hydrologic alterations, primarily low-head dams and concrete-lined channels, to the Brush Creek stream channel resulted in statistically significant differences between Brush Creek and the Blue River for several water-quality properties and constituents. Monthly median specific-conductance values of the Blue River were larger than the values of Brush Creek partly because a substantial part of flows in the Blue River downstream from Indian Creek sewage effluent that, although treated to meet applicable water-quality standards, has increased concentrations of a number of dissolved ions that increase specific conductance. Additionally, the Brush Creek Basin has a higher percentage of impervious cover than does the upper Blue River, which directs substantial amounts of low-conductance precipitation directly to Brush Creek. Turbidity values in the Blue River were approximately twice that in Brush Creek, reflective of the greater sediment load the Blue River carried during large runoff events. Additionally, sediment trapping within impounded reaches of Brush Creek lessened sediment concentrations in Brush Creek compared to the Blue River.

From April through November of each year, Blue River dissolved-oxygen concentrations rarely were (3 percent of days) below the 5 mg/L standard for full support of aquatic life, unlike Brush Creek where dissolved-oxygen concentrations were below the standard approximately 27 percent of time. These differences partly were because storms

deliver suspended sediment, organic matter, and nutrients to impounded Brush Creek reaches where biogeochemical processes frequently acted to reduce dissolved-oxygen levels. Nutrient-enriched waters also resulted in periodic algal blooms and eutrophication in impounded reaches of Brush Creek. Instream nutrient assimilation processes acted to remove part of the nutrient load (13 percent of the total nitrogen and 26 percent of the total phosphorus) in a 20-km reach of the Blue River. However, these processes appeared to be limited to warmer and drier periods and are insufficient to eliminate nutrient saturation of basin streams.

Large fecal coliform densities were strongly linked to stormflow runoff; the median *Escherichia coli* (*E. coli*) density in stormflow samples was 100 times the median base-flow density. During three base-flow synoptic samplings of 19 basin sites focused in the combined sewer system area, fecal-indicator bacteria densities (*E. coli* and fecal coliform) generally increased downstream and, correspondingly, as urbanization increased. Brush Creek, the tributary with the greatest number of CSO discharge points, contributed, on average, approximately 10 percent of the annual *E. coli* to downstream reaches of the Blue River. The tributary Town Fork Creek had median base-flow *E. coli* densities double that of other sites in the basin and median stormflow densities that were about 10 times greater than other stormflow samples primarily because approximately one-fourth of the runoff in Town Fork Creek Basin was thought to originate in combined sewers.

Cumulative duration curves of estimated daily mean *E. coli* densities in the Blue River Basin indicated that sites on the upper reaches of the main stem of the Blue River would meet the State of Missouri secondary contact criterion (1,134 col/100 mL) for *E. coli* approximately 85 percent of the time from October 2002 through September 2007 with exceptions occurring during runoff events. For stream segments of the Blue River where the current (2009) whole body contact, Class A criterion apply (126 col/100 mL), estimated *E. coli* densities rarely were below the standard. In reaches where the current (2009) whole body contact, Class B criterion (206 col/100 mL) apply, estimated *E. coli* densities were below the standard approximately 10 percent of the time.

Microbial-source tracking indicated that a substantial part of instream bacteria for wet weather and base-flow events was of human origin. Stormwater runoff generated the largest *E. coli* densities and *E. coli* loads and the largest amount of human *E. coli* to streams. Almost one-half (45 percent) of the human-sourced bacteria measured in the basin originated from two stormwater events on the Town Fork Creek tributary (site 19) because of large *E. coli* densities in this stream and the high percentage of these samples typed as human. The percent of human-sourced bacteria in basin base-flow samples (average of 43 percent) indicated that the persistence and adaptability of *E. coli* may be a concern.

Flow-adjusted concentration trends were determined for two sites on the main stem of the Blue River (sites 7 and 22) and for two sites on Brush Creek (sites 13 and 16) from October 1998 through September 2007. For two other basin

sites, one on the upper Blue River (site 2) and one on Indian Creek (site 6), which had shorter timeframes of data collection, flow-adjusted concentration trends were determined from October 2002 through September 2007. Monotonic trends were determined for 22 constituents using fitted linear regression models that included concentration, flow, time, and in some cases, yearly or seasonal terms. Constituents for flow-adjusted concentration trend analysis included total and dissolved nutrients, fecal-indicator bacteria, suspended sediment, chloride, and selected organic wastewater indicator compounds including caffeine, the sterols—cholesterol plus coprostanol, the insect repellent DEET, and the antimicrobial compound triclosan. In approximately two-thirds (64 percent) of the cases where models met the fit-selection criteria, trends were not significant, indicating that, in general, basin conditions remained relatively stable during the study period and did not affect constituent concentrations. Where statistically significant flow-adjusted trends were detected, most (88 percent) were declines. Declines in flow-adjusted concentration were associated with suspended sediment or constituents that have a strong affinity for suspended sediment.

A number of policies and efforts designed to reduce or control sediment in the basin began near the inception of this study and flow-adjusted sediment concentrations declined significantly at five of six sites in the basin. Declines in sediment concentrations are important because many water-quality contaminants have an affinity for suspended sediment, and limiting sediment supply to streams can reduce their concentration in streams. *E. coli* densities also declined at basin sites, although only one site (site 2) had a statistically significant decline.

Daily mean concentration duration curves for total nitrogen, total phosphorus, *E. coli*, suspended sediment, and the frequently detected wastewater indicator compounds – caffeine, DEET, sterol, and triclosan – were developed from fitted models that included concentration, flow, time, and in some cases, yearly or seasonal terms. Total nitrogen concentrations on Indian Creek (site 6) exceeded 10 milligrams per liter (mg/L) about 50 percent of the time from 2000 through 2007 and to a much lesser extent on sites in the Blue River (sites 2, 7, and 22) from 1998 through 2007 with the largest concentrations corresponding to the days in which treated effluent was the largest percent of streamflow.

Total nitrogen concentrations never exceeded 5 mg/L at Brush Creek sites from 1998 through 2007 and concentrations were greatest during runoff events rather than during base-flow events. At all sites in the basin, total nitrogen concentrations almost always exceeded the recommended U.S. Environmental Protection Agency ecoregional total nitrogen criterion of 0.69 mg/L.

Estimated total phosphorus concentration duration curves at stream sites followed similar patterns to estimated total nitrogen curves because sources largely are the same for both constituents. At stream sites dominated by treated sewage effluent (Blue River and Indian Creek), the median and range of concentrations were greater than at Brush Creek sites. Esti-

mated total phosphorus concentrations on the Blue River and Indian Creek also exceeded the U.S. Environmental Protection Agency ecoregional criterion of 0.037 mg/L 100 percent of the time from 1998 through 2007, with the largest concentrations occurring when effluent comprised the largest percentage of streamflow. The median and range of total phosphorus concentrations at Brush Creek sites also were less than at Blue River and Indian Creek sites. Estimated total phosphorus concentrations exceeded the U.S. Environmental Protection Agency ecoregional criterion less than 10 percent of the time on Brush Creek, and these periods corresponded with stormwater runoff.

Concentration ranges for caffeine were greater on Brush Creek (site 16) and the largest concentrations occurred during runoff in the spring and summer as opposed to sites on Indian Creek and the Blue River, where the highest concentrations occurred during the winter months when streamflows were largely comprised of effluent and biological removal processes were slowed by lower water temperatures. Concentrations of DEET, sterol, and triclosan generally were greater at wastewater-dominated sites than at CSO-dominated sites. DEET concentrations tended to peak during summer months at all sites; however, at wastewater-dominated sites, increased sterol and triclosan concentrations corresponded with winter base flows.

Loads of nutrients and organic wastewater compounds were, on average, about 20 times greater in the effluent-dominated Blue River than for the CSO-dominated Brush Creek. Seasonally, the largest contribution of nutrients to basin streams occurred from March through August of each year, partly because this corresponded with the greatest flows, and a substantial part of nutrient inputs originated during storm runoff. These events provide nonpoint and point-source contributions. An even larger percentage of nutrients was contributed to Brush Creek from March through August because precipitation events triggered more frequent CSO discharges. Seasonal patterns for caffeine, DEET, sterol, and triclosan were slightly different between the effluent-dominated Blue River and the CSO-dominated Brush Creek. On the Blue River, with flows augmented by discharges from three upstream WWTPs, colder winter temperatures reduced treatment plant removal efficiencies which, coupled with winter low-flow periods, resulted in an increased percentage of these constituents being delivered to the Blue River compared to Brush Creek, where the dominant source is CSO discharges, which occur much less frequently during the winter. DEET contributions to area streams were greatest during the summer, the expected period of greatest use. Declining percentages of caffeine and sterol in the Blue River throughout the summer and early fall indicate biogeochemical processes increase and act to decrease instream concentrations.

Total annual contributions of nutrients and fecal-indicator bacteria to stream reaches in the basin, and annual contributions from the two primary basin point sources, CSOs and WWTPs, as well as contributions from nonpoint sources were determined. For the main stem of the Blue River and Indian Creek, the primary sources of nutrients were nonpoint-source runoff and WWTPs effluent discharges. The relative

contribution of these two sources varied from year to year based upon annual precipitation and the number of upstream WWTPs. Nutrient contributions from CSOs to the Blue River were minor (1 percent or less of the annual total) when compared to those from nonpoint sources and from WWTPs. Nonpoint-source contributions of fecal-indicator bacteria contributions on the main stem of the Blue River and Indian Creek accounted for more than 96 percent of the annual total, whereas those from WWTPs accounted for 4 percent or less. In 2005, even though CSO contributions to Blue River reaches were sometimes more than 100 times larger than WWTP contributions, CSOs still contributed only 2 percent or less of the total fecal-indicator load to the Blue River.

On Brush Creek, approximately two-thirds of the annual nutrient load originated from nonpoint-source contributions, with the remaining one-third from CSOs. Annual contributions from CSOs accounted for 39 percent of the total fecal coliform load in 2005 and 24 percent of the total *E. coli* load. The bulk of the annual fecal coliform load in Brush Creek originated from nonpoint sources.

Biological assessments were conducted at basin sites using the sampling of benthic macroinvertebrate communities for diversity and abundance, habitat assessments, and toxicity evaluations. Macroinvertebrate communities that were the most diverse, the most evenly distributed among taxa, and the least tolerant of pollution occurred at sites in the upper Blue River and the outside control site. Downstream basin reaches contained the least diverse populations and the largest percentage of pollution-tolerant organisms of basin sites. Based upon Missouri Stream Condition Index Scores, no sites in the basin met the criteria for fully supporting aquatic life from 2000 through 2007. Sites in the upper Blue River fell into the range of partially biologically supportive, whereas sites in lower reaches were near the lower limit of partially supporting, or the upper limit of nonsupporting of aquatic life.

Channel alteration and loss of riparian vegetation accounted for almost two-thirds of the difference in stream physical habitat assessment scores observed at sites in the upper, least disturbed parts of the basin, and lower habitat scores observed at downstream, more disturbed sites. However, local stream habitat features were not as robust measures of the quality of macroinvertebrate communities as were the larger-scale landuse/land cover upstream from sites.

Toxicity screenings, using a tiered-approach to assess the major trophic levels – primary producers, consumers, and decomposers—were used to evaluate the acute and short-term acute toxicity of water and bottom sediments. Water and bottom sediments were not acutely toxic to the unicellular green algae (*Pseudokirchneriella subcapitata*) or consumers (*Daphna magna*). In fact, the growth rate of green algae exposed to stream water increased compared to that of control samples likely because of the nutrient-rich quality of basin streams. Although acute toxicity was not observed in the bioluminescent bacteria, *Vibrio fischeri*, when exposed to base-flow samples, approximately one-fourth of stormflow and bottom-sediment samples exhibited some degree of short-

term acute toxicity. These data indicate that deleterious effects associated with contaminants present in the Blue River Basin are more likely to be expressed as chronic, rather than as acute toxicity, and that responses are more likely to be observed at the cellular, rather than organismal level.

Polycyclic aromatic hydrocarbons (PAHs) accounted for approximately 75 percent of the organic wastewater compounds measured in lake-bottom sediments of Penn Valley Park Lake, an indication that the predominant source of PAHs entering the lake was likely to be runoff from impervious surfaces. Bottom-sediment concentrations of fluoranthrene, phenanthrene, and pyrene exceeded the consensus-based probable effects concentration for freshwater sediments.

Analysis of a wide variety of constituents in streamwater samples coupled with biological assessments from 1998 through 2007 provide the basis for assessing the efficacy of long-term combined sewer control and basin management plans in the Blue River Basin. These data provide spatial and temporal resolution to factors that affect the quality of water and biota in the basin and indicate that water quality in the basin could be improved by incorporating multiple strategies in order to reduce constituent loads in streams. Strategies designed to reduce or eliminate CSOs substantially would reduce the annual loads of nutrients and fecal-indicator bacteria in Brush Creek, but have little effect on Blue River loadings. Nonpoint-source reductions to Brush Creek potentially could have an equivalent, if not greater, effect on water quality than CSO reductions. Although WWTPs account for a small part (less than 1 percent) of the total annual bacteria loads to the Blue River and Indian Creek, reduction of WWTPs nutrient loads could substantially reduce Indian Creek and the Blue River nutrient loads. Nonpoint-source reductions could substantially reduce annual nutrient and bacteria loadings to the Blue River and Indian Creek.

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Tables

Table 4. Quality-assurance data for nutrients, fecal-indicator bacteria, and selected chemical constituents.

[SE, standard error in milligrams per liter, except bacteria that are in colonies per 100 milliliters; R², coefficient of determination; n, number of samples; --, not applicable]

Constituent	Samples collected 1998 through 2003					Samples collected 2004 through 2007					All samples				
	Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs		
	Average	Median	SE	R ²	n	Average	Median	SE	R ²	n	Average	Median	SE	R ²	n
Ammonia plus organic nitrogen	12	5.1	0.44	0.85	33	7.1	5.0	0.19	0.99	22	10	5.1	0.37	0.94	55
Ammonia	11	2.7	.04	.99	33	4.7	1.9	.01	1.0	22	8.5	2.1	.03	1.0	55
Dissolved nitrate	4.0	1.0	.11	1.0	33	1.2	.89	.04	1.0	22	2.9	1.0	.09	1.0	55
Dissolved nitrite plus nitrate	3.4	.74	.12	1.0	33	1.1	.45	.04	1.0	22	2.5	.71	.09	1.0	55
Dissolved nitrite	5.5	2.5	.04	.99	33	1.6	.62	0	1.0	22	3.9	1.9	.01	.99	55
Total organic nitrogen	13	6.6	.43	.81	33	11	6.0	.24	.98	22	12	6.6	.38	.91	55
Total nitrogen	8.6	2.8	.46	.98	33	3.9	2.4	.28	.99	22	6.7	2.6	.40	.98	55
Dissolved orthophosphate	9.2	1.6	.04	1.0	21	2.3	.69	.01	1.0	22	5.7	1.0	.02	1.0	43
Dissolved phosphorus	5.5	1.2	.04	1.0	33	3.1	0	.01	1.0	22	4.5	1.2	.02	1.0	55
Total phosphorus	4.4	.89	.07	.99	33	6.0	2.7	.08	.99	22	5.0	1.3	.07	.99	55
Dissolved chloride	1.0	.73	3.2	1.0	17	.21	.17	.81	1.0	21	.56	.28	2.4	1.0	38
Dissolved organic carbon	4.4	3.0	1.6	.95	12	7.2	2.6	1.1	.63	20	4.3	3.0	.88	.72	31
Total organic carbon	6.1	4.2	.37	.98	25	18	16	6.4	.93	19	11	6.0	4.6	.94	43
Biochemical oxygen demand	13	5.7	6.0	.92	8	14	11	.97	.86	19	14	6.0	3.7	.95	21
Chemical oxygen demand	13	13	15	.74	21	17	1.4	24	.96	14	14	7.2	21	.81	39
<i>Escherichia coli</i>	7.4	2.6	57	.99	11	23	11	5,800	.99	20	16	9.5	4,600	.99	31
Fecal coliform	--	--	--	--	--	22	15	9,700	.94	16	16	8.0	9,000	.94	27
Suspended sediment	6.6	5.5	60	1.0	22	27	8.7	22	1.0	16	15	5.9	48	1.0	38

Table 5. Quality-assurance data for selected organic wastewater compounds from unfiltered samples.

Constituent	Samples collected 1998 through 2003					Samples collected 2004 through 2007					All samples				
	Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs		
	Average	Median	SE	R ²	n	Average	Median	SE	R ²	n	Average	Median	SE	R ²	n
1,4-Dichlorobenzene	15	6.5	0.28	0.63	65	2.4	5.6	0.02	1.0	9	13	4.9	0.26	0.81	74
1-Methylnaphthalene	7.5	0	0	1.0	11	13	0	.01	1.0	9	10	0	.02	1.0	20
2,6-Dimethylnaphthalene	9.9	0	.14	.92	42	.16	0	0	1.0	9	8.2	0	.13	.97	51
2-Methylnaphthalene	6.5	0	0	1.0	11	6.4	0	.01	1.0	9	6.5	0	.02	1.0	20
2,2',4,4'-Tetrabromodiphenyl ether	--	--	--	--	--	3.7	0	.01	1.0	8	3.7	0	.01	1.0	8
3-tert-Butyl-4-hydroxyanisole (BHA)	8.0	0	.06	1.0	65	6.1	0	.40	.97	6	7.8	0	.12	1.0	71
3,4-Dichlorophenyl isocyanate	16	6.7	.08	.97	7	27	7.4	.70	.97	9	22	7.4	.56	.97	16
3-beta-Coprostanol	23	16	11	.90	65	51	19	2.4	.9	9	27	19	11	.90	74
3-Methyl-1H-indole (skatol)	.23	0	0	1.0	11	21	0	.07	1.0	9	9.5	0	.05	1.0	20
4-Cumylphenol	12	0	0	1.0	11	.45	0	.02	1.0	9	6.6	0	.05	1.0	20
4-n-Octylphenol	12	0	0	1.0	11	.35	0	.02	1.0	9	6.6	0	.05	1.0	20
4-Nonylphenol	18	13	12	.84	65	28	13	.31	1.0	9	19	13	11	.84	74
4-tert-Octylphenol	9.7	0	.04	.99	11	2.4	0	.03	1.0	9	6.4	0	.04	1.0	20
5-Methyl-1H-benzotriazole	19	4.5	.89	.86	34	3.1	3.2	.07	1.0	9	16	2.7	.84	.99	43
Acetophenone	17	0	.54	.07	65	6.5	0	.04	1.0	9	16	0	.57	.39	74
Acetyl-hexamethyl-tetrahydro-naphthalene (AHTN)	33	16	.09	.81	11	30	15	.18	.99	9	32	13	.17	.98	20
Anthracene	22	1.8	.07	.82	65	26	4.3	.08	1.0	9	22	1.4	.07	.98	74
Anthraquinone	19	12	.04	.97	11	12	14	.19	.99	9	16	14	.12	.99	20
Atrazine	18	13	.08	.88	7	8.1	8.1	.02	1.0	9	12	5.2	.08	.99	16
Benzo[a]pyrene	24	3.2	.35	.16	65	11	4.1	.44	.94	9	22	3.3	.37	.76	74
Benzophenone	14	0	.03	.98	11	15	0	.09	1.0	9	14	0	.07	.99	20
Bis(2-ethylhexyl) phthalate	28	7.2	3.4	.50	60	7.9	13	.19	.97	9	25	6.9	3.3	.51	69
Bisphenol A	20	9.4	.31	.91	65	22	9.3	.10	1.0	9	20	9.3	.30	.92	74
Bromacil	15	4.9	.09	.81	11	1.7	0	.01	1.0	9	8.8	0	.09	1.0	20
Caffeine	21	14	5.5	.81	65	28	16	.55	.94	9	22	15	5.2	.80	74
Camphor	0	0	--	--	11	49	0	.23	.98	9	22	0	.15	.98	20
Carbaryl	4.0	0	.04	.99	65	24	0	.32	.92	9	6.4	0	.12	.95	74
Carbazole	11	0	.04	.96	11	8.2	0	.08	1.0	9	9.6	0	.06	1.0	20
Chlorpyrifos	2.4	0	0	1.0	65	.03	0	0	1.0	9	2.1	0	0	1.0	74
Cholesterol	25	19	18	.94	65	41	20	3.0	.86	9	27	20	17	.94	74
Cotinine	31	8.8	.41	.50	31	15	11	.08	1.0	9	27	9.0	.36	.96	40
Diazinon	14	3.7	.03	.95	65	.03	0	0	1.0	9	12	0	.03	1.0	74
Dichlorvos	14	0	.05	.98	11	.02	0	0	1.0	9	7.8	0	.05	1.0	20
Diethyl phthalate	8.8	0	.56	.93	27	12	7.0	.07	1.0	9	9.5	4.0	.49	.94	36

[SE, standard error in micrograms per liter; R², coefficient of determination; n, number of replicate samples; --, not applicable]

Table 5. Quality-assurance data for selected organic wastewater compounds from unfiltered samples.—Continued

Constituent	Samples collected 1998 through 2003					Samples collected 2004 through 2007					All samples				
	Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs		
	Average	Median	SE	R ²	n	Average	Median	SE	R ²	n	Average	Median	SE	R ²	n
d-Limonene	0	0	--	--	11	9.0	0	0.02	1.0	9	4.1	0	0.01	1.0	20
Fluoranthene	39	19	0.54	0.26	65	20	19	.91	.95	9	36	19	.60	.85	74
Hexahydrohexamethylcyclopentabenzopyran (HHCB)	14	4.3	.03	.98	11	22	5.1	.03	1.0	9	18	5.1	.03	1.0	20
Indole	1.7	0	--	1.0	11	9.5	0	.02	1.0	9	5.2	0	.02	1.0	20
Isoborneol	0	0	--	--	11	0	0	--	1.0	7	0	0	0	1.0	18
Isophorone	9.5	0	--	1.0	11	3.6	0	0	1.0	9	6.9	0	.02	1.0	20
Isopropylbenzene (cumene)	0	0	--	--	11	.21	0	0	1.0	9	.09	0	0	1.0	20
Isoquinoline	30	0	.11	.18	11	.02	0	0	1.0	9	16	0	.14	.98	20
Menthol	5.0	0	--	1.0	11	30	0	.08	1.0	8	16	0	.06	1.0	19
Metalaxyl	6.4	0	.03	.96	11	.39	0	.01	1.0	9	3.7	0	.03	1.0	20
Methyl salicylate	16	0	.03	.97	11	1.6	0	.01	1.0	9	9.5	0	.03	1.0	20
Metolachlor	17	7.8	.04	.95	11	23	6.8	.16	.99	9	19	5.5	.11	.99	20
N,N-diethyl-meta-tolamide (DEET)	17	9.5	.17	.91	31	35	13	.17	.99	9	21	12	.17	.97	40
Naphthalene	10	0	.12	1.0	65	25	.79	.17	.99	9	12	0	.16	.99	74
Nonylphenol monoethoxylate	17	9.6	8.1	.90	61	9.6	9.5	.27	1.0	9	16	9.0	7.6	.90	70
Nonylphenol diethoxylate	14	7.6	7.5	.74	64	11	6.8	.66	1.0	9	13	4.4	7.0	.80	73
Octylphenol monoethoxylate	18	12	.45	.83	62	26	13	.30	.99	9	19	12	.50	.86	71
Octylphenol diethoxylate	13	0	.18	.97	62	27	0	.31	.93	8	15	0	.20	.96	70
para-Cresol	23	8.3	3.9	.89	65	5.4	9.2	.04	1.0	9	20	7.8	3.7	.89	74
Pentachlorophenol	49	11	.56	.66	11	1.1	2.7	.04	1.0	9	28	.42	.45	.98	20
Phenanthrene	24	9.8	.51	.12	65	16	17	.48	.94	9	23	11	.50	.68	74
Phenol	26	8.7	2.5	.77	65	12	13	.09	1.0	9	24	4.9	2.4	.77	74
Prometon	18	0	.10	.95	11	20	0	.17	.99	9	19	0	.13	.98	20
Pyrene	33	16	.47	.26	65	38	16	.83	.93	9	34	17	.53	.83	74
Sitosterol	34	34	.75	.44	11	31	34	1.0	.96	9	33	34	1.3	.88	20
Stigmastanol	14	0	1.8	.64	31	.68	0	.04	1.0	8	12	0	1.6	.77	39
Tetrachloroethylene	11	0	.15	.90	65	2.6	0	.01	1.0	9	9.7	0	.16	.89	74
Tribromomethane	0	0	--	--	11	.26	0	0	1.0	9	.12	0	0	1.0	20
Tributyl phosphate	26	13	.14	.98	45	53	13	.28	.97	9	30	13	.19	.97	54
Triclosan	19	12	.72	.85	62	38	12	.17	.99	9	22	11	.67	.86	71
Triethyl citrate	25	0	.03	.99	11	37	0	.15	.99	9	30	0	.11	.98	20
Triphenyl phosphate	9.0	0	.13	.94	65	4.2	0	.01	1.0	9	8.4	0	.12	.97	74
Tris (2-butoxyethyl) phosphate	24	13	2.5	.74	65	36	15	.61	.83	9	26	15	2.4	.73	74
Tris (2-chloroethyl) phosphate	23	11	.09	.46	65	18	12	.05	1.0	9	22	11	.09	.96	74
Tris (dichloroisopropyl) phosphate	7.9	0	.05	.77	65	18	0	.04	1.0	9	9.1	0	.05	.99	74

[SE, standard error in micrograms per liter; R², coefficient of determination; n, number of replicate samples; --, not applicable]

Table 6. Quality-assurance data for selected pharmaceutical compounds in filtered samples.

[SE, standard error in micrograms per liter; R², coefficient of correlation; n, number of samples; --, not applicable]

Constituent	Samples collected 2000 through 2003						Samples collected 2004 through 2007						All samples			
	Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			Relative percent difference of replicate pairs			
	Aver- age	Median	SE	R ²	n		Average	Median	SE	R ²	n		Average	Median	SE	R ²
1,7-dimethylxanthine	9.8	0	.0054	.73	11		4.8	2.6	.0042	.98	10		7.4	0	.0047	.96
Acetaminophen	8.5	7.5	.023	1.0	12		20	11	.096	1.0	10		14	7.5	.102	1.0
Caffeine	14	11	.041	1.0	12		6.7	5.4	.250	.99	10		11	6.7	.170	.99
Carbamazepine	19	4.0	.007	.89	9		2.9	3.3	0	1.0	10		11	3.8	.005	.92
Codeine	17	0	.008	--	11		.44	0	0	--	10		8.9	0	.006	--
Cotinine	12	6.5	.006	.97	12		12	5.2	.017	.94	10		12	5.3	.015	.91
Dehydronifedipine	0	0	0	--	12		0	0	0	--	10		0	0	0	--
Diltiazem	1.58	0	.001	1.0	12		2.7	0	.001	.97	9		2.1	0	.001	1.0
Diphenhydramine	.56	0	.028	--	10		0	0	0	--	10		.28	0	.019	--
Fluoxetine	8.55	0	0	--	12		0	0	0	--	10		4.7	0	.001	--
Ranitidine	9.53	0	.002	--	12		0	0	0	--	10		5.2	0	.002	--
Salbutamol (Albuterol)	0	0	.008	--	12		0	0	0	--	10		0	0	.006	--
Sulfamethoxazole	11	0	.008	1.0	12		7.9	0	.005	.99	10		9.7	0	.007	1.0
Thiabendazole	0	0	0	--	10		0	0	0	--	10		0	0	0	--
Trimethoprim	11	2.5	.007	.99	12		4.5	0	.001	1.0	10		8.1	0	.006	.99
Warfarin	0	0	0	--	12		0	0	0	--	10		0	0	0	--

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand, col/100mL, colonies per 100 milliliters; µg/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	Discharge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (µS/cm)	Air temp. (°C)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)	Nitrate (mg/L as N)
Water samples													
2	9/3/2004	0945	34	12	8.20	8.02	575	23.4	22.4	32.6	0.52	<0.04	1.96
2	5/3/2005	1030	12	22	10.6	8.10	730	16.0	13.6	58.8	.76	.06	5.29
2	8/1/2005	0930	5	6.7	6.40	7.60	785	26.8	24.8	66.0	.79	E .02	6.90
2	10/6/2005	0940	29	25	7.90	7.60	509	8.0	17.8	30.4	.67	<.04	2.59
2	12/6/2005	0930	11	3.9	14.6	8.00	830	-6.0	1.10	58.6	.64	<.04	6.25
2	2/28/2006	1030	10	7.5	14.6	8.50	865	22.0	8.10	--	--	--	--
2	3/29/2006	1045	22	6.5	14.2	8.50	735	19.3	10.8	78.8	.66	<.04	2.12
2	6/27/2006	1145	16	14	8.40	8.10	615	28.5	23.4	48.3	.63	.04	2.46
2	11/1/2006	1330	23	14	10.8	8.20	564	14.5	9.00	38.3	.61	<.02	2.23
2	12/14/2006	1030	29	4.2	12.4	8.30	725	11.3	4.80	67.1	.47	E .02	1.52
2	3/7/2007	1400	61	18	12.8	8.10	669	15.5	8.90	65.0	.51	<.02	1.51
2	3/12/2007	1130	51	13	12.4	8.20	699	17.3	10.6	--	--	--	--
2	8/8/2007	1200	7	6.4	6.92	8.07	809	32.2	29.7	82.2	.84	.05	3.97
2	11/1/2007	1045	17	5.5	10.3	8.18	620	11.7	10.5	43.7	.52	E .01	2.16
6	9/3/2004	1400	36	<1	14.2	8.50	906	33.4	25.9	92.5	.96	.04	6.32
6	5/3/2005	1400	20	5.6	14.0	8.30	1,010	20.9	17.9	129	3.6	2.0	10.2
6	8/1/2005	1345	22	1.3	14.8	8.40	920	38.1	28.9	107	1.5	<.04	9.00
16	10/11/2005	1000	--	--	--	--	< 3	--	--	<2	E .05	<.04	<.05
6	10/11/2005	1130	33	3.5	7.70	7.70	894	15.1	16.3	93.9	2.6	1.2	8.26
26	10/11/2005	1131	33	3.5	7.70	7.70	894	15.1	16.3	94.1	2.7	1.3	8.24
6	12/5/2005	1130	20	7.9	10.8	7.70	984	-1.4	4.20	114	2.7	1.3	12.2
6	2/28/2006	1400	23	5.6	10.5	7.60	1,190	23.7	12.4	--	--	--	--
6	3/29/2006	0945	29	5.1	11.0	7.70	1,080	14.2	11.3	181	2.5	1.1	5.95
26	3/29/2006	0946	29	5.1	11.0	7.70	1,080	14.2	11.3	180	2.7	1.1	6.16
6	6/27/2006	1100	28	7.7	7.70	7.70	719	28.5	23.0	76.9	1.8	.59	5.54
6	11/1/2006	1200	34	4.1	8.20	7.90	887	9.5	10.8	89.1	2.7	1.6	5.55
6	12/14/2006	1230	32	4.2	10.7	7.90	1,410	17.0	9.30	243	2.3	1.1	8.96
6	3/7/2007	1315	52	--	10.1	8.60	1,190	8.2	11.1	177	2.0	.85	4.77

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	Discharge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (μ S/cm)	Air temp. (°C)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)	Nitrate (mg/L as N)
Water samples—Continued													
6	3/12/2007	1430	55	5.7	11	7.90	1,210	--	13	--	--	--	--
6	8/8/2007	1300	34	2.1	14	8.58	1,068	36	30	144	1.7	0.24	7.94
6	11/1/2007	0915	27	2.4	7.7	7.81	938	6.4	12	109	3.2	1.6	9.73
26	11/1/2007	0916	27	2.4	7.7	7.81	938	6.4	12	109	3.0	1.5	9.84
7	9/9/2004	1100	87	12	7.8	7.93	598	24	21	48.3	.65	<.04	3.03
7	5/3/2005	1200	40	12	8.2	7.80	891	18	14	98.6	2.0	.80	6.72
7	8/1/2005	1045	21	6.0	6.1	7.70	856	32	27	92.3	.94	<.04	7.13
7	10/6/2005	1245	58	8.5	8.1	7.80	683	8.6	18	56.4	.89	<.04	3.77
7	12/6/2005	0930	39	3.7	14	7.90	884	-3.7	.70	--	1.7	.66	9.40
7	3/1/2006	1030	34	6.3	8.3	7.60	986	13	11	--	--	--	--
7	3/29/2006	1230	61	5.9	14	8.50	910	18	12	137	.94	.07	3.49
7	6/27/2006	1300	51	8.9	7.4	7.90	587	30	24	55.0	.75	.05	2.68
7	11/2/2006	1215	53	6.0	9.7	--	745	6.8	7.8	66.3	1.3	.46	4.00
7	12/15/2006	1430	76	3.3	12	8.20	1,060	11	6.6	152	.99	.27	4.99
7	3/8/2007	1230	170	18	11	8.00	886	11	8.4	110	.91	.19	2.67
7	3/13/2007	0930	150	10	9.0	7.90	921	11	12	--	--	--	--
7	8/8/2007	1030	25	7.5	6.2	8.12	971	E 28	29	120	1.0	E .02	5.90
7	11/1/2007	1230	47	3.4	9.1	7.98	792	12	11	79.8	1.0	.22	4.75
8	9/9/2004	1300	84	18	8.3	7.80	601	29	22	47.8	.65	<.04	2.98
8	5/3/2005	1330	E 40	14	8.5	7.80	890	--	15	99.2	2.0	.80	6.74
8	8/1/2005	1200	E 22	16	6.5	7.60	858	33	27	92.4	1.2	.10	6.98
9	9/10/2004	1300	74	21	7.5	7.70	714	28	22	51.2	.65	.05	3.09
9	5/4/2005	1000	E 40	28	6.7	7.60	902	--	14	97.6	1.6	.46	6.11
9	8/1/2005	1300	E 22	9.3	5.9	7.50	752	32	28	74.6	.78	<.04	5.11
29	8/1/2005	1301	E 22	9.3	5.9	7.50	752	32	28	74.4	.72	<.04	5.18
10	3/1/2006	1330	--	18	10	7.60	1,040	26	11	--	--	--	--
10	3/13/2007	1145	--	11	10	7.90	931	19	13	--	--	--	--

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand, col/100mL, colonies per 100 milliliters; μg/L, micrograms per liter; <, less than; E, estimated; --, no data; ≥, greater than]

Site number (fig. 1)	Date	Time	Discharge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (μS/cm)	Air temp. (°C)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)	Nitrate (mg/L as N)
Water samples—Continued													
11	8/18/2004	1345	0.11	<1	10	8.21	717	33	26	86.0	0.45	<0.04	<0.05
11	5/10/2005	0945	.14	3.1	.30	7.40	634	--	18	107	1.9	.22	.060
11	8/3/2005	0900	.41	4.7	7.3	8.30	556	27	25	35.0	.46	.15	.740
12	8/16/2007	0915	.41	1.6	7.5	8.17	785	31	29	112	.41	E .02	.143
13	8/18/2004	1000	.27	<1	10	8.12	810	29	26	102	.70	<.04	.099
213	8/18/2004	1001	.27	<1	10	8.12	810	29	26	102	.70	<.04	.092
13	5/10/2005	1045	.65	5.4	1.4	7.30	511	--	23	49.1	1.3	.23	<.04
213	5/10/2005	1046	.65	5.4	1.4	7.30	511	--	23	49.2	1.3	.22	<.04
13	8/3/2005	0945	.96	3.3	6.3	7.70	633	29	28	53.7	.55	<.04	.178
13	10/13/2005	0945	.72	4.1	11	7.80	847	17	16	92.8	.48	<.04	.543
13	12/7/2005	0930	.35	1.4	6.8	7.20	792	-8.3	2.4	64.7	.53	E .02	.307
13	3/30/2006	0945	.59	29	8.5	7.60	668	20	14	96.1	.81	<.04	.410
13	6/28/2006	1100	1.8	6.3	7.2	7.70	656	--	24	76.1	.59	.03	.540
13	11/1/2006	1015	2.4	2.3	9.9	7.90	853	13	8.3	82.7	.36	<.02	1.46
13	12/14/2006	1330	1.2	25	9.8	7.80	1,520	16	6.4	297	.67	.29	1.17
13	3/7/2007	1130	3.1	3.9	9.7	7.64	1,288	7.8	7.5	197	.44	.05	2.99
13	8/16/2007	1015	.74	1.1	11	8.35	773	32	31	99.7	.41	E .02	.045
13	10/31/2007	0915	2.2	2.3	9.2	7.81	862	14	13	94.9	.60	<.02	1.23
14	8/18/2004	1130	E .30	1.9	14	8.76	765	33	29	99.3	.54	<.04	.092
14	5/10/2005	1200	E .70	11	8.6	7.80	549	--	26	53.9	1.2	.18	.120
14	8/3/2005	1030	E 1.0	1.3	12	8.50	620	31	28	52.9	.38	<.04	.066
15	8/19/2004	1145	E 30	<1	8.0	8.47	770	22	24	105	.69	<.04	<.05
15	5/10/2005	1230	E 10	16	.20	7.20	661	--	22	86.5	2.6	.25	<.05
15	8/3/2005	1100	E 10	3.4	4.7	7.70	375	33	28	28.7	.99	E .04	<.05
16	8/19/2004	1030	.10	<1	7.7	8.41	774	21	25	109	.75	<.04	<.05
16	5/11/2005	1030	.44	3.3	8.7	8.20	822	--	24	39.7	1.6	.18	<.05
16	8/11/2005	0930	.13	6.2	8.1	7.70	558	25	30	55.5	1.1	<.04	<.05

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	Discharge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (μ S/cm)	Air temp. (°C)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)	Nitrate (mg/L as N)
Water samples—Continued													
16	10/13/2005	1045	0.86	3.8	14	8.90	642	18	17	59	0.96	<0.04	0.42
16	12/7/2005	1130	.95	3.6	10	7.40	454	-9.5	1.9	41	1.1	.08	E .04
16	3/30/2006	1100	.71	3.5	7.5	7.50	732	21	12	129	1.0	<.04	.37
16	6/28/2006	1200	2.5	4.6	8.7	8.00	273	--	26	16	.90	E .01	.34
16	10/31/2006	1245	4.9	9.1	6.8	7.70	365	8.3	11	23	.56	.03	.81
16	12/15/2006	1230	8.1	3.3	8.7	7.80	4,760	16	6.0	1,380	.98	.40	.93
³ 16	1/29/2007	1201	--	--	--	--	--	--	--	--	--	--	--
³ 16	1/29/2007	1206	--	--	--	--	--	--	--	--	--	--	--
16	3/7/2007	1045	8.1	5.5	8.4	7.80	1,290	4.8	7.1	196	1.6	.49	4.1
16	8/16/2007	1100	1.2	4.3	6.3	8.67	413	33	30	41	.89	.02	.31
16	10/31/2007	1030	2.9	2.3	6.0	7.51	408	14	13	34	.76	.19	.75
17	8/19/2005	1300	E .10	2.3	9.5	7.67	1,120	23	23	152	3.6	1.4	<.05
17	5/11/2005	1115	E .50	1.8	18	9.20	766	--	27	111	1.1	.06	<.05
17	8/11/2005	1015	E .15	37	11	8.80	488	30	30	50	1.2	<.04	<.05
18	9/1/2004	1000	E .10	5.9	5.4	7.52	880	29	25	73	1.3	.08	3.0
18	5/11/2005	1300	E .50	46	8.0	7.80	859	--	27	116	1.5	.38	.03
18	8/11/2005	1045	E .15	9.7	3.3	7.30	611	29	28	58	1.4	.29	<.05
19	9/1/2004	1130	.44	<1	11	7.81	1,080	31	21	86	.35	<.04	1.1
² 19	9/1/2004	1131	.44	<1	11	7.81	1,080	31	21	86	.30	E .03	1.1
19	5/11/2005	1200	.02	1.1	10	8.00	1,120	--	23	117	1.8	.77	.24
19	8/3/2005	1200	E .01	14	18	7.50	873	35	26	82	1.4	.26	.72
² 19	8/3/2005	1201	E .01	14	18	7.50	873	35	26	82	1.5	.27	.72
19	10/12/2005	1100	--	1.5	9.4	8.00	1,020	18	14	83	.31	E .02	.31
19	12/13/2005	1100	.16	2.5	13	7.40	1,410	6.0	.50	299	.98	.51	.58
19	3/30/2006	1245	<.10	2.5	12	8.00	1,110	20	15	139	.64	.09	.11
19	6/28/2006	1000	.31	1.5	9.0	8.20	746	--	20	69	.55	.04	1.4
² 19	6/28/2006	1001	.31	1.5	9.0	8.20	746	--	20	70	.55	.03	1.4

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand, col/100mL, colonies per 100 milliliters; µg/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	Discharge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (µS/cm)	Air temp. (°C)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)	Nitrate (mg/L as N)
Water samples—Continued													
19	10/31/2006	1045	0.21	5.1	7.9	7.80	934	10	8.8	77	7.8	6.9	0.39
19	10/31/2006	1046	.21	--	--	--	--	--	8.8	77	8.5	6.8	.39
19	12/18/2006	1015	.08	--	--	8.20	1	--	--	<.1	<.10	<.020	<.05
19	12/18/2006	1030	.08	3.2	14	7.90	1,060	6.0	4.4	118	.40	.13	.46
19	12/18/2006	1031	.08	3.2	14	7.90	1,060	6.0	4.4	120	.39	.13	.45
19	3/7/2007	0945	.49	3.5	11	7.60	1,170	3.8	5.5	145	3.0	2.1	1.6
19	8/16/2007	1215	<.10	1.2	14	8.56	1,002	35	30	97	.48	.06	.77
19	8/16/2007	1216	<.10	1.2	14	8.56	1,002	35	30	98	.48	.06	.78
19	10/31/2007	1150	<.1	1.2	13	8.11	1,094	15	13	107	.45	E.01	.36
20	9/1/2004	1330	5.7	6.8	9.8	8.10	707	32	26	54	1.2	<.04	3.1
20	5/12/2005	0930	3.4	46	4.2	7.50	907	--	23	115	2.3	.74	.11
20	8/11/2005	1115	.18	42	3.3	7.20	830	31	30	66	5.6	4.4	.03
20	3/2/2006	0945	--	5.6	15	7.50	1,350	8.3	7.3	--	--	--	--
20	3/13/2007	1400	--	15	12	8.00	1,060	22	14	--	--	--	--
21	9/10/2004	1230	77	19	8.2	7.75	700	30	22	49	.62	<.04	2.5
21	5/4/2005	1045	E 40	28	8.2	7.70	913	--	14	98	1.6	.50	5.8
21	8/2/2005	0845	E 29	12	5.0	7.40	682	25	27	63	.97	.16	3.6
22	9/10/2004	1030	83	33	7.8	7.58	691	28	22	49	.60	E.03	2.2
22	5/4/2005	1145	47	67	7.3	7.80	931	--	14	101	1.6	.49	5.6
22	8/2/2005	0930	37	34	4.1	7.40	646	28	27	61	.97	.15	3.2
22	10/6/2005	1120	60	90	6.9	7.60	601	8.7	19	46	.86	<.04	2.3
22	12/13/2005	0930	89	16	13	7.50	1,800	1.0	.10	373	1.6	.66	6.4
22	12/13/2005	0931	89	16	13	7.50	1,800	1.0	.10	376	1.3	.66	6.4
22	3/2/2006	1300	30	21	11	7.90	1,080	8.6	11	--	--	--	--
22	3/29/2006	1400	92	15	13	8.80	923	28	14	139	.86	E.02	3.9
22	6/27/2006	0930	68	37	6.7	7.70	432	27	23	38	.68	.06	1.4
22	11/2/2006	1015	73	14	9.4	7.90	745	7.5	7.4	63	1.1	.35	2.4

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophos- phate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)	TOC (mg/L)
Water samples—Continued											
2	9/3/2004	0945	1.98	0.02	0.48	2.50	0.111	0.13	0.17	4.6	5.2
2	5/3/2005	1030	5.48	.19	.71	6.24	.420	.45	.49	4.2	7.0
2	8/1/2005	0930	6.93	.03	.77	7.71	.970	.97	.99	8.0	8.2
2	10/6/2005	0940	2.64	.04	.63	3.31	.290	.33	.39	6.0	7.5
2	12/6/2005	0930	6.28	.03	.60	6.92	.830	.88	.85	4.8	4.9
2	2/28/2006	1030	--	--	--	--	--	--	--	--	--
2	3/29/2006	1045	2.15	.03	.62	2.81	.250	.30	.32	6.0	11
2	6/27/2006	1145	2.48	.02	.60	3.11	.382	.40	.42	5.1	6.0
2	11/1/2006	1330	2.25	.01	.60	2.86	.452	.50	.47	5.9	7.1
2	12/14/2006	1030	1.53	.01	.46	2.01	.191	.20	.21	3.6	4.3
2	3/7/2007	1400	1.53	.02	.49	2.05	.160	.17	.21	3.9	4.7
2	3/12/2007	1130	--	--	--	--	--	--	--	--	--
2	8/8/2007	1200	4.00	.03	.79	4.84	.765	.77	.82	5.1	6.1
2	11/1/2007	1045	2.19	.03	--	2.71	.318	.34	.37	6.1	5.8
6	9/3/2004	1400	6.40	.08	.92	7.36	1.03	1.1	1.1	5.5	7.6
6	5/3/2005	1400	11.1	.88	1.6	14.7	2.33	2.5	2.6	8.9	14
6	8/1/2005	1345	9.21	.21	1.5	10.7	1.96	2.2	2.2	10	9.8
16	10/11/2005	1000	<.060	<.01	<.010	<.100	.020	<.04	<.04	.40	E.3
6	10/11/2005	1130	8.52	.26	1.4	11.1	2.09	2.2	2.3	7.5	11
26	10/11/2005	1131	8.50	.26	1.4	11.2	2.08	2.2	2.2	7.0	9.7
6	12/5/2005	1130	12.4	.25	1.4	15.1	3.01	3.1	3.2	8.1	14
6	2/28/2006	1400	--	--	--	--	--	--	--	--	--
6	3/29/2006	0945	6.12	.17	1.5	8.66	1.48	1.7	1.7	8.5	13
6	3/29/2006	0946	6.33	.17	1.6	8.98	1.51	1.7	1.7	8.9	13
6	6/27/2006	1100	5.73	.19	1.2	7.51	1.38	1.4	1.5	7.0	9.5
6	11/1/2006	1200	5.95	.40	1.1	8.61	1.33	1.3	1.3	6.2	9.4
6	12/14/2006	1230	9.20	.24	1.2	11.5	1.69	1.7	1.8	6.2	9.5
6	3/7/2007	1315	4.94	.17	1.1	6.91	.745	.82	.95	5.4	8.4

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophos- phate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)	TOC (mg/L)
Water samples—Continued											
11	8/18/2004	1345	<.06	<.010	0.41	0.500	<.018	<.04	E 0.04	7.5	7.5
11	5/10/2005	0945	.09	.025	1.7	2.01	.190	.24	.40	8.6	12
11	8/3/2005	0900	.85	.11	.31	1.31	.100	.14	.13	3.0	3.1
12	8/16/2007	0915	.14	.006	.39	.556	.022	.03	.06	3.6	4.6
13	8/18/2004	1000	.11	<.008	.66	.805	<.018	<.04	E .04	5.6	6.5
213	8/18/2004	1001	.1	<.008	.66	.800	<.020	<.04	E .03	4.2	6.0
13	5/10/2005	1045	<.06	.016	1.1	1.36	.11	.15	.27	8.8	12
213	5/10/2005	1046	<.06	.016	1.1	1.36	.11	.15	.27	8.5	12
13	8/3/2005	0945	.18	E .01	.51	.730	.020	.05	.07	4.2	5.1
13	10/13/2005	0945	.55	E .01	.44	1.03	.020	.04	.08	3.1	6.5
13	12/7/2005	0930	.31	E .01	.51	.839	.16	.19	.23	7.7	9.4
13	3/30/2006	0945	.45	.042	.77	1.27	<.020	E .04	.10	6.1	8.6
13	6/28/2006	1100	.57	.031	.56	1.17	.045	.05	.08	5.4	6.5
13	11/1/2006	1015	1.5	.012	.34	1.83	.037	E .04	.05	3.3	3.9
13	12/14/2006	1330	1.2	.021	.38	1.86	.032	.04	.06	3.0	3.9
13	3/7/2007	1130	3.0	.057	.39	3.49	.047	.06	.08	3.0	3.3
13	8/16/2007	1015	.05	.005	.39	.461	.022	.03	.05	3.7	4.5
13	10/31/2007	0915	1.2	.016	--	1.84	.036	.04	.07	3.2	4.0
14	8/18/2004	1130	.1	<.008	.5	.640	<.018	<.04	E .03	5.3	5.5
14	5/10/2005	1200	.15	.022	1.0	1.34	.100	.14	.20	8.2	13
14	8/3/2005	1030	.07	E .00	.34	.447	.020	E .04	E .03	4.3	4.4
15	8/19/2004	1145	<.06	<.0080	.65	.754	.051	.08	.12	11	15
15	5/10/2005	1230	<.06	<.01	2.4	2.60	.120	.15	.49	11	17
15	8/3/2005	1100	<.06	<.01	.95	.990	.080	.13	.21	5.5	6.3
16	8/19/2004	1030	<.06	<.0080	.71	.795	<.018	E .03	.08	6.8	8.7
16	5/11/2005	1030	<.06	<.01	1.4	1.66	.160	.19	.38	11	18
16	8/11/2005	0930	<.06	<.01	1.0	1.16	<.020	E .03	.16	6.1	11

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophos- phate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)	TOC (mg/L)
Water samples—Continued											
16	10/13/2005	1045	0.47	0.05	0.92	1.43	<0.02	0.04	0.14	5.6	8.8
16	12/7/2005	1130	E .04	E .01	1.0	1.14	.390	.45	.56	11	13
16	3/30/2006	1100	.44	.07	.99	1.47	E .010	.14	.18	8.2	8.9
16	6/28/2006	1200	.38	.04	.89	1.28	.072	.08	.19	4.2	6.8
16	10/31/2006	1245	.84	.03	.53	1.41	.130	.13	.17	4.0	5.5
16	12/15/2006	1230	.96	.03	.59	1.95	.090	.10	.14	4.0	5.6
³ 16	1/29/2007	1201	--	--	--	--	--	--	--	--	--
³ 16	1/29/2007	1206	--	--	--	--	--	--	--	--	--
16	3/7/2007	1045	4.1	.08	1.1	5.76	.120	.13	.20	4.0	5.7
16	8/16/2007	1100	.36	.05	.87	1.25	.007	.02	.08	4.1	6.4
16	10/31/2007	1030	.81	.06	.57	1.57	.130	.15	.17	4.0	4.8
17	8/19/2005	1300	<.06	.02	2.2	3.66	<.018	.09	.42	9.8	12
17	5/11/2005	1115	E .06	.01	1.0	1.16	.090	.14	.18	8.0	12
17	8/11/2005	1015	<.06	<.01	1.1	<.1	.040	.09	.17	9.2	15
18	9/1/2004	1000	3.1	.15	1.2	4.37	.058	.07	.15	4.0	6.3
18	5/11/2005	1300	.07	.05	1.1	1.60	.140	.17	.41	8.1	15
18	8/11/2005	1045	<.06	.01	1.1	1.46	.100	.14	.36	7.3	11
19	9/1/2004	1130	1.2	.08	.31	1.52	.060	.08	.11	6.0	9.6
² 19	9/1/2004	1131	1.2	.07	.27	1.47	.067	.08	.10	6.0	8.0
19	5/11/2005	1200	.35	.11	1.1	2.19	.360	.38	.51	6.5	15
19	8/3/2005	1200	.86	.14	1.1	2.24	.070	.11	.24	5.7	10
² 19	8/3/2005	1201	.86	.14	1.2	2.35	.070	.12	.24	5.6	13
19	10/12/2005	1100	.34	.04	.29	.65	.100	.12	.18	3.4	7.4
19	12/13/2005	1100	.63	.05	.48	1.62	.050	.06	.14	4.1	5.3
19	3/30/2006	1245	.13	.02	.55	.77	.070	.09	.17	5.4	6.5
19	6/28/2006	1000	1.6	.13	.51	2.10	.110	.12	.13	4.5	4.8
² 19	6/28/2006	1001	1.5	.13	.52	2.09	.100	.12	.13	4.5	5.0

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; ≥, greater than]

Site number (fig. 1)	Date	Time	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophos- phate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)	TOC (mg/L)
Water samples—Continued											
19	10/31/2006	1045	0.48	0.09	0.88	8.24	0.670	0.67	0.85	8.4	13
19	10/31/2006	1046	.48	.09	1.6	8.97	.670	.64	.83	8.5	--
19	12/18/2006	1015	<.06	<.01	<.08	<.08	<.010	<.04	<.04	E 0.4	.40
19	12/18/2006	1030	.53	.07	.26	.93	.070	.08	.13	2.7	3.9
19	12/18/2006	1031	.52	.07	.25	.91	.070	.08	.12	2.8	5.0
19	3/7/2007	0945	1.8	.19	.92	4.79	.200	.23	.34	4.1	6.2
19	8/16/2007	1215	.81	.04	.42	1.30	.110	.10	.14	3.4	5.0
19	8/16/2007	1216	.82	.04	.42	1.30	.110	.11	.14	3.5	4.5
19	10/31/2007	1150	.38	.02	--	.84	.087	.10	.16	3.9	7.8
20	9/1/2004	1330	3.2	.11	1.2	4.41	E .020	.05	.18	9.4	7.7
20	5/12/2005	0930	.16	.06	1.6	2.45	.030	.06	.32	9.2	14
20	8/11/2005	1115	E .05	.03	1.2	5.65	.020	.04	.29	7.9	15
20	3/2/2006	0945	--	--	--	--	--	--	--	--	--
20	3/13/2007	1400	--	--	--	--	--	--	--	--	--
21	9/10/2004	1230	2.6	.03	.58	3.20	.320	.34	.4	5.3	8.0
21	5/4/2005	1045	6.1	.32	1.1	7.77	.940	.96	1.1	5.7	10
21	8/2/2005	0845	3.7	.03	.81	4.63	.570	.58	.68	5.5	7.6
22	9/10/2004	1030	2.2	.03	.57	2.81	.280	.30	.35	4.9	7.8
22	5/4/2005	1145	5.8	.29	1.1	7.45	.780	.80	.99	5.3	7.9
22	8/2/2005	0930	3.2	.05	.82	4.21	.440	.47	.58	5.3	9.7
22	10/6/2005	1120	2.3	.04	.82	3.20	.350	.40	.56	5.5	7.7
22	12/13/2005	0930	6.5	.12	.91	8.09	1.3	1.3	1.4	5.4	7.5
22	12/13/2005	0931	6.5	.12	.68	7.88	1.3	1.3	1.3	--	--
22	3/2/2006	1300	--	--	--	--	--	--	--	--	--
22	3/29/2006	1400	3.9	.07	.84	4.78	.510	.55	.63	6.9	11
22	6/27/2006	0930	1.5	.04	.61	2.15	.270	.28	.34	5.6	6.4
22	11/2/2006	1015	2.5	.12	.71	3.53	.450	.42	.52	5.2	7.3

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; µg/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	BOD (mg/L)	COD (mg/L)	<i>Esch- erichia coli</i> (col/100mL)	Fecal coliform (col/100mL)	Total coliform (col/100mL)	Chlorophyll <i>a</i> (µg/L)	Chlorophyll <i>b</i> (µg/L)	Suspended sediment (mg/L)
Water samples—Continued										
2	9/3/2004	0945	--	--	E 250	232	> 4,800	--	--	55
2	5/3/2005	1030	< 2.0	13	120	120	1,500	0.6	0.10	51
2	8/1/2005	0930	2.0	16	32	76	> 9,700	1.1	.10	8
2	10/6/2005	0940	--	17	240	210	> 9,700	--	--	34
2	12/6/2005	0930	< 2.0	15	5	< 10	910	--	--	3
2	2/28/2006	1030	--	--	--	--	--	--	--	--
2	3/29/2006	1045	--	22	18	11	> 9,700	--	--	4
2	6/27/2006	1145	2.3	14	250	330	22,000	--	--	46
2	11/1/2006	1330	< 2.0	15	67	100	3,000	--	--	13
2	12/14/2006	1030	--	12	39	59	3,600	--	--	4
2	3/7/2007	1400	< 2.0	10	15	100	780	--	--	50
2	3/12/2007	1130	--	--	--	--	--	--	--	--
2	8/8/2007	1200	--	18	52	80	> 9,700	--	--	8
2	11/1/2007	1045	--	21	45	40	2,200	--	--	18
6	9/3/2004	1400	--	--	E 265	E 240	> 4800	--	--	49
6	5/3/2005	1400	5.0	36	73	71	2,500	< 10	< 10	51
6	8/1/2005	1345	5.0	37	220	260	6,400	1.1	.30	6
16	10/11/2005	1000	--	10	--	--	--	--	--	1
6	10/11/2005	1130	--	32	110	140	> 9700	--	--	2
26	10/11/2005	1131	--	34	--	--	--	--	--	2
6	12/5/2005	1130	4.9	41	70	98	1,600	--	--	7
6	2/28/2006	1400	--	--	--	--	--	--	--	--
6	3/29/2006	0945	--	39	1,800	1,200	9,700	--	--	1
6	3/29/2006	0946	--	36	5,600	2,700	> 9,700	--	--	6
6	6/27/2006	1100	5.5	28	350	480	14,000	--	--	44
6	11/1/2006	1200	2.8	25	19	90	2,100	--	--	3
6	12/14/2006	1230	--	28	98	64	3,500	--	--	4
6	3/7/2007	1315	3.6	28	8,400	6,300	48,000	--	--	68

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std. standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	BOD (mg/L)	COD (mg/L)	<i>Esch- erichia coli</i> (col/100mL)	Fecal coliform (col/100mL)	Total coliform (col/100mL)	Chlorophyll <i>a</i> (μ g/L)	Chlorophyll <i>b</i> (μ g/L)	Suspended sediment (mg/L)
Water samples—Continued										
6	3/12/2007	1430	--	--	--	--	--	--	--	--
6	8/8/2007	1300	--	35.7	109	280	9,700	--	--	6
6	11/1/2007	0915	--	25.7	226	100	9,700	--	--	3
²⁶	11/1/2007	0916	--	25.2	211	60	7,900	--	--	4
7	9/9/2004	1100	3	< 10.0	365	440	> 4,800	E 2.4	E 0.15	46
7	5/3/2005	1200	4	24.5	140	120	2,200	.40	<.10	57
7	8/1/2005	1045	7	20.6	210	260	9,700	1.4	.3	14
7	10/6/2005	1245	--	17.4	260	220	9,700	--	--	17
7	12/6/2005	0930	2	--	28	50	2,800	--	--	4
7	3/1/2006	1030	--	--	--	--	--	--	--	--
7	3/29/2006	1230	--	28.2	30	27	6,900	--	--	3
7	6/27/2006	1300	3	19.1	210	560	14,000	--	--	39
7	11/2/2006	1215	2	17.3	62	16	1,400	--	--	47
7	12/15/2006	1430	--	12.8	220	80	1,700	--	--	5
7	3/8/2007	1230	2	12.5	410	500	970	--	--	75
7	3/13/2007	0930	--	--	--	--	--	--	--	--
7	8/8/2007	1030	--	17.9	120	170	> 9,700	--	--	11
7	11/1/2007	1230	--	19.1	184	E 129	2,900	--	--	6
8	9/9/2004	1300	< 2	10.4	226	475	> 4,800	--	--	44
8	5/3/2005	1330	4	23.3	83	80	1,900	--	--	59
8	8/1/2005	1200	4	21.5	270	250	> 9,700	--	--	28
9	5/4/2005	1000	3	24.2	100	63	1,600	--	--	75
9	8/1/2005	1300	4	18.5	61	110	6,200	--	--	16
²⁹	8/1/2005	1301	2	16.9	98	110	> 9,700	--	--	20
10	3/1/2006	1330	--	--	--	--	--	--	--	--
10	3/13/2007	1145	--	--	--	--	--	--	--	--

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std. standard, SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; µg/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	BOD (mg/L)	COD (mg/L)	<i>Esch- erichia coli</i> (col/100mL)	Fecal coliform (col/100mL)	Total coliform (col/100mL)	Chlorophyll <i>a</i> (µg/L)	Chlorophyll <i>b</i> (µg/L)	Suspended sediment (mg/L)
Water samples—Continued										
11	8/18/2004	1345	2	12.2	146	258	> 4,800	--	--	33
11	5/10/2005	0945	11	36.8	4,200	7,200	> 9,700	--	--	29
11	8/3/2005	0900	2	< 10.0	5	< 10	1,100	--	--	6
12	8/16/2007	0915	< 2	13.3	58	208	17,400	--	--	2
13	8/18/2004	1000	2	15.5	90	133	1,520	7.9	.69	47
² 13	8/18/2004	1001	2	13.4	82	128	1,520	9.7	.79	37
13	5/10/2005	1045	2	35.9	4,000	3,900	> 9,700	2.4	.50	28
² 13	5/10/2005	1046	3	30.6	3,600	3,100	> 9,700	2.7	.60	32
13	8/3/2005	0945	4	17.1	170	400	31,000	2.1	.50	6
13	10/13/2005	0945	--	14.0	65	230	7,300	--	--	12
13	12/7/2005	0930	7	32.9	87	64	5,400	--	--	2
13	3/30/2006	0945	--	19.9	30	25	8,600	--	--	46
13	6/28/2006	1100	< 2	11.4	1,600	3,300	52,000	--	--	36
13	11/1/2006	1015	< 2	< 10.0	48	40	6,900	--	--	11
13	12/14/2006	1330	--	14.6	100	110	3,500	--	--	29
13	3/7/2007	1130	< 2	< 10.0	10	10	690	--	--	113
13	8/16/2007	1015	--	12.1	60	205	22,400	--	--	16
13	10/31/2007	0915	--	12.9	65	115	> 9700	--	--	12
14	8/18/2004	1130	3	< 10.0	208	420	1,500	5.1	.78	43
14	5/10/2005	1200	3	26.4	900	1,200	> 9,700	9.8	5.4	34
14	8/3/2005	1030	2	10.7	320	660	64,000	5.9	< .10	3
15	8/19/2004	1145	6	48.3	302	645	> 9,700	10	1.1	33
15	5/10/2005	1230	10	57.9	> 9,700	E 33,000	> 9,700	13	2.6	42
15	8/3/2005	1100	4	25.3	100	350	6,200	4.8	< 1	2
16	8/19/2004	1030	< 2	18.5	426	495	> 9,700	9.9	.77	31
16	5/11/2005	1030	4	42.4	100	150	4,900	14	2.0	43
16	8/11/2005	0930	7	28.3	120	1,000	41,000	22	6.7	8

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std. standard, SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; $\text{NH}_3\text{-orgN}$, ammonia plus organic nitrogen; $\text{NO}_2\text{-NO}_3$, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	BOD (mg/L)	COD (mg/L)	<i>Esch- erichia coli</i> (col/100mL)	Fecal coliform (col/100mL)	Total coliform (col/100mL)	Chlorophyll <i>a</i> (μ g/L)	Chlorophyll <i>b</i> (μ g/L)	Suspended sediment (mg/L)
Water samples—Continued										
16	10/13/2005	1045	--	25	49	100	7,300	--	--	6
16	12/7/2005	1130	10	48	40	66	21,000	--	--	9
16	3/30/2006	1100	--	25	9	20	17,000	--	--	1
16	6/28/2006	1200	5	21	310	860	14,000	--	--	22
16	10/31/2006	1245	< 2	15	530	900	7,300	--	--	11
16	12/15/2006	1230	--	22	46	E 130	1,700	--	--	6
³ 16	1/29/2007	1201	--	--	24	--	24	--	--	--
³ 16	1/29/2007	1206	--	--	28	--	28	--	--	--
16	3/7/2007	1045	3	19	27	14	2,400	--	--	70
16	8/16/2007	1100	--	23	6	E 60	2,400	--	--	4
16	10/31/2007	1030	--	15	51	92	3,600	--	--	5
17	8/19/2005	1300	4	41	119	350	> 9,700	--	--	61
17	5/11/2005	1115	< 2	21	1,100	1,000	36,000	--	--	44
17	8/11/2005	1015	10	20	330	480	98,000	--	--	5
18	9/1/2004	1000	3	22	193	460	> 4,800	--	--	140
18	5/11/2005	1300	< 2	35	150	63	17,000	--	--	89
18	8/11/2005	1045	8	29	530	480	19,000	--	--	15
19	9/1/2004	1130	9	17	228	331	> 4,800	--	--	49
² 19	9/1/2004	1131	8	20	254	440	> 4,800	--	--	84
19	5/11/2005	1200	2	31	3,600	2,900	21,000	--	--	53
19	8/3/2005	1200	4	30	160	620	12,000	--	--	6
² 19	8/3/2005	1201	6	24	170	770	12,000	--	--	25
19	10/12/2005	1100	--	13	230	340	> 9,700	--	--	16
19	12/13/2005	1100	< 2	25	3,200	41	> 5,600	--	--	4
19	3/30/2006	1245	--	16	390	400	41,000	--	--	2
19	6/28/2006	1000	< 2	16	880	1,200	24,000	--	--	41
19 ²	6/28/2006	1001	< 2	16	850	1,200	31,000	--	--	44

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std. standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; N, nitrogen; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; <, less than; E, estimated; >, greater than; --, no data]

Site number (fig. 1)	Date	Time	BOD (mg/L)	COD (mg/L)	<i>Esch- erichia coli</i> (col/100mL)	Fecal coliform (col/100mL)	Total coliform (col/100mL)	Chlorophyll <i>a</i> (µg/L)	Chlorophyll <i>b</i> (µg/L)	Suspended sediment (mg/L)
Water samples—Continued										
19	10/31/2006	1045	10	40	> 7,300	38,000	> 7,300	--	--	3
19	10/31/2006	1046	11	--	> 7,300	41,000	> 7,300	--	--	5
¹ 19	12/18/2006	1015	--	< 10	< 1	--	< 1	--	--	< 1
19	12/18/2006	1030	--	11	800	960	> 9,700	--	--	34
19	12/18/2006	1031	--	< 10	880	940	> 9,700	--	--	53
19	3/7/2007	0945	3	15	18,000	9,700	> 2,400	--	--	87
19	8/16/2007	1215	--	18	770	2,000	30,000	--	--	50
² 19	8/16/2007	1216	--	13	870	2,100	43,000	--	--	33
19	10/31/2007	1150	--	25	420	540	40,000	--	--	69
20	9/1/2004	1330	5	15	220	450	> 4,800	43	6.0	38
20	5/12/2005	0930	7	39	150	170	29,000	14	2.8	90
20	8/11/2005	1115	8	27	4,000	5,000	170,000	13	3.7	107
20	3/2/2006	0945	--	--	--	--	--	--	--	--
20	3/13/2007	1400	--	--	--	--	--	--	--	--
21	9/10/2004	1230	2	17	276	430	> 2,400	E 1.1	< 10	55
21	5/4/2005	1045	--	18	61	59	2,900	1.3	< 10	70
21	8/2/2005	0845	3	21	65	120	> 5600	6.4	1.4	19
22	9/10/2004	1030	3	< 10	506	590	> 4,800	E 1.2	E 1.2	69
22	5/4/2005	1145	5	25	65	80	5,600	1.7	< 10	100
22	8/2/2005	0930	4	24	170	260	> 9,700	6.2	.90	61
22	10/6/2005	1120	--	17	300	480	> 9,700	--	--	121
22	12/13/2005	0930	3	27	420	220	> 5,600	--	--	17
² 22	12/13/2005	0931	--	--	460	140	> 5,600	--	--	19
22	3/2/2006	1300	--	--	--	--	--	--	--	--
22	3/29/2006	1400	--	26	8	13	> 9,700	--	--	15
22	6/27/2006	0930	3	21	230	720	20,000	--	--	71
22	11/2/2006	1015	< 2	15	32	39	2,100	--	--	16

Table 7. Physical properties, nutrients, bacteria, and selected chemical concentrations in base-flow samples collected between August 2004 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std. standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; μ g/L, micrograms per liter; <, less than; E, estimated; --, no data; >, greater than]

Site number (fig. 1)	Date	Time	BOD (mg/L)	COD (mg/L)	<i>Esch- erichia coli</i> (col/100mL)	Fecal coliform (col/100mL)	Total coliform (col/100mL)	Chlorophyll <i>a</i> (μ g/L)	Chlorophyll <i>b</i> (μ g/L)	Suspended sediment (mg/L)
Water samples—Continued										
22	12/15/2006	1100	--	18	43	68	1,600	--	--	7
22	3/8/2007	1000	< 2	17	30	< 10	1,400	--	--	24
² 22	3/8/2007	1001	< 2	14	< 10	< 10	1,700	--	--	48
22	3/14/2007	0945	--	--	--	--	--	--	--	--
22	8/8/2007	0900	--	18	140	260	> 9,700	--	--	41
22	11/1/2007	1430	--	16	71	91	5,500	--	--	4
23	9/10/2004	1130	12	30	> 4,800	210,000	> 4,800	--	--	82
23	5/5/2005	1030	2	25	2,900	5,400	36,000	--	--	95
² 23	5/5/2005	1031	2	22	3,600	4,200	32,000	--	--	96
23	8/2/2005	1030	4	25	2,100	3,100	33,000	--	--	71
24	9/15/2004	1000	4	12	2,600	2,200	> 4,800	E 12	E 1.2	57
24	5/5/2005	1145	2	25	860	1,200	20,000	2.9	< 10	83
¹ 24	5/5/2005	1215	< 2	< 10	< 1	< 1	< 10	--	--	--
24	8/2/2005	1115	4	23	160	420	17,000	11	< 10	37
25	9/15/2004	1230	2	14	> 4,800	11,600	> 4,800	E 12	< 10	59
25	5/12/2005	1030	2	14	14,000	15,000	200,000	--	--	63
25	8/11/2005	1200	4	120	4,000	E 1,300	18,000	--	--	3
26	8/30/2006	1115	--	< 10	650	1,200	22,000	8.3	5.1	--
27	2/27/2006	1045	--	--	--	--	--	--	--	--
27	3/14/2007	1250	--	--	--	--	--	--	--	--
Bottom sediment sample										
26	8/30/2006	1200	--	--	⁴ < 100	20	310	--	--	--

¹Field equipment blank.²Replicate sample.³Laboratory reagent spike of <50 *Escherichia coli* per 100 milliliters.⁴Bacteria densities in bottom sediment samples listed in colonies per 100 milligrams of sample.

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than, E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Discharge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (µS/cm)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)
2	4/24/2006	0115	4/24/2006	1045	395	--	--	8.10	557	--	65	3.5	0.14
2	4/29/2006	0430	4/29/2006	0915	208	--	--	8.30	620	--	50	.96	<.04
2	6/5/2006	2145	6/6/2006	0545	874	--	--	8.00	376	--	28	4.1	.07
2	7/11/2006	2130	7/12/2006	0515	1,070	--	--	8.10	355	--	25	3.2	.08
2	7/12/2006	0805	7/12/2006	0830	1,490	--	--	8.00	272	--	15	4.7	.07
2	2/24/2007	1200	2/24/2007	1900	362	--	--	8.00	900	--	162	1.8	<.02
2	3/30/2007	1030	3/31/2007	0130	240	--	--	8.20	738	--	130	.74	.12
2	4/25/2007	1815	4/26/2007	0000	972	--	--	7.80	459	--	41	3.0	E.01
2	5/7/2007	0930	--	--	6,080	370	--	7.70	250	--	--	--	--
6	10/20/2005	0115	10/20/2005	1145	552	--	--	7.80	627	--	39	2.4	<.04
6	4/28/2006	1430	4/28/2006	2045	534	--	--	8.00	544	--	61	1.4	.27
6	4/29/2006	2200	4/30/2006	0525	1,210	--	--	8.00	1,240	--	42	2.7	.06
6	4/29/2006	2201	4/30/2006	0526	1,210	--	--	8.00	1,240	--	42	2.7	.07
6	6/5/2006	2015	6/6/2006	0640	943	--	--	7.90	878	--	29	6.1	.33
6	2/24/2007	0915	2/25/2007	0630	398	--	--	7.90	1,580	--	395	3.0	.62
6	3/30/2007	0120	3/30/2007	0910	473	--	--	7.60	634	--	106	3.5	.15
6	4/25/2007	1700	4/26/2007	0830	949	--	--	7.60	412	--	58	3.6	<.02
6	5/7/2007	1100	--	--	3,080	280	--	7.70	302	--	--	--	--
7	5/13/2005	0000	5/13/2005	0930	2,140	520	7.1	8.10	429	19	50	6.0	.30
7	5/13/2005	0930	5/13/2005	1800	2,840	380	8.2	8.60	367	18	35	2.5	.08
7	6/1/2005	0100	6/1/2005	1400	973	180	7.6	7.50	534	22	51	2.3	.15
7	7/3/2005	1030	7/4/2005	0600	1,510	810	1.4	7.80	386	24	29	3.9	.08
7	7/3/2005	1031	7/4/2005	0601	1,510	810	1.4	7.80	386	24	29	4.0	.08
7	7/26/2005	2230	7/27/2005	0445	672	200	7.0	7.60	448	25	47	2.5	.14
7	4/24/2006	0230	4/24/2006	1015	1,020	820	5.3	7.50	539	20	66	3.9	.27
7	4/28/2006	1500	4/28/2006	2045	576	180	8.5	7.80	579	15	61	1.3	.25
7	4/28/2006	2345	4/29/2006	1500	402	20	8.8	8.80	510	14	52	1.5	E.02
7	6/5/2006	2130	6/6/2006	0445	1,630	1,050	7.5	7.70	488	19	31	7.5	.28

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Dis-charge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (μ S/cm)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)
7	2/24/2007	0945	2/25/2007	0700	754	--	--	8.00	1,160	--	250	2.5	0.24
17	2/24/2007	0946	2/25/2007	0701	754	--	--	8.00	1,160	--	249	3.0	.24
7	3/30/2007	0215	3/30/2007	0645	666	400	7.2	7.70	745	19	70	2.4	.05
7	4/25/2007	1800	4/25/2007	2215	2,830	660	8.3	8.00	408	17	52	4.3	.15
7	5/7/2007	1200	--	--	12,700	300	7.8	7.70	285	18	--	--	--
12	6/28/2007	1015	--	--	92	94	8.1	7.80	330	22	26	1.1	.04
12	10/18/2007	1115	--	--	12	19	8.2	7.67	746	17	75	1.0	.13
12	10/22/2007	1015	--	--	72	35	10	8.09	167	13	13	.58	.08
12	1/10/2008	1245	--	--	93	133	12	7.82	850	4.0	133	1.2	.06
13	5/12/2005	2315	5/13/2005	0430	255	30	--	7.40	99	--	15	.90	.15
13	5/13/2005	0430	5/13/2005	1130	239	45	--	7.70	216	--	17	1.4	.24
13	5/31/2005	2315	6/1/2005	0900	112	--	--	7.80	443	--	18	1.2	.33
13	6/30/2005	1000	6/30/2005	2000	142	--	--	6.90	300	--	23	2.2	.14
13	7/26/2005	1730	7/26/2005	2015	405	--	--	7.00	123	--	7	1.4	.07
13	10/20/2005	0200	10/20/2005	0320	388	--	--	7.70	280	--	25	2.1	<.04
213	11/21/2005	1000	--	--	--	--	--	7.40	5	--	<.2	<.10	<.04
13	4/28/2006	1255	4/28/2006	1530	225	--	--	7.70	321	--	32	1.8	.12
13	4/29/2006	2130	4/30/2006	0005	232	--	--	7.90	339	--	30	4.9	<.04
13	6/5/2006	2030	6/5/2006	2215	664	--	--	7.80	168	--	9	5.4	.32
13	2/12/2007	1950	2/12/2007	2130	133	--	--	--	1,810	--	510	--	--
13	2/24/2007	0940	2/24/2007	1400	171	--	--	7.80	1,680	--	463	3.0	.22
13	3/29/2007	2315	3/30/2007	0100	460	--	--	7.70	248	--	30	2.8	.20
13	4/25/2007	1700	4/25/2007	2225	807	--	--	7.50	247	--	28	8.6	.21
13	6/30/2007	0900	6/30/2007	1645	143	100	--	7.50	202	--	16	1.1	.04
13	8/9/2007	0045	--	--	1,385	470	--	8.24	171	--	--	--	--
13	10/17/2007	1215	10/17/2007	2130	431	110	--	7.35	255	--	23	1.4	.09

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Dis-charge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (µS/cm)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)
16	5/12/2005	2300	5/13/2005	0500	419	88	6.0	7.50	523	21	33	4.2	0.35
16	5/13/2005	0500	5/13/2005	1100	380	77	8.4	7.50	186	18	13	1.6	.05
16	5/31/2005	2315	6/1/2005	0920	224	34	6.2	7.80	431	22	48	1.9	.51
16	6/30/2005	0930	6/30/2005	2100	182	72	5.8	8.90	404	24	61	1.8	.32
16	7/26/2005	1715	7/26/2005	2030	496	120	4.8	> 9.00	294	25	30	3.1	.20
16	10/20/2005	0130	10/20/2005	0415	330	140	6.0	8.00	542	--	--	--	--
16	4/28/2006	1320	4/28/2006	1600	237	110	6.6	7.40	348	15	32	1.9	<.04
16	4/29/2006	2140	4/30/2006	0155	319	200	7.6	7.50	253	15	20	1.0	<.04
16	6/5/2006	2015	6/5/2006	2300	689	380	--	7.50	193	22	17	10	.78
16	2/24/2007	0815	2/24/2007	1500	105	--	--	7.80	1,490	--	376	1.6	<.02
16	3/29/2007	2240	3/30/2007	0135	486	230	8.8	8.00	398	19	57	3.4	.19
16	4/25/2007	1700	4/25/2007	2355	821	310	8.2	7.70	235	7.7	28	6.5	.34
16	4/25/2007	1701	4/25/2007	2356	821	310	8.2	7.70	235	7.7	28	7.0	.33
16	6/30/2007	0915	6/30/2007	1530	196	34	8.1	7.60	258	20	25	.87	.09
16	6/30/2007	0916	6/30/2007	1531	196	34	8.1	7.60	258	20	25	.91	.09
16	8/9/2007	0100	--	--	2,820	300	7.4	7.80	149	26	--	--	--
16	10/17/2007	1200	10/17/2007	2200	492	140	8.7	7.91	268	17	29	1.6	.17
19	5/13/2005	1045	--	--	--	24	--	7.50	267	--	20	1.8	.26
19	5/13/2005	1046	--	--	--	24	--	7.50	267	--	20	1.9	.29
19	6/1/2005	1045	--	--	--	--	--	7.60	187	--	12	2.2	.97
19	7/26/2005	1720	7/26/2005	1820	--	--	--	6.80	116	--	5.6	4.8	.39
19	7/26/2005	1721	7/26/2005	1821	--	--	--	6.80	116	--	5.6	5.6	.40
19	8/12/2005	1750	8/13/2005	0715	--	--	--	7.40	142	--	6.2	1.9	.07
19	10/19/2005	2000	10/20/2005	0300	--	--	--	--	177	--	11	13	.37
19	6/5/2006	2030	6/5/2006	2140	42	--	--	7.60	189	--	7.9	14	1.3
19	6/10/2006	2150	6/11/2006	0055	--	--	--	7.80	252	--	12	3.8	.35
19	6/24/2006	1505	6/24/2006	1805	--	--	--	7.70	156	--	4.9	4.5	.39
19	6/24/2006	1506	6/24/2006	1806	--	--	--	7.70	156	--	4.9	4.7	.38

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Discharge (ft ³ /s)	Turbidity (FNU)	DO (mg/L)	pH (std units)	SC (µS/cm)	Water temp. (°C)	Chloride (mg/L)	NH ₃ +orgN (mg/L as N)	Ammonia (mg/L as N)
19	2/28/2007	1920	2/28/2007	2320	--	--	--	--	--	--	48	11	0.83
19	2/28/2007	1921	2/28/2007	2321	--	--	--	--	--	--	--	--	--
19	3/1/2007	0550	3/1/2007	0630	--	--	--	--	--	--	104	1.6	.22
19	3/29/2007	2245	3/29/2007	2340	--	--	--	7.40	243	--	23	5.9	.58
19	4/25/2007	1730	4/25/2007	2100	--	--	--	7.30	226	--	20	2.7	.21
19	6/18/2007	1050	6/18/2007	1130	--	--	--	7.70	169	--	9.8	3.4	.38
19	10/17/2007	1130	10/17/2007	1900	--	430	--	7.82	116	--	5.6	1.9	.12
22	5/13/2005	1300	--	--	3,220	640	--	7.50	357	--	35	2.6	.16
22	5/13/2005	1300	5/13/2005	2045	2,990	610	--	7.50	335	--	36	2.0	.10
22	6/1/2005	1630	--	--	1,330	--	--	7.50	412	--	44	1.3	.17
22	7/4/2005	0115	7/4/2005	1000	1,340	--	--	6.90	399	--	40	2.8	.07
22	7/26/2005	2300	7/27/2005	0930	768	--	--	7.60	531	--	54	2.4	.20
22	4/24/2006	0715	4/24/2006	1215	1,110	--	--	7.70	594	--	72	2.5	.19
22	4/28/2006	1615	4/29/2006	0815	685	--	--	7.90	541	--	66	1.4	<.040
22	6/6/2006	1030	6/6/2006	1100	1,830	--	--	8.00	335	--	28	4.1	.12
22	6/25/2006	0700	6/25/2006	1805	818	--	--	8.00	341	--	28	2.2	.16
22	6/25/2006	0701	6/25/2006	1806	818	--	--	8.00	341	--	--	--	--
22	2/24/2007	0945	2/25/2007	0345	1,010	--	--	7.90	1,530	--	371	3.3	.05
22	3/29/2007	2315	3/30/2007	0915	868	--	--	8.10	715	--	102	3.0	<.020
22	4/26/2007	1045	4/26/2007	1100	1,740	--	--	7.80	414	--	47	3.7	.10
22	5/7/2007	1415	--	--	19,400	--	--	7.70	307	--	--	--	--
22	9/7/2007	0500	9/7/2007	1030	1,130	--	--	8.11	535	--	61	3.5	.34
25	6/1/2005	1000	--	--	4.4	--	--	7.82	196	20.4	13	1.1	.52

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Nitrate (mg/L as N)	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophosphate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)
2	4/24/2006	0115	4/24/2006	1045	1.6	1.6	0.060	3.3	5.10	0.12	0.14	1.2	6.7
2	4/29/2006	0430	4/29/2006	0915	1.2	1.3	.033	.92	2.22	.08	.12	.21	7.2
2	6/5/2006	2145	6/6/2006	0545	1.2	1.2	.036	4.1	5.36	.15	.14	1.5	7.6
2	7/11/2006	2130	7/12/2006	0515	.80	.82	.019	3.1	4.04	.10	.12	1.1	5.2
2	7/12/2006	0805	7/12/2006	0830	.49	.51	.018	4.6	5.19	.06	.07	1.4	5.4
2	2/24/2007	1200	2/24/2007	1900	.95	.99	.039	1.8	2.77	.03	.08	.49	7.6
2	3/30/2007	1030	3/31/2007	0130	3.1	3.2	.150	.62	3.96	.51	.54	.18	5.6
2	4/25/2007	1815	4/26/2007	0000	.70	.72	.027	3.0	3.74	.03	.04	.85	5.3
2	5/7/2007	0930	--	--	--	--	--	--	--	--	--	--	--
6	10/20/2005	0115	10/20/2005	1145	2.3	2.4	.082	2.4	4.82	.45	.47	.97	7.3
6	4/28/2006	1430	4/28/2006	2045	2.8	2.9	.075	1.1	4.24	.41	.44	.56	24
6	4/29/2006	2200	4/30/2006	0525	1.2	1.2	.042	2.6	3.90	.15	.17	.85	6.7
6	4/29/2006	2201	4/30/2006	0526	1.2	1.2	.042	2.6	3.86	.14	.17	.85	6.6
6	6/5/2006	2015	6/6/2006	0640	1.2	1.3	.110	5.8	7.44	.17	.16	2.4	7.4
6	2/24/2007	0915	2/25/2007	0630	1.9	2.0	.058	2.4	5.02	.32	.35	.90	8.7
6	3/30/2007	0120	3/30/2007	0910	1.6	1.7	.090	3.4	5.24	.17	.22	1.1	8.1
6	4/25/2007	1700	4/26/2007	0830	1.1	1.1	.052	3.5	4.66	.10	.16	1.0	6.9
6	5/7/2007	1100	--	--	--	--	--	--	--	--	--	--	--
7	5/13/2005	0000	5/13/2005	0930	1.9	2.0	.110	5.7	8.04	.32	.54	2.5	5.1
7	5/13/2005	0930	5/13/2005	1800	.78	.82	.039	2.4	3.31	.10	.12	.89	5.2
7	6/1/2005	0100	6/1/2005	1400	2.3	2.4	.120	2.2	4.76	.38	.42	1.0	6.9
7	7/3/2005	1030	7/4/2005	0600	1.6	1.7	.066	3.8	5.51	.19	.20	1.5	4.7
7	7/3/2005	1031	7/4/2005	0601	1.6	1.7	.066	3.9	5.62	.19	.21	1.6	4.7
7	7/26/2005	2230	7/27/2005	0445	3.2	3.3	.100	2.4	5.77	.62	.62	1.4	6.3
7	4/24/2006	0230	4/24/2006	1015	2.3	2.4	.16	3.6	6.30	.23	.27	1.3	7.8
7	4/28/2006	1500	4/28/2006	2045	1.7	1.8	.061	1.1	3.13	.26	.30	.64	6.8
7	4/28/2006	2345	4/29/2006	1500	1.5	1.5	.059	1.5	3.01	.15	.21	.46	5.8
7	6/5/2006	2130	6/6/2006	0445	1.4	1.5	.100	7.2	9.02	.19	.19	3.2	5.7

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Nitrate (mg/L as N)	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophosphate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)
7	2/24/2007	0945	2/25/2007	0700	1.4	1.4	0.036	2.2	3.90	0.17	0.17	0.81	6.8
17	2/24/2007	0946	2/25/2007	0701	1.4	1.4	.036	2.8	4.45	.17	.17	1.0	6.8
7	3/30/2007	0215	3/30/2007	0645	.71	.73	.017	2.4	3.15	.05	.07	1.2	3.7
7	4/25/2007	1800	4/25/2007	2215	1.1	1.1	.061	4.2	5.43	.14	.16	1.6	5.3
7	5/7/2007	1200	--	--	--	--	--	--	--	--	--	--	--
12	6/28/2007	1015	--	--	.36	.38	.022	1.1	1.53	.06	.08	.23	7.7
12	10/18/2007	1115	--	--	4.1	4.1	.037	.86	5.11	.10	.10	.14	4.3
12	10/22/2007	1015	--	--	.40	.41	.014	.49	.989	.10	.10	.15	4.6
12	1/10/2008	1245	--	--	.81	.83	.024	1.1	2.02	.09	.14	.31	6.4
13	5/12/2005	2315	5/13/2005	0430	.45	.47	.022	.75	1.37	.06	.09	.16	11
13	5/13/2005	0430	5/13/2005	1130	.56	.58	.021	1.2	2.03	.11	.13	.26	5.7
13	5/31/2005	2315	6/1/2005	0900	.78	.84	.058	.90	2.06	.05	.08	.16	8.5
13	6/30/2005	1000	6/30/2005	2000	.93	1.0	.076	2.1	3.20	.02	.05	.38	8.3
13	7/26/2005	1730	7/26/2005	2015	.44	.45	.014	1.3	1.83	.06	.09	.34	4.3
13	10/20/2005	0200	10/20/2005	0320	.72	.76	.041	2.0	2.82	.06	.14	.49	11
² 13	11/21/2005	1000	--	--	<.05	<.06	<.01	<.06	<.10	<.02	<.04	<.04	--
13	4/28/2006	1255	4/28/2006	1530	.42	.46	.040	1.7	2.28	E .01	.07	.26	15
13	4/29/2006	2130	4/30/2006	0005	.76	.78	.018	4.9	5.69	.06	.08	.88	29
13	6/5/2006	2030	6/5/2006	2215	.39	.42	.027	5.1	5.85	.04	.05	2.0	6.2
13	2/12/2007	1950	2/12/2007	2130	--	--	--	--	--	--	--	--	--
13	2/24/2007	0940	2/24/2007	1400	.92	.96	.038	2.7	3.91	.05	.09	.67	7.2
13	3/29/2007	2315	3/30/2007	0100	.53	.55	.027	2.6	3.38	.03	.05	.59	8.4
13	4/25/2007	1700	4/25/2007	2225	.42	.45	.032	8.4	9.02	.04	.07	1.9	7.8
13	6/30/2007	0900	6/30/2007	1645	.38	.40	.019	1.1	1.50	.08	.07	.32	3.7
13	8/9/2007	0045	--	--	--	--	--	--	--	--	--	--	--
13	10/17/2007	1215	10/17/2007	2130	.88	.90	.018	1.3	2.28	.12	.14	.38	5.4

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Nitrate (mg/L as N)	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophosphate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)
16	5/12/2005	2300	5/13/2005	0500	0.33	0.36	0.030	3.9	4.6	<0.02	0.08	0.94	24
16	5/13/2005	0500	5/13/2005	1100	.44	.46	.023	1.6	2.1	.05	.08	.34	4.4
16	5/31/2005	2315	6/1/2005	0920	.62	.69	.075	1.4	2.6	.13	.16	.32	8.1
16	6/30/2005	0930	6/30/2005	2100	.54	.58	.045	1.4	2.3	.07	.10	.28	7.5
16	7/26/2005	1715	7/26/2005	2030	.41	.43	.026	2.9	3.6	.04	.07	.71	7.3
16	10/20/2005	0130	10/20/2005	0415	--	--	--	--	--	--	--	--	5.2
16	4/28/2006	1320	4/28/2006	1600	.09	.14	.054	1.9	2.0	.03	.22	.39	12
16	4/29/2006	2140	4/30/2006	0155	.62	.64	.018	.95	1.6	.08	.10	.19	5.5
16	6/5/2006	2015	6/5/2006	2300	.37	.41	.042	9.2	10	.02	E .03	2.3	6.8
16	2/24/2007	0815	2/24/2007	1500	.94	.98	.040	1.5	2.5	.02	.12	.29	9.9
16	3/29/2007	2240	3/30/2007	0135	.37	.40	.033	3.2	3.8	.01	E .04	.76	5.7
16	4/25/2007	1700	4/25/2007	2355	.75	.78	.030	6.2	7.3	.08	.11	1.8	6.0
16	4/25/2007	1701	4/25/2007	2356	.74	.77	.029	6.7	7.8	.09	.11	1.8	6.0
16	6/30/2007	0915	6/30/2007	1530	.48	.51	.035	.77	1.4	.08	.09	.19	5.4
16	6/30/2007	0916	6/30/2007	1531	.48	.52	.034	.82	1.4	.08	.12	.19	5.4
16	8/9/2007	0100	--	--	--	--	--	--	--	--	--	--	--
16	10/17/2007	1200	10/17/2007	2200	.99	1.0	.033	1.4	2.6	.10	.10	.35	5.8
19	5/13/2005	1045	--	--	1.1	1.2	.042	1.6	3.0	.15	.18	.33	5.4
19	5/13/2005	1046	--	--	1.1	1.1	.041	1.6	3.0	.15	.17	.33	5.4
19	6/1/2005	1045	--	--	1.1	1.1	.064	1.2	3.3	.14	.17	.27	6.6
19	7/26/2005	1720	7/26/2005	1820	.47	.50	.032	4.5	5.3	.11	.14	1.4	5.5
19	7/26/2005	1721	7/26/2005	1821	.47	.50	.033	5.2	6.1	.11	.14	1.5	5.8
19	8/12/2005	1750	8/13/2005	0715	.57	.60	.027	1.8	2.5	.05	.10	.52	4.8
19	10/19/2005	2000	10/20/2005	0300	.56	.61	.051	13	14	.11	.18	2.8	9.2
19	6/5/2006	2030	6/5/2006	2140	.37	.43	.065	12	14	.17	.19	3.3	12
19	6/10/2006	2150	6/11/2006	0055	.86	.94	.079	3.5	4.8	.04	.09	.84	10
19	6/24/2006	1505	6/24/2006	1805	.66	.70	.037	4.1	5.2	.11	.12	1.2	5.8
19	6/24/2006	1506	6/24/2006	1806	.66	.70	.038	4.3	5.4	.11	.13	1.3	5.9

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	Nitrate (mg/L as N)	NO ₂ +NO ₃ (mg/L as N)	Nitrite (mg/L as N)	Organic N (mg/L)	Total N (mg/L)	Orthophosphate (mg/L as P)	Dissolved P (mg/L)	Total P (mg/L)	DOC (mg/L)
19	2/28/2007	1920	2/28/2007	2320	0.78	0.82	0.041	10	12	0.13	0.18	2.9	6.2
19 ¹	2/28/2007	1920	2/28/2007	2320	--	--	--	--	--	--	--	--	--
19	3/1/2007	0550	3/1/2007	0630	5.0	5.0	.060	1.38	6.61	.11	.10	.25	6.1
19	3/29/2007	2245	3/29/2007	2340	.53	.58	.052	5.33	6.49	.11	.16	1.4	8.2
19	4/25/2007	1730	4/25/2007	2100	.74	.79	.051	2.49	3.49	.16	.21	.59	10
19	6/18/2007	1050	6/18/2007	1130	.54	.60	.065	3.03	4.01	.13	.20	.79	10
19	10/17/2007	1130	10/17/2007	1900	.49	.50	.014	1.77	2.39	.13	.14	.47	3.2
22	5/13/2005	1300	--	--	1.1	1.2	.070	2.48	3.81	.12	.13	.97	4.5
22	5/13/2005	1300	5/13/2005	2045	.80	.85	.054	1.93	2.88	.10	.11	.70	5.1
22	6/1/2005	1630	--	--	1.4	1.5	.110	1.17	2.82	.22	.24	.47	7.1
22	7/4/2005	0115	7/4/2005	1000	2.1	2.2	.100	2.75	5.05	.25	.28	1.2	5.4
22	7/26/2005	2300	7/27/2005	0930	3.6	3.7	.094	2.23	6.16	.61	.63	1.3	6.3
22	4/24/2006	0715	4/24/2006	1215	2.2	2.3	.130	2.36	4.83	.23	.28	.92	7.5
22	4/28/2006	1615	4/29/2006	0815	3.5	3.6	.100	1.39	4.98	.43	.53	.52	7.4
22	6/6/2006	1030	6/6/2006	1100	1.1	1.2	.058	3.96	5.27	.16	.15	1.6	5.7
22	6/25/2006	0700	6/25/2006	1805	1.9	2.0	.057	2.04	4.14	.27	.29	.94	5.2
22	6/25/2006	0701	6/25/2006	1806	--	--	--	--	--	--	--	--	--
22	2/24/2007	0945	2/25/2007	0345	2.0	2.0	.047	3.22	5.28	.20	.26	1.2	6.5
22	3/29/2007	2315	3/30/2007	0915	1.3	1.4	.089	2.99	4.42	.12	.20	1.1	7.4
22	4/26/2007	1045	4/26/2007	1100	.76	.80	.034	3.65	4.54	.08	.09	1.8	5.8
22	5/7/2007	1415	--	--	--	--	--	--	--	--	--	--	--
22	9/7/2007	0500	9/7/2007	1030	2.8	2.8	.045	3.16	6.32	.60	.61	1.7	6.8
25	6/1/2005	1000	--	--	.90	.94	.040	.61	2.06	.05	.07	.26	5.2

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than, E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	TOC (mg/L)	BOD (mg/L)	COD (mg/L)	<i>Escherichia coli</i> (col/100 mL)	Fecal coliform (col/100 mL)	Total coliform (col/100 mL)	Suspended sediment (mg/L)
2	4/24/2006	0115	4/24/2006	1045	22	13	92	17,000	25,000	2,000,000	1,000
2	4/29/2006	0430	4/29/2006	0915	17	4.0	21	1,500	3,300	180,000	101
2	6/5/2006	2145	6/6/2006	0545	46	5.4	106	18,000	21,000	600,000	1,630
2	7/11/2006	2130	7/12/2006	0515	30	5.1	78	16,000	8,000	1,200,000	1,350
2	7/12/2006	0805	7/12/2006	0830	36	6.3	112	20,000	28,000	1,600,000	1,320
2	2/24/2007	1200	2/24/2007	1900	16	6.6	45	300	400	1,500	490
2	3/30/2007	1030	3/31/2007	0130	7.3	2.9	18	590	320	12,000	145
2	4/25/2007	1815	4/26/2007	0000	29	2.5	72	11,000	3,000	200,000	975
2	5/7/2007	0930	--	--	--	--	--	48,000	>13,000	2,000,000	776
6	10/20/2005	0115	10/20/2005	1145	17	18	72	29,000	24,000	1,200,000	939
6	4/28/2006	1430	4/28/2006	2045	25	15	91	7,500	24,000	340,000	46
6	4/29/2006	2200	4/30/2006	0525	25	8.2	75	5,200	10,000	150,000	555
6	4/29/2006	2201	4/30/2006	0526	24	8.2	80	8,300	--	190,000	553
6	6/5/2006	2015	6/6/2006	0640	55	9.8	195	37,000	35,000	690,000	2,070
6	2/24/2007	0915	2/25/2007	0630	24	13	82	1,700	2,200	25,000	495
6	3/30/2007	0120	3/30/2007	0910	33	23	102	16,000	22,000	400,000	785
6	4/25/2007	1700	4/26/2007	0830	34	6.9	80	24,000	24,000	780,000	829
6	5/7/2007	1100	--	--	--	--	--	17,000	18,000	270,000	773
7	5/13/2005	0000	5/13/2005	0930	39	22	130	2,100	25,000	110,000	1,900
7	5/13/2005	0930	5/13/2005	1800	26	8.0	50	E 9,900	23,000	E 240,000	1,110
7	6/1/2005	0100	6/1/2005	1400	33	6.0	52	22,000	30,000	980,000	476
7	7/3/2005	1030	7/4/2005	0600	40	5.0	95	23,000	34,000	820,000	1,540
7	7/3/2005	1031	7/4/2005	0601	42	5.0	93	24,000	--	700,000	1,530
7	7/26/2005	2230	7/27/2005	0445	28	5.0	83	9,800	23,000	310,000	560
7	4/24/2006	0230	4/24/2006	1015	27	7.4	86	24,000	26,000	> 240,000	334
7	4/28/2006	1500	4/28/2006	2045	14	9.8	29	9,400	5,600	820,000	40
7	4/28/2006	2345	4/29/2006	1500	14	4.0	37	1,000	--	86,000	170
7	6/5/2006	2130	6/6/2006	0445	66	3.4	206	27,000	46,000	590,000	2,830

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	TOC (mg/L)	BOD (mg/L)	COD (mg/L)	<i>Escherichia coli</i> (col/100 mL)	Fecal coliform (col/100 mL)	Total coliform (col/100 mL)	Suspended sediment (mg/L)
7	2/24/2007	0945	2/25/2007	0700	24	11	53	2,400	800	23,000	719
17	2/24/2007	0946	2/25/2007	0701	28	11	108	2,400	800	23,000	970
7	3/30/2007	0215	3/30/2007	0645	22	7.7	52	19,000	22,000	285,000	1,257
7	4/25/2007	1800	4/25/2007	2215	76	3.3	120	36,000	30,000	> 480,000	2,427
7	5/7/2007	1200	--	--	--	--	--	18,000	24,000	230,000	568
12	6/28/2007	1015	--	--	13	4.4	43	47,000	72,000	700,000	4
12	10/18/2007	1115	--	--	6.0	2.1	17	2,740	4,000	230,000	18
12	10/22/2007	1015	--	--	7.6	6.8	29	10,200	6,450	213,000	36
12	1/10/2008	1245	--	--	14	5.2	51	--	2,500	--	--
13	5/12/2005	2315	5/13/2005	0430	11	23	46	20,000	70,000	> 240,000	62
13	5/13/2005	0430	5/13/2005	1130	11	6.0	34	9,700	> 7,000	> 240,000	92
13	5/31/2005	2315	6/1/2005	0900	12	5.0	36	71,000	380,000	3,500,000	83
13	6/30/2005	1000	6/30/2005	2000	18	14	59	42,000	92,000	820,000	342
13	7/26/2005	1730	7/26/2005	2015	16	4.0	53	66,000	53,000	3,900,000	257
13	10/20/2005	0200	10/20/2005	0320	49	26	170	52,000	110,000	2,000,000	877
213	11/21/2005	1000	--	--	--	--	--	2	6	307	--
13	4/28/2006	1255	4/28/2006	1530	19	12	120	30,000	11,000	> 2,400,000	337
13	4/29/2006	2130	4/30/2006	0005	E 66	74	220	52,000	15,000	650,000	443
13	6/5/2006	2030	6/5/2006	2215	75	7.8	180	44,000	100,000	1,400,000	1,890
13	2/12/2007	1950	2/12/2007	2130	--	--	--	--	--	--	900
13	2/24/2007	0940	2/24/2007	1400	34	11	150	4,500	5,000	56,000	565
13	3/29/2007	2315	3/30/2007	0100	27	14	82	40,000	45,000	1,700,000	1,640
13	4/25/2007	1700	4/25/2007	2225	81	8.0	230	78,000	60,000	4,800,000	1,794
13	6/30/2007	0900	6/30/2007	1645	12	--	38	9,600	15,000	180,000	178
13	8/9/2007	0045	--	--	--	--	--	55,400	E 214,000	2,200,000	617
13	10/17/2007	1215	10/17/2007	2130	12	7.6	37	21,000	35,000	985,000	167

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; µS/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorous; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than, E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	TOC (mg/L)	BOD (mg/L)	COD (mg/L)	<i>Escherichia coli</i> (col/100 mL)	Fecal coliform (col/100 mL)	Total coliform (col/100 mL)	Suspended sediment (mg/L)
16	5/12/2005	2300	5/13/2005	0500	E 43	72	140	> 55,000	200,000	> 240,000	844
16	5/13/2005	0500	5/13/2005	1100	10	7.0	32	28,000	170,000	> 240,000	143
16	5/31/2005	2315	6/1/2005	0920	14	4.0	41	40,000	> 34,000	3,400,000	101
16	6/30/2005	0930	6/30/2005	2100	13	2.0	59	38,000	73,000	600,000	96
16	7/26/2005	1715	7/26/2005	2030	28	10	100	65,000	100,000	1,700,000	359
16	10/20/2005	0130	10/20/2005	0415	11	13	--	38,000	90,000	1,700,000	--
16	4/28/2006	1320	4/28/2006	1600	14	9.9	42	21,000	11,000	730,000	8
16	4/29/2006	2140	4/30/2006	0155	7.1	2.7	23	5,900	6,600	300,000	20
16	6/5/2006	2015	6/5/2006	2300	92	13	300	57,000	150,000	1,600,000	1,580
16	2/24/2007	0815	2/24/2007	1500	16	13	64	13,000	10,000	140,000	156
16	3/29/2007	2240	3/30/2007	0135	33	16	100	59,000	90,000	1,600,000	415
16	4/25/2007	1700	4/25/2007	2355	103	7.1	240	72,000	66,000	3,500,000	1,540
16	4/25/2007	1701	4/25/2007	2356	78	6.9	190	60,000	72,000	3,500,000	1,560
16	6/30/2007	0915	6/30/2007	1530	7.5	--	27	6,200	11,000	141,000	53
16	6/30/2007	0916	6/30/2007	1531	7.3	--	29	--	--	--	41
16	8/9/2007	0100	--	--	--	--	--	60,000	E 140,000	1,400,000	618
16	10/17/2007	1200	10/17/2007	2200	14	12	80	34,000	88,000	930,000	147
19	5/13/2005	1045	--	--	13	9.0	35	82,000	130,000	> 240,000	84
19	5/13/2005	1046	--	--	11	9.0	35	82,000	260,000	> 240,000	89
19	6/1/2005	1045	--	--	10	5.0	40	160,000	180,000	2,200,000	31
19	7/26/2005	1720	7/26/2005	1820	E 50	18	190	240,000	250,000	24,000,000	869
19	7/26/2005	1721	7/26/2005	1821	E 57	22	120	200,000	250,000	> 24,000,000	784
19	8/12/2005	1750	8/13/2005	0715	18	9.0	48	33,000	130,000	150,000	365
19	10/19/2005	2000	10/20/2005	0300	76	38	460	210,000	310,000	2,400,000	--
19	6/5/2006	2030	6/5/2006	2140	90	32	300	180,000	580,000	4,800,000	1,340
19	6/10/2006	2150	6/11/2006	0055	37	11	120	21,000	--	730,000	520
19	6/24/2006	1505	6/24/2006	1805	48	12	110	280,000	490,000	11,000,000	648
19	6/24/2006	1506	6/24/2006	1806	36	--	130	--	--	--	648

Table 8. Physical properties, nutrients, bacteria, and selected chemical concentrations in stormflow samples collected between May 2005 and October 2007.—Continued

[ft³/s, cubic feet per second; FNU, Formazin Nephelometric Unit; DO, dissolved oxygen; mg/L, milligrams per liter; std, standard; SC, specific conductance; μ S/cm, microsiemens per centimeter at 25 degrees Celsius; temp., temperature; °C, degrees Celsius; NH₃+orgN, ammonia plus organic nitrogen; NO₂+NO₃, nitrite plus nitrate; N, nitrogen; P, phosphorus; DOC, dissolved organic carbon; TOC, total organic carbon; BOD, biochemical oxygen demand; COD, chemical oxygen demand; col/100mL, colonies per 100 milliliters; --, no data; <, less than; E, estimated; >, greater than]

Site number (fig. 1)	Sample start date	Start time	End date	End time	TOC (mg/L)	BOD (mg/L)	COD (mg/L)	<i>Escherichia coli</i> (col/100 mL)	Fecal coli- form (col/100 mL)	Total coliform (col/100 mL)	Suspended sediment (mg/L)
19	2/28/2007	1920	2/28/2007	2320	128	24	380	120,000	100,000	> 2,900,000	1,939
'19	2/28/2007	1921	2/28/2007	2321	--	--	--	210,000	140,000	3,000,000	--
19	3/1/2007	0550	3/1/2007	0630	10	6.4	27	23,000	8,200	240,000	83
19	3/29/2007	2245	3/29/2007	2340	50	--	150	200,000	270,000	> 2,400,000	1,907
19	4/25/2007	1730	4/25/2007	2100	17	7.5	67	86,000	92,000	2,100,000	161
19	6/18/2007	1050	6/18/2007	1130	31	26	100	610,000	300,000	> 2,400,000	449
19	10/17/2007	1130	10/17/2007	1900	16	9.1	52	170,000	220,000	4,400,000	258
22	5/13/2005	1300	--	--	22	10	46	2,200	40,000	96,000	821
22	5/13/2005	1300	5/13/2005	2045	17	10	41	3,600	19,000	67,000	471
22	6/1/2005	1630	--	--	12	6.0	33	14,000	22,000	520,000	161
22	7/4/2005	0115	7/4/2005	1000	24	8.0	67	11,000	22,000	350,000	772
22	7/26/2005	2300	7/27/2005	0930	22	--	62	15,000	26,000	270,000	449
22	4/24/2006	0715	4/24/2006	1215	18	16	55	23,000	26,000	> 2,400,000	364
22	4/28/2006	1615	4/29/2006	0815	21	8.2	40	3,900	5,000	440,000	141
22	6/6/2006	1030	6/6/2006	1100	33	4.2	100	15,000	17,000	500,000	1,680
22	6/25/2006	0700	6/25/2006	1805	17	4.7	46	21,000	19,000	450,000	597
'22	6/25/2006	0701	6/25/2006	1806	--	6.0	--	17,000	29,000	560,000	606
22	2/24/2007	0945	2/25/2007	0345	29	12	95	13,000	20,000	530,000	771
22	3/29/2007	2315	3/30/2007	0915	30	14	77	13,000	20,000	530,000	614
22	4/26/2007	1045	4/26/2007	1100	33	5.8	85	22,000	9,400	> 480,000	1,639
22	5/7/2007	1415	--	--	--	--	--	46,000	64,000	> 2,400,000	627
22	9/7/2007	0500	9/7/2007	1030	29	9.9	75	--	--	--	676
25	6/1/2005	1000	--	--	9	2.0	30	7,600	18,000	250,000	598

¹Replicate samples²Field equipment blank.

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.

[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Hardness as CaCO ₃ (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Alkalinity as CaCO ₃ (mg/L)	Silica (mg/L)	Sulfate (mg/L)	Residue on evaporation (mg/L)	Residue, due, fixed (mg/L)	Residue, due, total (mg/L)	Residue, due, volatile (mg/L)
2	5/3/2005	1030	--	--	300	97	13	--	195	--	--	445	--	<10	<10
2	8/1/2005	0930	--	--	260	78	16	--	159	--	--	485	--	<10	<10
2	12/6/2005	0930	--	--	300	90	19	54	--	6.3	141	--	--	--	--
2	12/14/2006	1030	--	--	270	90	11	41	--	7.2	56	--	--	--	--
6	5/3/2005	1400	--	--	280	83	18	--	141	--	--	625	--	<10	<10
6	8/1/2005	1345	--	--	220	64	14	--	135	--	--	572	--	<10	<10
6	12/5/2005	1130	--	--	230	62	18	98	--	12	121	--	--	--	--
6	12/14/2006	1230	--	--	910	270	57	444	--	26	119	--	--	--	--
7	5/3/2005	1200	--	--	300	93	16	--	177	--	--	552	--	<10	<10
7	5/13/2005	0000	5/13/2005	0930	130	41	6.1	--	79	--	--	431	1,280	1,470	188
7	5/13/2005	0930	5/13/2005	1800	100	34	4.4	--	77	--	--	190	688	754	66
7	6/1/2005	0100	6/1/2005	1400	120	38	6.4	--	80	--	--	262	288	342	54
7	7/3/2005	1030	7/4/2005	0600	110	35	4.8	--	73	--	--	183	1,030	1,150	116
7	7/3/2005	1031	7/4/2005	0601	110	35	4.9	--	72	--	--	179	1,090	1,210	123
7	7/26/2005	2230	7/27/2005	0445	120	37	6.1	--	78	--	--	269	461	542	82
7	8/1/2005	1045	--	--	230	71	14	--	143	--	--	512	--	<10	<10
7	12/15/2006	1430	--	--	290	91	15	95	--	6.8	87	--	--	--	--
8	5/3/2005	1330	--	--	310	96	16	--	177	--	--	541	--	11	<10
8	8/1/2005	1200	--	--	240	74	14	--	144	--	--	516	--	16	<10
9	5/4/2005	1000	--	--	320	100	16	--	183	--	--	554	18	28	10
9	8/1/2005	1300	--	--	230	73	12	--	141	--	--	449	--	<10	<10
9	8/1/2005	1301	--	--	230	71	12	--	141	--	--	456	--	<10	<10
11	5/10/2005	0945	--	--	280	89	13	--	165	--	--	474	--	<10	<10
11	8/3/2005	0900	--	--	130	40	6.4	--	59	--	--	349	--	<10	<10

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Hardness as CaCO ₃ (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Alkalinity as CaCO ₃ (mg/L)	Silica (mg/L)	Sulfate (mg/L)	Residue on evaporation (mg/L)	Residue, fixed (mg/L)	Residue, total (mg/L)	Residue, volatile (mg/L)
13	5/10/2005	1045	--	--	180	59	7.2	--	130	--	--	310	--	<10	<10
13	5/10/2005	1046	--	--	180	60	7.4	--	130	--	--	313	--	<10	<10
13	5/12/2005	2315	5/13/2005	0430	6.0	1.1	.85	--	48	--	--	103	--	<10	<10
13	5/13/2005	0430	5/13/2005	1130	66	23	2.5	--	54	--	--	123	31	42	11
13	5/31/2005	2315	6/1/2005	0900	70	24	2.5	--	52	--	--	142	--	14	<10
13	6/30/2005	1000	6/30/2005	2000	91	31	3.1	--	60	--	--	152	184	244	60
13	7/26/2005	1730	7/26/2005	2015	41	15	1.2	--	34	--	--	71	164	222	58
13	8/3/2005	0945	--	--	170	54	8.0	--	105	--	--	384	--	<10	<10
13	12/7/2005	0930	--	--	310	101	13	45	--	13	91	--	--	--	--
13	12/14/2006	1330	--	--	250	74	16	206	--	9.9	142	--	--	--	--
14	5/10/2005	1200	--	--	190	64	7.4	--	136	--	--	325	--	<10	<10
14	8/3/2005	1030	--	--	190	62	8.4	--	105	--	--	379	--	<10	<10
15	5/10/2005	1230	--	--	220	71	11	--	132	--	--	403	4.0	20	16
15	8/3/2005	1100	--	--	130	43	4.8	--	96	--	--	215	--	<10	<10
16	5/11/2005	1030	--	--	170	57	7.7	--	133	--	--	292	--	<10	13
16	5/12/2005	2300	5/13/2005	0500	100	33	4.1	--	71	--	--	190	294	404	110
16	5/13/2005	0500	5/13/2005	1100	56	19	1.8	--	45	--	--	105	57	73	16
16	5/31/2005	2315	6/1/2005	0920	140	44	6.0	--	91	--	--	249	--	15	<10
16	6/30/2005	0930	6/30/2005	2100	160	51	7.3	--	90	--	--	291	40	53	13
16	7/26/2005	1715	7/26/2005	2030	92	31	3.6	--	66	--	--	172	200	260	60
16	8/11/2005	0930	--	--	130	38	10	--	114	--	--	309	--	<10	<10
16	12/7/2005	1130	--	--	160	54	6.8	26	--	6.1	40	--	--	--	--
16	12/15/2006	1230	--	--	370	120	17	793	--	7.9	89	--	--	--	--
17	5/11/2005	1115	--	--	280	88	14	--	156	--	--	495	--	<10	<10
17	8/11/2005	1015	--	--	170	58	6.7	--	112	--	--	338	--	<10	<10

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued

[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Hardness as CaCO ₃ (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Alkalinity as CaCO ₃ (mg/L)	Silica (mg/L)	Sulfate (mg/L)	Residue on evaporation (mg/L)	Residue, due, fixed (mg/L)	Residue, due, total (mg/L)	Residue, due, volatile (mg/L)
18	5/11/2005	1300	--	--	280	89	14	--	165	--	--	518	34	44	10
18	8/11/2005	1045	--	--	220	72	8.6	--	134	--	--	364	--	<10	<10
19	5/11/2005	1200	--	--	490	166	18	--	302	--	--	681	--	<10	<10
19	5/13/2005	1045	--	--	89	31	3.1	--	70	--	--	166	34	45	11
'19	5/13/2005	1046	--	--	88	30	3.1	--	70	--	--	158	25	37	12
19	6/1/2005	1045	--	--	54	19	1.6	--	39	--	--	114	--	14	<10
19	7/26/2005	1720	7/26/2005	1820	37	14	.78	--	31	--	--	60	317	423	107
'19	7/26/2005	1721	7/26/2005	1821	37	14	.78	--	32	--	--	60	370	490	120
19	8/3/2005	1200	--	--	300	101	11	--	212	--	--	518	--	<10	13
'19	8/3/2005	1201	--	--	300	101	11	--	204	--	--	518	--	<10	<10
19	8/12/2005	1750	8/13/2005	0715	50	18	1.2	--	40	--	--	77	191	228	37
19	12/13/2005	1100	--	--	360	122	14	165	--	11	77	--	--	--	--
'19	12/18/2006	1015	--	--	--	.01	.014	<.2	--	.03	<.18	--	--	--	--
19	12/18/2006	1030	--	--	350	118	13	83	--	13	127	--	--	--	--
'19	12/18/2006	1031	--	--	350	120	13	86	--	12	126	--	--	--	--
20	5/12/2005	0930	--	--	300	97	14	--	157	--	--	555	46	57	11
20	8/11/2005	1115	--	--	330	110	13	--	190	--	--	480	--	20	<10
21	5/4/2005	1045	--	--	320	103	16	--	187	--	--	563	--	24	<10
21	8/2/2005	0845	--	--	190	62	9.5	--	133	--	--	402	--	13	<10
22	5/4/2005	1145	--	--	330	105	16	--	193	--	--	565	45	63	18
22	5/13/2005	1300	--	--	110	35	4.7	--	76	--	--	207	588	682	95
22	5/13/2005	1300	5/13/2005	2045	99	33	4.2	--	73	--	--	193	478	536	58
22	6/1/2005	1630	--	--	120	39	6.0	--	81	--	--	254	117	140	23
22	7/4/2005	0115	7/4/2005	1000	140	44	6.3	--	84	--	--	234	576	676	100
22	7/26/2005	2300	7/27/2005	0930	140	44	6.9	--	88	--	--	304	348	408	60
22	8/2/2005	0930	--	--	190	61	9.1	--	131	--	--	388	30	44	14
22	12/13/2005	0930	--	--	300	93	17	220	--	8.7	104	--	--	--	--
22	12/15/2006	1100	--	--	310	96	16	109	--	7.1	96	--	--	--	--

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued

[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Hardness as CaCO ₃ (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Alkalinity as CaCO ₃ (mg/L)	Silica (mg/L)	Sulfate (mg/L)	Residue on evaporation (mg/L)	Residue, fixed (mg/L)	Residue, total (mg/L)	Residue, volatile (mg/L)
23	5/5/2005	1030	--	--	340	109	17	--	197	--	--	577	36	49	13
23	5/5/2005	1031	--	--	330	107	16	--	198	--	--	582	32	43	11
23	8/2/2005	1030	--	--	200	65	8.9	--	134	--	--	361	47	63	16
24	5/5/2005	1145	--	--	350	112	17	--	204	--	--	586	--	26	<10
24	5/5/2005	1215	--	--	--	.020	.014	--	<2	--	--	10	--	<10	<10
24	8/2/2005	1115	--	--	210	65	10	--	150	--	--	372	--	31	<10
25	5/12/2005	1030	--	--	400	128	20	--	227	--	--	695	--	16	<10
25	6/1/2005	1000	--	--	63	22	2.0	--	44	--	--	107	182	226	44
25	8/11/2005	1200	--	--	540	166	30	--	273	--	--	894	--	<10	<10

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued

[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Aluminum (µg/L)	Antimony (µg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)
2	5/3/2005	1030	--	--	--	--	--	--	--	--	E 0.03	3	--	1.5	--	E 0.05
2	8/1/2005	0930	--	--	--	--	--	--	--	--	.09	E1	--	2.8	--	.22
2	12/6/2005	0930	--	--	1.7	E 0.19	1.0	108	<0.06	140	E .03	.26	0.33	1.5	13	E .04
2	12/14/2006	1030	--	--	3.7	.16	.84	116	<.06	55	<.04	E .09	.61	1.0	7	<.12
6	5/3/2005	1400	--	--	--	--	--	--	--	--	.08	3	--	3.3	--	.40
6	8/1/2005	1345	--	--	--	--	--	--	--	--	.12	E2	--	5.6	--	.32
6	12/5/2005	1130	--	--	8.3	.54	1.2	66	<.06	262	.10	.34	1.0	3.6	49	.38
6	12/14/2006	1230	--	--	1.9	.13	.42	35	<.06	61	E .03	E .09	.29	.97	110	E .11
7	5/3/2005	1200	--	--	--	--	--	--	--	--	.06	3	--	2.3	--	.20
7	5/13/2005	0000	5/13/2005	0930	--	--	--	--	--	--	.17	3	--	5.6	--	5.0
7	5/13/2005	0930	5/13/2005	1800	--	--	--	--	--	--	<.04	E2	--	1.9	--	.12
7	6/1/2005	0100	6/1/2005	1400	--	--	--	--	--	--	.04	2	--	2.2	--	.10
7	7/3/2005	1030	7/4/2005	0600	--	--	--	--	--	--	E .03	<2	--	1.7	--	E .07
17	7/3/2005	1031	7/4/2005	0601	--	--	--	--	--	--	E .03	<2	--	1.6	--	E .06
7	7/26/2005	2230	7/27/2005	0445	--	--	--	--	--	--	.07	<2	--	2.8	--	.13
7	8/1/2005	1045	--	--	--	--	--	--	--	--	.12	<2	--	4.1	--	.17
7	12/15/2006	1430	--	--	2.3	.25	1.1	106	<.06	115	.06	.16	.42	2.0	16	.16
8	5/3/2005	1330	--	--	--	--	--	--	--	--	.06	3	--	2.3	--	.21
8	8/1/2005	1200	--	--	--	--	--	--	--	--	.12	E1	--	4.0	--	.22
9	5/4/2005	1000	--	--	--	--	--	--	--	--	.05	3	--	2.0	--	.20
9	8/1/2005	1300	--	--	--	--	--	--	--	--	.10	E1	--	3.2	--	.17
19	8/1/2005	1301	--	--	--	--	--	--	--	--	.10	E1	--	3.2	--	.30
11	5/10/2005	0945	--	--	--	--	--	--	--	--	<.04	3	--	1.5	--	E .04
11	8/3/2005	0900	--	--	--	--	--	--	--	--	E .03	2	--	1.4	--	<.08

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Aluminum (µg/L)	Antimony (µg/L)	Ar-senic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)
13	5/10/2005	1045	--	--	--	--	--	--	--	--	E 0.04	2	--	0.70	--	0.40
13	5/10/2005	1046	--	--	--	--	--	--	--	--	<0.04	2	--	2.0	--	.12
13	5/12/2005	2315	5/13/2005	0430	--	--	--	--	--	--	<0.04	<2	--	1.8	--	.21
13	5/13/2005	0430	5/13/2005	1130	--	--	--	--	--	--	E .02	2	--	3.2	--	.32
13	5/31/2005	2315	6/1/2005	0900	--	--	--	--	--	--	<0.04	2	--	3.3	--	.39
13	6/30/2005	1000	6/30/2005	2000	--	--	--	--	--	--	<0.04	E2	--	3.0	--	.17
13	7/26/2005	1730	7/26/2005	2015	--	--	--	--	--	--	<0.04	2	--	1.4	--	.20
13	8/3/2005	0945	--	--	--	--	--	--	--	--	<0.04	E1	--	1.7	--	<.08
13	12/7/2005	0930	--	--	2.9	0.26	2.1	104	<0.06	57	E .02	.28	1.2	2.0	162	.11
13	12/14/2006	1330	--	--	6.4	.45	1.4	111	<.06	82	.04	.44	.56	1.1	9	<.12
14	5/10/2005	1200	--	--	--	--	--	--	--	--	E .02	E2	--	2.3	--	.11
14	8/3/2005	1030	--	--	--	--	--	--	--	--	<0.04	<2	--	1.7	--	E .07
15	5/10/2005	1230	--	--	--	--	--	--	--	--	E .03	3	--	2.2	--	.27
15	8/3/2005	1100	--	--	--	--	--	--	--	--	<0.04	<2	<2	1.2	--	.08
16	5/11/2005	1030	--	--	--	--	--	--	--	--	<0.04	2	--	2.2	--	.12
16	5/12/2005	2300	5/13/2005	0500	--	--	--	--	--	--	<0.04	E2	--	1.9	--	.45
16	5/13/2005	0500	5/13/2005	1100	--	--	--	--	--	--	<0.04	E1	--	1.7	--	.33
16	5/31/2005	2315	6/1/2005	0920	--	--	--	--	--	--	<0.04	2	--	2.7	--	.16
16	6/30/2005	0930	6/30/2005	2100	--	--	--	--	--	--	E .02	E2	--	3.1	--	.09
16	7/26/2005	1715	7/26/2005	2030	--	--	--	--	--	--	<0.04	<2	--	1.3	--	.16
16	8/11/2005	0930	--	--	--	--	--	--	--	--	<0.04	E1	--	1.3	--	<.08
16	12/7/2005	1130	--	--	31	.34	2.4	63	<.06	45	E .04	.27	1.3	2.3	321	.77
16	12/15/2006	1230	--	--	E 2.8	.36	1.1	193	<.1	54	E .06	E .20	.74	1.9	39	<.24
17	5/11/2005	1115	--	--	--	--	--	--	--	--	E .02	3	--	2.3	--	E .07
17	8/11/2005	1015	--	--	--	--	--	--	--	--	.04	E1	--	2.6	--	.10

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Alumi-num (µg/L)	Antimony (µg/L)	Ar-senic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)
18	5/11/2005	1300	--	--	--	--	--	--	--	--	<0.04	3	--	1.3	--	0.09
18	8/11/2005	1045	--	--	--	--	--	--	--	--	<0.04	E1	--	.70	--	.10
19	5/11/2005	1200	--	--	--	--	--	--	--	--	E.02	4	--	1.5	--	.09
19	5/13/2005	1045	--	--	--	--	--	--	--	--	E.03	3	--	2.2	--	.33
19	5/13/2005	1046	--	--	--	--	--	--	--	--	E.03	3	--	2.2	--	.37
19	6/1/2005	1045	--	--	--	--	--	--	--	--	E.04	2	--	2.6	--	.36
19	7/26/2005	1720	7/26/2005	1820	--	--	--	--	--	--	E.03	<2	--	1.2	--	.36
19	7/26/2005	1721	7/26/2005	1821	--	--	--	--	--	--	E.02	<2	--	1.1	--	.26
19	8/3/2005	1200	--	--	--	--	--	--	--	--	E.02	E1	--	1.0	--	.08
19	8/3/2005	1201	--	--	--	--	--	--	--	--	E.02	E1	--	.80	--	.08
19	8/12/2005	1750	8/13/2005	0715	--	--	--	--	--	--	E.03	<2	--	1.7	--	.29
19	12/13/2005	1100	--	--	E 1.6	0.35	0.79	106	<0.06	53	E.03	.06	0.83	1.1	30	E.05
219	12/18/2006	1015	--	--	<1.6	<.06	<.12	.08	<.06	8.0	<.04	<.1	.19	<.40	<6	<.12
19	12/18/2006	1030	--	--	E 1.2	.25	.91	96	<.06	72	E.02	.07	.79	.47	33	<.12
19	12/18/2006	1031	--	--	E 1.2	.23	.87	96	<.06	71	E.02	.06	.71	.46	29	<.12
20	5/12/2005	0930	--	--	--	--	--	--	--	--	<.04	3	--	1.1	--	.13
20	8/11/2005	1115	--	--	--	--	--	--	--	--	<.04	2	--	.50	--	.08
21	5/4/2005	1045	--	--	--	--	--	--	--	--	.06	3	--	2.1	--	.19
21	8/2/2005	0845	--	--	--	--	--	--	--	--	.08	<2	--	2.5	--	.14
22	5/4/2005	1145	--	--	--	--	--	--	--	--	.05	3	--	1.9	--	.17
22	5/13/2005	1300	--	--	--	--	--	--	--	--	E.02	E 2	--	2.1	--	.09
22	5/13/2005	1300	5/13/2005	2045	--	--	--	--	--	--	E.02	E1	--	1.8	--	.09
22	6/1/2005	1630	--	--	--	--	--	--	--	--	.05	2	--	2.2	--	.08
22	7/4/2005	0115	7/4/2005	1000	--	--	--	--	--	--	.04	E1	--	1.7	--	.09
22	7/26/2005	2300	7/27/2005	0930	--	--	--	--	--	--	.08	<2	--	2.9	--	.15
22	8/2/2005	0930	--	--	--	--	--	--	--	--	.06	E1	--	2.3	--	.18
22	12/13/2005	0930	--	--	7.4	.35	1.2	99	<.06	143	.10	.40	.85	2.6	39	.17
22	12/15/2006	1100	--	--	E 1.4	.27	1.3	107	<.06	105	.05	.20	.67	1.7	20	.14

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued

[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Aluminum (µg/L)	Antimony (µg/L)	Ar-senic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Boron (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)	Lead (µg/L)
23	5/5/2005	1030	--	--	--	--	--	--	--	--	0.04	3	--	1.8	--	0.21
23	5/5/2005	1031	--	--	--	--	--	--	--	--	.04	3	--	1.8	--	.20
23	8/2/2005	1030	--	--	--	--	--	--	--	--	.04	<2	--	2.1	--	.16
24	5/5/2005	1145	--	--	--	--	--	--	--	--	E .04	3	--	1.4	--	.14
24	5/5/2005	1215	--	--	--	--	--	--	--	--	<.04	<2	--	<.40	--	<.08
24	8/2/2005	1115	--	--	--	--	--	--	--	--	E .03	E1	--	1.4	--	.11
25	5/12/2005	1030	--	--	--	--	--	--	--	--	.07	4	--	1.5	--	.13
25	6/1/2005	1000	--	--	--	--	--	--	--	--	E .04	9	--	4.3	--	.10
25	8/11/2005	1200	--	--	--	--	--	--	--	--	.15	E2	--	2.0	--	.10

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Lithium (µg/L)	Manganese (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Uranium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
2	5/3/2005	1030	--	--	--	--	--	4.64	--	--	--	--	--	--	5.8
2	8/1/2005	0930	--	--	--	--	--	5.08	--	--	--	--	--	--	9.3
2	12/6/2005	0930	--	--	15.2	24.9	2.2	2.67	0.51	<0.20	566	<0.04	1.27	0.98	11
2	12/14/2006	1030	--	--	5.0	25.8	1.0	1.40	.31	<.10	446	<.04	1.60	.59	4.0
6	5/3/2005	1400	--	--	--	--	--	4.44	--	--	--	--	--	--	33
6	8/1/2005	1345	--	--	--	--	--	4.77	--	--	--	--	--	--	31
6	12/5/2005	1130	--	--	22.6	70.6	10	2.96	.76	<.20	375	<.04	.63	1.10	35
6	12/14/2006	1230	--	--	6.0	20.2	1.0	.79	.25	<.10	176	<.04	.51	.30	9.9
7	5/3/2005	1200	--	--	--	--	--	5.59	--	--	--	--	--	--	16
7	5/13/2005	0000	5/13/2005	0930	--	--	--	4.22	--	--	--	--	--	--	30
7	5/13/2005	0930	5/13/2005	1800	--	--	--	2.97	--	--	--	--	--	--	5.3
7	6/1/2005	0100	6/1/2005	1400	--	--	--	3.30	--	--	--	--	--	--	9.2
7	7/3/2005	1030	7/4/2005	0600	--	--	--	2.29	--	--	--	--	--	--	3.8
17	7/3/2005	1031	7/4/2005	0601	--	--	--	2.24	--	--	--	--	--	--	3.3
7	7/26/2005	2230	7/27/2005	0445	--	--	--	3.19	--	--	--	--	--	--	13
7	8/1/2005	1045	--	--	--	--	--	5.01	--	--	--	--	--	--	20
7	12/15/2006	1430	--	--	11.7	31.0	2.1	1.90	.53	<.10	482	<.04	1.51	.82	14
8	5/3/2005	1330	--	--	--	--	--	4.87	--	--	--	--	--	--	18
8	8/1/2005	1200	--	--	--	--	--	5.13	--	--	--	--	--	--	20
9	5/4/2005	1000	--	--	--	--	--	5.39	--	--	--	--	--	--	13
9	8/1/2005	1300	--	--	--	--	--	5.03	--	--	--	--	--	--	10
19	8/1/2005	1301	--	--	--	--	--	5.19	--	--	--	--	--	--	9.7
11	5/10/2005	0945	--	--	--	--	--	4.57	--	--	--	--	--	--	1.9
11	8/3/2005	0900	--	--	--	--	--	2.00	--	--	--	--	--	--	.90

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued

[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Lithium (µg/L)	Manganese (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Uranium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
13	5/10/2005	1045	--	--	--	--	--	2.27	--	--	--	--	--	--	6.5
13	5/10/2005	1046	--	--	--	--	--	5.83	--	--	--	--	--	--	5.3
13	5/12/2005	2315	5/13/2005	0430	--	--	--	1.01	--	--	--	--	--	--	5.4
13	5/13/2005	0430	5/13/2005	1130	--	--	--	1.18	--	--	--	--	--	--	6.2
13	5/31/2005	2315	6/1/2005	0900	--	--	--	2.07	--	--	--	--	--	--	8.4
13	6/30/2005	1000	6/30/2005	2000	--	--	--	2.19	--	--	--	--	--	--	5.1
13	7/26/2005	1730	7/26/2005	2015	--	--	--	1.25	--	--	--	--	--	--	4.2
13	8/3/2005	0945	--	--	--	--	--	2.89	--	--	--	--	--	--	2.1
13	12/7/2005	0930	--	--	12.4	454	1.6	3.57	0.36	<0.20	427	<0.04	0.91	0.60	4.1
13	12/14/2006	1330	--	--	29.5	218	2.9	1.50	1.1	<.10	411	<.04	1.62	.87	2.3
14	5/10/2005	1200	--	--	--	--	--	4.71	--	--	--	--	--	--	5.2
14	8/3/2005	1030	--	--	--	--	--	3.21	--	--	--	--	--	--	1.4
15	5/10/2005	1230	--	--	--	--	--	5.30	--	--	--	--	--	--	13
15	8/3/2005	1100	--	--	--	--	--	2.26	--	--	--	--	--	--	1.2
16	5/11/2005	1030	--	--	--	--	--	5.95	--	--	--	--	--	--	5.5
16	5/12/2005	2300	5/13/2005	0500	--	--	--	2.58	--	--	--	--	--	--	4.7
16	5/13/2005	0500	5/13/2005	1100	--	--	--	1.66	--	--	--	--	--	--	4.1
16	5/31/2005	2315	6/1/2005	0920	--	--	--	3.31	--	--	--	--	--	--	7.2
16	6/30/2005	0930	6/30/2005	2100	--	--	--	3.01	--	--	--	--	--	--	5.0
16	7/26/2005	1715	7/26/2005	2030	--	--	--	2.58	--	--	--	--	--	--	3.5
16	8/11/2005	0930	--	--	--	--	--	3.33	--	--	--	--	--	--	2.0
16	12/7/2005	1130	--	--	6.7	609	1.5	2.89	.26	<20	238	<.04	.38	1.2	8.5
16	12/15/2006	1230	--	--	22.0	440	2.0	1.70	.56	<20	666	<.08	1.1	.78	7.5
17	5/11/2005	1115	--	--	--	--	--	4.58	--	--	--	--	--	--	3.0
17	8/11/2005	1015	--	--	--	--	--	3.15	--	--	--	--	--	--	7.8

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Lithium (µg/L)	Manganese (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Uranium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
18	5/11/2005	1300	--	--	--	--	--	5.47	--	--	--	--	--	--	3.3
18	8/11/2005	1045	--	--	--	--	--	4.55	--	--	--	--	--	--	1.5
19	5/11/2005	1200	--	--	--	--	--	5.33	--	--	--	--	--	--	4.1
19	5/13/2005	1045	--	--	--	--	--	2.15	--	--	--	--	--	--	8.2
19	5/13/2005	1046	--	--	--	--	--	2.09	--	--	--	--	--	--	8.4
19	6/1/2005	1045	--	--	--	--	--	1.58	--	--	--	--	--	--	9.9
19	7/26/2005	1720	7/26/2005	1820	--	--	--	1.26	--	--	--	--	--	--	6.4
19	7/26/2005	1721	7/26/2005	1821	--	--	--	1.22	--	--	--	--	--	--	4.0
19	8/3/2005	1200	--	--	--	--	--	5.75	--	--	--	--	--	--	2.8
19	8/3/2005	1201	--	--	--	--	--	5.74	--	--	--	--	--	--	3.8
19	8/12/2005	1750	8/13/2005	0715	--	--	--	1.35	--	--	--	--	--	--	4.9
19	12/13/2005	1100	--	--	6.9	257	2.3	3.80	0.53	<0.20	536	<0.04	1.7	0.60	4.6
219	12/18/2006	1015	--	--	<.60	.40	.10	.070	<.08	<.10	<.04	<.04	<.04	<.04	.85
19	12/18/2006	1030	--	--	17.9	298	2.0	1.70	.96	<.10	535	<.04	1.5	.54	4.1
19	12/18/2006	1031	--	--	17.6	294	2.0	1.60	.97	<.10	537	<.04	1.5	.52	3.4
20	5/12/2005	0930	--	--	--	--	--	5.80	--	--	--	--	--	--	3.0
20	8/11/2005	1115	--	--	--	--	--	6.49	--	--	--	--	--	--	1.5
21	5/4/2005	1045	--	--	--	--	--	6.01	--	--	--	--	--	--	13
21	8/2/2005	0845	--	--	--	--	--	4.93	--	--	--	--	--	--	6.9
22	5/4/2005	1145	--	--	--	--	--	6.50	--	--	--	--	--	--	10
22	5/13/2005	1300	--	--	--	--	--	1.87	--	--	--	--	--	--	3.2
22	5/13/2005	1300	5/13/2005	2045	--	--	--	2.94	--	--	--	--	--	--	2.6
22	6/1/2005	1630	--	--	--	--	--	3.21	--	--	--	--	--	--	5.8
22	7/4/2005	0115	7/4/2005	1000	--	--	--	3.10	--	--	--	--	--	--	5.0
22	7/26/2005	2300	7/27/2005	0930	--	--	--	4.05	--	--	--	--	--	--	12
22	8/2/2005	0930	--	--	--	--	--	5.08	--	--	--	--	--	--	5.3
22	12/13/2005	0930	--	--	17.6	176	4.3	3.36	.51	<.20	488	<.04	1.1	1.10	15
22	12/15/2006	1100	--	--	12.3	69	2.3	2.00	.57	<.10	508	<.04	1.8	.91	12

Table 9. Concentrations of selected major ions and trace metals in samples collected between May 2005 and December 2006.—Continued[CaCO₃, calcium carbonate; mg/L, milligrams per liter; µg/L, micrograms per liter; --, no data or not applicable; <, less than; unless noted, all concentrations from filtered samples]

Site number (fig. 1)	Start date	Start time	End date	End time	Lithium (µg/L)	Manganese (µg/L)	Molybdenum (µg/L)	Nickel (µg/L)	Selenium (µg/L)	Silver (µg/L)	Strontium (µg/L)	Thallium (µg/L)	Uranium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
23	5/5/2005	1030	--	--	--	--	--	6.57	--	--	--	--	--	--	8.3
23	5/5/2005	1031	--	--	--	--	--	6.65	--	--	--	--	--	--	9.9
23	8/2/2005	1030	--	--	--	--	--	4.75	--	--	--	--	--	--	4.2
24	5/5/2005	1145	--	--	--	--	--	6.54	--	--	--	--	--	--	7.3
24	5/5/2005	1215	--	--	--	--	--	E.04	--	--	--	--	--	--	<.60
24	8/2/2005	1115	--	--	--	--	--	4.65	--	--	--	--	--	--	3.6
25	5/12/2005	1030	--	--	--	--	--	9.12	--	--	--	--	--	--	12
25	6/1/2005	1000	--	--	--	--	--	1.62	--	--	--	--	--	--	2.2
25	8/11/2005	1200	--	--	--	--	--	12.2	--	--	--	--	--	--	6.0

¹Replicate samples.²Field equipment blank.

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	1,4-Dichloro-benzene	1-Methyl-naphthalene	2,6-Dimethyl-naphthalene	2-Methyl-naphthalene	2,2',4,4'-Tetrabromo-diphenyl ether	3-tert-Butyl-4-hydroxyanisole (BHA)	3,4-Dichloro-phenyl isocyanate	3-beta-Coprostanol	3-Methyl-1H-indole (skatol)
Whole-water samples											
2	5/3/2005	1030	<0.5	<0.5	<0.5	<0.5	<0.5	<5	E 10	<2.0	<1
2	8/1/2005	0930	<5	<5	<5	<5	<5	<5	E 3.0	<2.0	<1
2	10/6/2005	0940	<5	<5	<5	<5	<5	--	E 2.7	<2.0	<1
2	3/29/2006	1045	<5	<5	<5	<5	<5	--	<5	<2.0	<1
2	11/1/2006	1330	<2	E .01	E .01	<2	--	<2	<2.0	--	<2
2	3/7/2007	1400	<2	<2	<2	<2	<2	<2	<2.0	<1.6	<2
6	5/3/2005	1400	E .02	<5	<5	<5	<5	<5	E 32	E 1.4	<1
6	8/1/2005	1345	E .06	<5	<5	<5	<5	<5	E 13	2.6	<1
6	10/11/2005	1000	<5	<5	<5	<5	<5	<5	<50	<2.0	<1
6	10/11/2005	1130	<5	<5	<5	<5	<5	--	E 1.8	8.3	E .04
6	10/11/2005	1131	<5	<5	<5	<5	<5	--	<50	E 1.2	<1
6	3/29/2006	0945	<5	<5	<5	<5	<5	--	E .93	3.3	<1
6	3/29/2006	0946	<5	<5	<5	<5	<5	--	E .57	E 1.7	<1
6	11/1/2006	1200	<2	<2	<2	<2	--	<2	<2.0	E 5.3	<2
6	3/7/2007	1315	<2	<2	<2	<2	<2	<2	E .49	E 4.3	<2
7	5/3/2005	1200	<5	<5	<5	<5	<5	<5	E 46	E 1.0	<1
7	8/1/2005	1045	<5	<5	<5	<5	<5	<5	E 15	E 1.2	<1
7	10/6/2005	1245	<5	<5	<5	<5	<5	--	E 1.5	E .64	<1
7	3/29/2006	1230	<5	<5	<5	<5	<5	--	E .79	E .87	<1
7	11/2/2006	1215	<2	<2	<2	<2	--	<2	<2.0	--	<2
7	3/8/2007	1230	<2	<2	<2	<2	<2	<2	<2.0	E 1.2	<2
13	5/10/2005	1045	<5	<5	<5	<5	<5	<5	E 10	E .26	<1
13	5/10/2005	1046	<5	<5	<5	<5	<5	<5	E 7.7	<2.0	<1
13	8/3/2005	0945	<5	<5	<5	<5	<5	<5	<50	<2.0	<1
13	10/13/2005	0945	<5	<5	<5	<5	<5	--	<50	<2.0	<1
13	3/30/2006	0945	<5	<5	<5	<5	<5	--	E .51	<2.0	<1
13	11/1/2006	1015	<2	<2	<2	<2	<2	<2	<2.0	--	<2
13	12/14/2006	1330	<2	<2	<2	<2	<2	<2	<2.0	<.80	<2
13	3/7/2007	1130	<2	<2	<2	<2	<2	<2	<2.0	<1.6	<2

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	1,4-Dichloro-benzene	1-Methyl-naphthalene	2,6-Dimethyl-naphthalene	2-Methyl-naphthalene	2,2',4,4'-Tetrabromo-diphenyl ether	3-tert-Butyl-4-hydroxyanisole (BHA)	3,4-Dichloro-phenyl isocyanate	3-beta-Coprostanol	3-Methyl-1H-indole (skatol)
Whole-water samples—Continued											
15	8/3/2005	1100	<0.5	<0.5	<0.5	<0.5	<0.5	<5	<0.50	<2.0	<1
16	5/11/2005	1030	<.5	<.5	<.5	<.5	<.5	<.5	E 1.0	E.44	<1
16	8/11/2005	0930	E .04	<.5	<.5	<.5	<.5	<.5	<.50	<2.0	<1
16	10/13/2005	1045	<.5	<.5	<.5	E .01	<.5	--	<.50	<2.0	<1
16	3/30/2006	1100	<.5	<.5	<.5	<.5	<.5	--	E 1.5	<2.0	<1
16	10/31/2006	1245	E .01	<2	<2	<2	--	<0.2	<2.0	--	<2
16	12/15/2006	1230	<2	E .01	<2	E .01	--	<2	<2.0	<80	E .01
16	1/29/2007	1201	E 4	E 4	E 4	E 4	E .07	E 2	E 1.7	18.0	4
16	1/29/2007	1206	E 4	E 4	E 4	E 4	<2	E 3	E 2.3	16.0	4
16	3/7/2007	1045	<2	<2	<2	<2	<2	<2	<2.0	E 1.7	<2
19	10/12/2005	1100	E .08	<.5	<.5	<.5	<.5	--	<.50	<2.0	<1
19	12/13/2005	1100	E .3	E .02	E .01	E .03	<.5	--	E .31	E .65	E .09
19	3/30/2006	1245	E .1	<.5	<.5	<.5	<.5	--	E .38	E .84	E .04
19	10/31/2006	1045	E .07	<2	<2	<2	--	<2	<2.0	E 17	E .08
² 19	10/31/2006	1046	E .08	<2	<2	<2	--	<2	<2.0	E 14	E .09
19	12/18/2006	1015	<2	<2	<2	<2	--	<2	<2.0	<80	<2
19	3/7/2007	0945	E .06	<2	<2	<2	<2	<2	E .46	E 4.5	E .05
19	6/20/2007	1001	E .4	E .4	E .3	E .4	E .08	E 2	E 1.5	E 1.6	E .3
² 19	6/20/2007	1002	E 1	E 1	E 1	E 1	E .2	E .7	--	E 5.3	1
22	5/4/2005	1145	<.5	<.5	<.5	<.5	<.5	<.5	E 16	<2.0	<1
22	8/2/2005	0930	E .02	<.5	<.5	<.5	<.5	<.5	E 12	<2.0	<1
22	10/6/2005	1120	<.5	E .03	<.5	E .03	<.5	--	E 2.2	<2.0	<1
22	3/29/2006	1400	E .03	E .02	<.5	E .02	<.5	--	E .80	E .48	<1
22	11/2/2006	1015	<2	E .01	<2	E .01	--	<2	<2.0		<2
22	3/8/2007	1000	<2	<2	<2	<2	<2	<2	<2.0	E 1.4	<2
² 22	3/8/2007	1001	<2	<2	<2	<2	<2	<2	<2.0	E 1.0	<2
22	3/8/2007	1026	E 2	E 2	E 2	E 2	<2	<2	E 2.7	E 8.0	1
26	8/30/2006	1115	E .03	<2	<2	<2	<2	<2	--	<80	<2
Bottom sediment sample											
26	8/30/2006	1200	<115	E 40	200	E 60	--	<345	--	<1,200	E 90

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	4-Cumylphenol	4-n-Octylphenol	4-Nonylphenol	4-tert-Octylphenol	5-Methyl-1H- benzo-triazole	Acetophenone	hexamethyltetra- hydronaphthalene (AHTN)	Anthracene
Whole-water samples										
2	5/3/2005	1030	<1	<1	<5.0	<1	<2.0	<0.5	E 0.04	<0.5
2	8/1/2005	0930	<1	<1	<5.0	<1	E.16	<5	E.1	<5
2	10/6/2005	0940	<1	<1	<5.0	<1	<2.0	<5	<5	<5
2	3/29/2006	1045	<1	<1	<5.0	<1	<2.0	<5	E.2	<5
2	11/1/2006	1330	E.03	<2	E.23	<2	<1.6	<2	.2	E.01
2	3/7/2007	1400	<2	<2	<1.6	<2	<1.6	<2	<2	<2
6	5/3/2005	1400	<1	<1	E.52	<1	E 2.6	<5	E.3	<5
6	8/1/2005	1345	<1	<1	E.59	<1	E.38	<5	E.3	<5
16	10/11/2005	1000	<1	<1	<5.0	<1	<2.0	<5	<5	<5
6	10/11/2005	1130	<1	<1	E 1.5	E.2	<2.0	<5	.6	<5
26	10/11/2005	1131	<1	<1	E.55	<1	<2.0	<5	E.1	<5
6	3/29/2006	0945	<1	<1	E.91	<1	<2.0	E.2	.5	<5
26	3/29/2006	0946	<1	<1	E.59	<1	<2.0	<5	E.4	<5
6	11/1/2006	1200	<2	<2	E 1.2	<2	E.52	E.1	.6	<2
6	3/7/2007	1315	<2	<2	E.56	<2	<1.6	<2	E.08	<2
7	5/3/2005	1200	<1	<1	E.46	<1	E.87	<5	E.2	<5
7	8/1/2005	1045	<1	<1	E.26	<1	E.37	<5	E.2	<5
7	10/6/2005	1245	<1	<1	<5.0	<1	E.28	<5	E.2	<5
7	3/29/2006	1230	<1	<1	E.47	<1	<2.0	<5	E.3	<5
7	11/2/2006	1215	<2	<2	E.39	<2	<1.6	<2	.4	<2
7	3/8/2007	1230	<2	<2	<1.6	<2	<1.6	<2	<2	<2
13	5/10/2005	1045	<1	<1	<5.0	<1	E.61	<5	<5	<5
213	5/10/2005	1046	<1	<1	<5.0	<1	E.49	<5	<5	<5
13	8/3/2005	0945	<1	<1	<5.0	<1	E.10	<5	<5	<5
13	10/13/2005	0945	<1	<1	<5.0	<1	<2.0	<5	<5	<5
13	3/30/2006	0945	<1	<1	<5.0	<1	<2.0	<5	<5	<5
13	11/1/2006	1015	<2	<2	<1.6	<2	<1.6	<2	<2	<2
13	12/14/2006	1330	<2	<2	<1.6	<2	<1.6	<2	<2	<2
13	3/7/2007	1130	<2	<2	<1.6	<2	<1.6	<2	<2	<2

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	4-Cumylphenol	4-n-Octylphenol	4-Nonylphenol	4-tert-Octylphenol	5-Methyl-1H- benzo-triazole	Acetophenone	Acetyl- hexamethyltetra- hydronaphtha- lene (AHTN)	Anthracene
Whole-water samples—Continued										
15	8/3/2005	1100	<1	<1	<5.0	<1	E 0.31	<0.5	<0.5	<0.5
16	5/11/2005	1030	<1	<1	<5.0	<1	E .61	<5	E .03	<.5
16	8/11/2005	0930	<1	<1	<5.0	<1	E .23	<5	<.5	E .04
16	10/13/2005	1045	<1	<1	<5.0	<1	<2.0	<5	<.5	<.5
16	3/30/2006	1100	<1	<1	<5.0	<1	E 1.6	<5	E .03	<.5
16	10/31/2006	1245	<2	<2	E .17	<2	<1.6	<2	E .03	<2
16	12/15/2006	1230	<2	<2	<1.6	<2	<1.6	<2	<2	<2
16	1/29/2007	1201	4	4	E 38	5	E 47	5	5	4
16	1/29/2007	1206	4	4	E 38	5	E 45	4	5	4
16	3/7/2007	1045	<2	<2	<1.6	<2	<1.6	<2	<2	<2
19	10/12/2005	1100	<1	<1	<5.0	<1	<2.0	<5	E .08	<.5
19	12/13/2005	1100	<1	<1	E 2.6	E .3	E .76	<5	E .4	<.5
19	3/30/2006	1245	<1	<1	E 1.1	<1	<2.0	E .2	E .2	<.5
19	10/31/2006	1045	<2	<2	E 1.9	<2	<1.6	E .2	1	<2
219	10/31/2006	1046	<2	<2	E 1.7	<2	<1.6	E .2	1	<2
19	12/18/2006	1015	<2	<2	<1.6	<2	<1.6	<2	<2	<2
19	3/7/2007	0945	<2	E .05	E .72	<2	<1.6	<2	E .1	E .02
19	6/20/2007	1001	E .4	E .4	E 3.4	E .4	E 3.1	E .4	E .4	E .3
219	6/20/2007	1002	1	1	E 13	2	E 16	1	2	1
22	5/4/2005	1145	<1	<1	<5.0	<1	E .47	<5	<.5	<.5
22	8/2/2005	0930	<1	<1	<5.0	<1	E .29	<5	E .05	<.5
22	10/6/2005	1120	<1	<1	<5.0	<1	<2.0	<5	E .08	E .05
22	3/29/2006	1400	<1	<1	E .45	<1	<2.0	<5	E .2	<.5
22	11/2/2006	1015	<2	<2	<1.6	<2	<1.6	<2	E .2	<2
22	3/8/2007	1000	<2	<2	<1.6	<2	<1.6	<2	<2	E .02
22	3/8/2007	1001	<2	<2	<1.6	<2	<1.6	<2	<2	<2
22	3/8/2007	1026	2	1	E 17	3	E 23	2	2	2
26	8/30/2006	1115	<2	<2	<1.6	<2	<1.6	<2	<2	<2
Bottom sediment sample										
26	8/30/2006	1200	<115	<115	780	<115	--	<345	<115	254

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Anthra- quinone	Atrazine	Benzo[a] pyrene	Benzo- phenone	Bis(2-ethylhex- yl) phthalate	Bisphenol A	Bromacil	Caffeine	Camphor	Carbaryl
Whole-water samples												
2	5/3/2005	1030	<0.5	E .01	<0.5	E 0.03	<2	<1	<0.5	<0.5	<0.5	<1
2	8/1/2005	0930	E .08	E .05	<5	E .05	<2	<1	<5	E .05	<5	<1
2	10/6/2005	0940	<5	E .07	<5	E .04	<2	<1	<5	<5	<5	<1
2	3/29/2006	1045	<5	<5	<5	<5	<2	<1	<5	<5	<5	<1
2	11/1/2006	1330	E .09	E .04	E .03	E .08	<2	<4	E .5	E .07	<2	<2
2	3/7/2007	1400	<2	<2	E .08	<2	<2	<4	<2	<2	<2	<2
6	5/3/2005	1400	E .08	E .1	<5	E .1	<2	<1	<5	.79	<5	<1
6	8/1/2005	1345	<5	E .2	<5	E .2	<2	<1	<5	1.20	E .02	<1
6	10/11/2005	1000	<5	<5	<5	<5	<2	<1	<5	<5	<5	<1
6	10/11/2005	1130	<5	E .08	<5	E .3	<2	<1	<5	3.00	E .05	<1
6	10/11/2005	1131	<5	<5	<5	E .08	<2	<1	<5	E 1.50	<5	<1
6	3/29/2006	0945	E .2	<5	<5	<5	<2	E .1	<5	2.56	<5	<1
6	3/29/2006	0946	E .2	<5	<5	<5	<2	E .08	<5	1.64	<5	<1
6	11/1/2006	1200	<2	E .05	<2	E .2	<2	<4	<2	3.32	E .05	E .12
6	3/7/2007	1315	<2	<2	<2	E .09	<2	<4	<2	2.32	<2	<2
7	5/3/2005	1200	E .09	E .2	<5	E .1	<2	E .03	<5	.60	<5	<1
7	8/1/2005	1045	E .1	E .1	<5	E .09	<2	<1	<5	E .38	<5	<1
7	10/6/2005	1245	<5	E .05	<5	E .1	<2	<1	<5	E .46	<5	<1
7	3/29/2006	1230	E .2	<5	<5	<5	2	<1	<5	.82	<5	<1
7	11/2/2006	1215	<2	E .03	<2	E .1	E 1	<4	<2	1.11	E .02	<2
7	3/8/2007	1230	<2	<2	<2	<2	<2	<4	<2	.60	<2	<2
13	5/10/2005	1045	E .1	E .3	<5	<5	<2	<1	<5	.57	E .06	<1
13	5/10/2005	1046	E .1	E .2	<5	<5	<2	<1	<5	E .41	E .04	<1
13	8/3/2005	0945	E .1	E .1	<5	<5	<2	<1	E .2	E .04	E .02	<1
13	10/13/2005	0945	<5	<5	<5	<5	<2	<1	<5	E .04	<5	<1
13	3/30/2006	0945	E .1	<5	<5	<5	<2	<1	<5	E .14	<5	<1
13	11/1/2006	1015	<2	<2	<2	<2	<2	<4	<2	E .07	E .03	<2
13	12/14/2006	1330	<2	<2	<2	<2	<2	<4	<2	E .04	<2	<2
13	3/7/2007	1130	<2	<2	<2	<2	<2	<4	<2	.38	<2	<2

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Anthra- quinone	Atrazine	Benzof[a] pyrene	Benzo- phenone	Bis(2- ethylhexyl) phthalate	Bisphenol A	Bromacil	Caffeine	Camphor	Carbaryl
Whole-water samples—Continued												
15	8/3/2005	1100	<0.5	E 0.03	<0.5	<0.5	<2	E 0.05	E 0.5	0.53	E 0.02	<1
16	5/11/2005	1030	E .2	E .3	E .02	E .03	<2	E .1	E .2	1.2	E .02	<1
16	8/11/2005	0930	E .1	E .06	<.5	<.5	<2	E .06	E .3	E .13	E .04	<1
16	10/13/2005	1045	<.5	<.5	<.5	<.5	<2	<1	<.5	E .30	E .02	<1
16	3/30/2006	1100	E .3	<.5	E .03	<.5	<2	E .3	<.5	1.5	<.5	<1
16	10/31/2006	1245	E .08	E .03	<2	<2	E .9	<.4	<2	.43	<2	<2
16	12/15/2006	1230	<2	<2	<2	<2	<2	E .06	<2	.58	<2	<2
16	1/29/2007	1201	4	4	4	4	4	5	E 20	4.2	5.0	E 4
16	1/29/2007	1206	4	4	4	4	4	5	E 20	3.9	4.0	E 4
16	3/7/2007	1045	<2	<2	<2	E .2	<2	<.4	<2	2.6	<2	<2
19	10/12/2005	1100	<.5	<.5	<.5	<.5	<2	<1	<.5	<.50	<.5	<1
19	12/13/2005	1100	E .2	E .03	E .04	E .06	<2	E .2	<.5	1.0	E .06	<1
19	3/30/2006	1245	E .1	<.5	E .03	<.5	<2	<1	<.5	1.2	<.5	<1
19	10/31/2006	1045	<2	<2	<2	0.4	E 2	E .2	<2	6.6	.6	<.3
² 19	10/31/2006	1046	<2	<2	<2	0.3	E 1	E .2	<2	4.8	.5	<2
19	12/18/2006	1015	<2	<2	<2	<2	<2	<.4	<2	<.20	<2	<2
19	3/7/2007	0945	<2	<2	<2	E .1	<2	E .1	<2	4.1	<2	<2
19	6/20/2007	1001	E .4	E .4	E .4	E 4	E 0	E .4	E 2	E .31	E .4	E .3
² 19	6/20/2007	1002	1	1	1	2	<2	2	6	1.1	1.4	E 1
22	5/4/2005	1145	<.5	E .2	<.5	E .03	<2	<1	<.5	E .35	<.5	<1
22	8/2/2005	0930	E .1	E .08	E .03	E .04	<2	E .05	<.5	E .25	<.5	<1
22	10/6/2005	1120	<.5	<.5	<.5	E .06	<2	E .06	<.5	E .28	E .02	<1
22	3/29/2006	1400	E .2	E .09	<.5	<.5	<2	E .2	<.5	.62	<.5	<1
22	11/2/2006	1015	<2	E .02	<2	E .08	<2	<.4	<2	.91	<2	<2
22	3/8/2007	1000	<2	<2	E .05	<2	<2	E .1	<2	1.2	<2	<2
² 22	3/8/2007	1001	<2	<2	<2	<2	<2	E .1	<2	1.0	<2	<2
22	3/8/2007	1026	2	E 1	1	3	E 1	3	E 10	3.0	2.3	E 2
26	8/30/2006	1115	E .04	<2	<2	E .05	<2	E .2	<2	E .11	<2	<2
Bottom sediment sample												
26	8/30/2006	1200	644	230	1,040	<115	2,090	<115	<1,150	--	<115	--

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Carbazole	Chlorpyrifos	Cholesterol	Cotinine	Diazinon	Dichlorvos	Diethyl phthalate	d-Limonene
Whole-water samples										
2	5/3/2005	1030	<.5	<.5	<2	<1	<.5	<1	<.5	<.5
2	8/1/2005	0930	<.5	<.5	E.36	E.03	<.5	<1	<.5	<.5
2	10/6/2005	0940	<.5	<.5	<2	<1	<.5	<1	<.5	<.5
2	3/29/2006	1045	<.5	<.5	E.80	<1	<.5	<1	<.5	<.5
2	11/1/2006	1330	E.02	E.02	--	E.3	<2	E.05	<2	<2
2	3/7/2007	1400	<2	<2	E 1.1	<.8	<2	<2	<2	<2
6	5/3/2005	1400	<.5	<.5	E 2.5	E.05	<.5	<1	<.5	<.5
6	8/1/2005	1345	<.5	<.5	3.4	E.08	<.5	<1	<.5	<.5
16	10/11/2005	1000	<.5	<.5	<2	<1	<.5	<1	<.5	<.5
6	10/11/2005	1130	<.5	<.5	12	E.1	<.5	<1	<.5	<.5
26	10/11/2005	1131	<.5	<.5	E 2.9	<1	<.5	<1	<.5	<.5
6	3/29/2006	0945	E.03	<.5	5.4	E.3	<.5	<1	E.3	<.5
26	3/29/2006	0946	E.03	<.5	2.6	E.3	<.5	<1	<.5	<.5
6	11/1/2006	1200	<2	<2	E 7.1	E.3	<2	E.2	.3	<2
6	3/7/2007	1315	<2	<2	E 6.1	E.1	<2	<2	.3	<2
7	5/3/2005	1200	E.02	<.5	E 1.9	E.06	<.5	<1	<.5	<.5
7	8/1/2005	1045	<.5	<.5	E 1.9	E.06	E.03	<1	<.5	<.5
7	10/6/2005	1245	<.5	<.5	E 1.2	<1	<.5	<1	<.5	<.5
7	3/29/2006	1230	<.5	<.5	2.2	<1	<.5	<1	<.5	<.5
7	11/2/2006	1215	<2	<2	--	E.3	<2	E.1	E.1	<2
7	3/8/2007	1230	<2	<2	E 2.0	<.8	<2	<2	E.08	<2
13	5/10/2005	1045	<.5	<.5	E.56	E.06	<.5	<1	<.5	<.5
213	5/10/2005	1046	<.5	<.5	E.51	E.04	<.5	<1	<.5	<.5
13	8/3/2005	0945	E.01	<.5	E.63	<1	<.5	<1	<.5	<.5
13	10/13/2005	0945	<.5	<.5	E.64	<1	<.5	<1	<.5	<.5
13	3/30/2006	0945	E.02	<.5	<2.0	<1	<.5	<1	<.5	<.5
13	11/1/2006	1015	<2	<2	--	<.8	<2	<2	<2	<2
13	12/14/2006	1330	<2	<2	<.80	<.8	<2	<2	<2	<2
13	3/7/2007	1130	<2	<2	<.80	<.8	<2	<2	<2	<2

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Carbazole	Chlorpyrifos	Cholesterol	Cotinine	Diazinon	Dichlorvos	Diethyl phthalate	d-Limonene
Whole-water samples—Continued										
15	8/3/2005	1100	E 0.02	<0.5	E 1.4	E 0.04	<0.5	<1	<0.5	<0.5
16	5/11/2005	1030	E .05	<.5	4.2	E .10	<.5	<1	<.5	<.5
16	8/11/2005	0930	E .04	<.5	E 1.5	E .04	<.5	<1	<.5	<.5
16	10/13/2005	1045	<.5	<.5	<2.0	<1	<.5	<1	<.5	<.5
16	3/30/2006	1100	E .05	<.5	E 1.7	<1	<.5	<1	<.5	<.5
16	10/31/2006	1245	E .02	<.2	--	<.8	<.2	E .1	E .2	<.2
16	12/15/2006	1230	<.2	<.2	<.80	<.8	<.2	<.2	<.2	<.2
16	1/29/2007	1201	4	4	E 16	E 10	4	E 4	5	E 4
16	1/29/2007	1206	4	4	E 15	E 10	4	E 4	5	E 4
16	3/7/2007	1045	<.2	<.2	E 2.8	<.8	<.2	<.2	.4	<.2
19	10/12/2005	1100	<.5	<.5	<2.0	<1	<.5	<1	<.5	<.5
19	12/13/2005	1100	E .04	<.5	E 1.4	E .2	<.5	<1	<.5	E .05
19	3/30/2006	1245	E .04	<.5	E 1.4	E .3	<.5	<1	<.5	<.5
19	10/31/2006	1045	<.2	<.2	E 22	E .6	<.2	<.2	3	E .07
² 19	10/31/2006	1046	<.2	<.2	E 19	E .7	<.2	<.2	3	E .06
19	12/18/2006	1015	<.2	<.2	<.80	<.8	<.2	<.2	<.2	<.2
19	3/7/2007	0945	E .06	<.2	E 5.2	E .3	<.2	<.2	.6	<.2
19	6/20/2007	1001	E .4	E .4	E 1.6	E .8	E .3	E .3	E .4	E .3
² 19	6/20/2007	1002	1	1	E 4.5	E .3	1	E 2	2	E .7
22	5/4/2005	1145	<.5	<.5	E .49	E .04	<.5	<1	<.5	<.5
22	8/2/2005	0930	E .02	<.5	E .51	E .05	<.5	<1	<.5	<.5
22	10/6/2005	1120	E .03	<.5	E .50	<1	<.5	<1	<.5	<.5
22	3/29/2006	1400	E .05	<.5	E 1.6	<1	<.5	<1	<.5	<.5
22	11/2/2006	1015	<.2	<.2	--	E .3	<.2	E .07	E .2	<.2
22	3/8/2007	1000	<.2	<.2	E 2.1	<.8	<.2	<.2	E .2	<.2
² 22	3/8/2007	1001	<.2	<.2	E 1.4	<.8	<.2	<.2	E .1	<.2
22	3/8/2007	1026	2	2	E 8.3	E .5	2	E 2	3	E 1
26	8/30/2006	1115	<.2	<.2	1.1	<.8	<.2	<.4	.5	<.2
Bottom sediment sample										
26	8/30/2006	1200	297	< 115	< 1,130	--	< 115	--	< 230	< 115

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; < less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Hexahydro- hexamethyl-cyclo- penta-benzopyran (HHCB)						Isoquinoline	Menthol	
			Fluoranthene	Indole	Isoborneol	Isophorone	Isopropyl- benzene (cumene)				
Whole-water samples											
2	5/3/2005	1030	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.50	
2	8/1/2005	0930	E .01	E .02	<.5	<.5	<.5	<.5	<.5	<.50	
2	10/6/2005	0940	<.5	E .07	<.5	<.5	<.5	<.5	<.5	<.50	
2	3/29/2006	1045	<.5	E .07	<.5	<.5	<.5	<.5	<.5	<.50	
2	11/1/2006	1330	E .03	E .05	E .01	--	E .02	<.2	E .04	--	
2	3/7/2007	1400	.2	E .2	<.2	<.2	<.2	<.2	<.2	<.20	
6	5/3/2005	1400	E .03	E .03	<.5	<.5	<.5	<.5	<.5	E .11	
6	8/1/2005	1345	E .02	E .05	<.5	<.5	E .02	<.5	<.5	E .16	
16	10/11/2005	1000	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.50	
6	10/11/2005	1130	<.5	E .07	<.5	<.5	<.5	<.5	<.5	E .42	
26	10/11/2005	1131	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.50	
6	3/29/2006	0945	E .07	E .1	<.5	<.5	<.5	<.5	<.5	E .43	
26	3/29/2006	0946	E .05	E .08	<.5	<.5	<.5	<.5	<.5	E .27	
6	11/1/2006	1200	E .01	E .07	<.2	--	<.2	<.2	<.2	.55	
6	3/7/2007	1315	E .05	.5	<.2	<.2	<.2	<.2	<.2	.43	
7	5/3/2005	1200	E .07	E .04	<.5	<.5	<.5	<.5	<.5	E .06	
7	8/1/2005	1045	E .04	E .03	<.5	<.5	<.5	<.5	<.5	<.50	
7	10/6/2005	1245	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.50	
7	3/29/2006	1230	E .04	<.5	<.5	<.5	<.5	<.5	<.5	E .14	
7	11/2/2006	1215	E .01	<.2	<.2	<.2	<.2	<.2	<.2		
7	3/8/2007	1230	E .05	E .2	<.2	<.2	<.2	<.2	<.2	<.20	
13	5/10/2005	1045	<.5	<.5	E .04	<.5	E .03	<.5	<.5	E .06	
213	5/10/2005	1046	<.5	<.5	E .02	<.5	E .02	<.5	<.5	E .05	
13	8/3/2005	0945	E .07	<.5	<.5	<.5	E .02	<.5	<.5	<.50	
13	10/13/2005	0945	E .04	<.5	<.5	<.5	<.5	<.5	<.5	<.50	
13	3/30/2006	0945	E .06	<.5	<.5	<.5	<.5	<.5	<.5	<.50	
13	11/1/2006	1015	E .03	<.2	<.2	--	<.2	<.2	<.2	--	
13	12/14/2006	1330	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.20	
13	3/7/2007	1130	E .06	E .06	<.2	<.2	<.2	<.2	<.2	<.20	

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Fluoranthene	Hexahydro-hexamethyl- cyclopenta-benzopyran (HHCb)	Indole	Isoborneol	Isophorone	Isopropyl- benzene (cumene)	Isoquinoline	Menthol
Whole-water samples—Continued										
15	8/3/2005	1100	E .05	<.5	<.5	<.5	<.5	<.5	<.5	<.50
16	5/11/2005	1030	E .04	<.5	E .01	<.5	E .07	<.5	<.5	E .10
16	8/11/2005	0930	E .1	<.5	<.5	<.5	E .03	<.5	<.5	E .05
16	10/13/2005	1045	<.5	<.5	<.5	<.5	<.5	<.5	<.5	<.50
16	3/30/2006	1100	E .1	<.5	<.5	<.5	E .05	<.5	<.5	<.50
16	10/31/2006	1245	E .04	<.2	<.2	--	<.2	<.2	<.2	--
16	12/15/2006	1230	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.20
16	1/29/2007	1201	5	5	5	4	5	E 4	4	4.9
16	1/29/2007	1206	4	5	4	4	5	E 4	4	4.6
16	3/7/2007	1045	E .03	E .2	<.2	<.2	<.2	<.2	<.2	.45
19	10/12/2005	1100	E .03	<.5	<.5	<.5	<.5	<.5	<.5	<.50
19	12/13/2005	1100	E .09	E .07	E .02	<.5	E .03	<.5	<.5	E .20
19	3/30/2006	1245	E .1	E .08	<.5	<.5	<.5	<.5	<.5	E .11
19	10/31/2006	1045	E .03	E .1	<.2	--	E .03	<.2	<.2	E 6.5
219	10/31/2006	1046	E .03	E .1	<.2	--	E .03	<.2	<.2	E 6.2
19	12/18/2006	1015	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.20
19	3/7/2007	0945	E .06	.5	<.2	<.2	<.2	<.2	<.2	<.20
19	6/20/2007	1001	E .4	E .3	E .3	E .4	E .4	E .3	E .2	E .44
219	6/20/2007	1002	1	1	1	2	1	E .8	1	1.6
22	5/4/2005	1145	<.5	<.5	<.5	<.5	<.5	<.5	<.5	E .04
22	8/2/2005	0930	E .08	<.5	<.5	<.5	<.5	<.5	<.5	<.50
22	10/6/2005	1120	E .2	<.5	<.5	<.5	<.5	<.5	<.5	<.50
22	3/29/2006	1400	E .1	<.5	<.5	<.5	E .05	<.5	<.5	E .08
22	11/2/2006	1015	E .02	<.2	E .02	--	<.2	<.2	<.2	--
22	3/8/2007	1000	E .2	.3	<.2	<.2	<.2	<.2	<.2	<.20
22	3/8/2007	1001	E .07	.3	<.2	<.2	<.2	<.2	<.2	<.20
22	3/8/2007	1026	2	2	E .1	2	3	E 2	3	3.0
26	8/30/2006	1115	E .07	<.2	<.2	<.2	<.2	<.2	<.4	<.20
Bottom sediment sample										
26	8/30/2006	1200	4,270	<115	571	--	E 26.5	<230	<230	--

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Metalaxyl	Methyl salicylate	Metolachlor	N,N-diethyl- meta-tolamide (DEET)	Naphthalene	Nonylphenol monoethoxylate	Nonylphenol diethoxylate	Octylphenol mono- ethoxylate
Whole-water samples										
2	5/3/2005	1030	<0.5	<0.5	E 0.03	E 0.12	<0.5	<2.0	<5.0	<1
2	8/1/2005	0930	<5	<5	<5	E 1.3	<5	<2.0	<5.0	<1
2	10/6/2005	0940	<5	<5	E .06	E .050	<5	<2.0	<5.0	<1
2	3/29/2006	1045	<5	<5	<5	E .11	<5	<2.0	<5.0	<1
2	11/1/2006	1330	E .05	E .02	E .06	E .070	<2	E .47	E 1.6	E .09
2	3/7/2007	1400	<2	<2	<2	E .060	<2	<2.0	<3.2	<1
6	5/3/2005	1400	<5	<5	E .03	E .33	<5	E .75	E 1.8	E .2
6	8/1/2005	1345	<5	<5	E .06	1.2	<5	E 1.1	E 2.3	<1
16	10/11/2005	1000	<5	<5	<5	<50	<5	<2	<5.0	<1
6	10/11/2005	1130	<5	<5	E .06	.59	E .04	E 1.5	E 3.5	E .3
26	10/11/2005	1131	<5	<5	<5	E .090	<5	E .75	E 1.6	<1
6	3/29/2006	0945	<5	<5	<5	E .17	<5	E 1.0	E 2.6	<1
26	3/29/2006	0946	<5	<5	<5	E .13	<5	E .88	E 2.0	<1
6	11/1/2006	1200	<2	<2	E .03	E .18	<2	E 1.8	E 4.0	E .2
6	3/7/2007	1315	<2	<2	<2	<20	<2	E .54	E 1.3	E .08
7	5/3/2005	1200	<5	<5	E .04	E .28	<5	E .47	E 1.6	<1
7	8/1/2005	1045	<5	<5	E .05	E .38	<5	E .39	E 1.1	<1
7	10/6/2005	1245	<5	<5	<5	E .25	<5	<2.0	<5.0	<1
7	3/29/2006	1230	<5	<5	<5	E .13	<5	E .55	E 1.8	<1
7	11/2/2006	1215	<2	E .02	E .03	E .10	<2	E .39	E 1.8	<1
7	3/8/2007	1230	<2	<2	<2	<20	<2	<2.0	<3.2	<1
13	5/10/2005	1045	<5	<5	E .04	E .080	<5	<2.0	<5.0	E .2
213	5/10/2005	1046	<5	<5	E .03	E .070	<5	<2.0	<5.0	E .4
13	8/3/2005	0945	<5	<5	E .03	E .12	E .01	<2.0	<5.0	<1
13	10/13/2005	0945	<5	<5	<5	E .16	<5	<2.0	<5.0	<1
13	3/30/2006	0945	<5	<5	<5	E .080	<5	<2.0	<5.0	<1
13	11/1/2006	1015	<2	<2	<2	E .050	<2	<2.0	<3.2	<1
13	12/14/2006	1330	<2	<2	<2	<20	<2	<2.0	<3.2	<1
13	3/7/2007	1130	<2	<2	<2	<20	<2	<2.0	<3.2	<1

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Metalaxyl	Methyl salicylate	Metolachlor	n,n-diethyl-meta- toluamide (DEET)	Naphthalene	Nonylphenol monoethoxyl- ate	Nonylphenol diethoxylate	Octylphenol monoeth- oxylate
Whole-water samples—Continued										
15	8/3/2005	1100	<0.5	<0.5	<0.5	E 0.16	<0.5	<2.0	<5.0	<1
16	5/11/2005	1030			E .04	E .14				
16	8/11/2005	0930	<.5	<.5	<.5	E .18	<.5	<2.0	<5.0	E .2
16	10/13/2005	1045	<.5	<.5	<.5	E .14	E .02	<2.0	<5.0	<1
16	3/30/2006	1100	<.5	<.5	<.5	E .14	<.5	<2.0	<5.0	<1
16	10/31/2006	1245	<.2	<.2	<.2	E .060	<.2	<2.0	<3.2	<1
16	12/15/2006	1230	<.2	<.2	<.2	<.20	<.2	<2.0	<3.2	<1
16	1/29/2007	1201	4	5	4	E 5.6	E 4	E 34	E 76	E 9
16	1/29/2007	1206	4	5	4	E 5.1	E 4	E 33	E 76.3	E 7
16	3/7/2007	1045	<.2	<.2	<.2	<.20	<.2	<2.0	<3.2	<1
19	10/12/2005	1100	<.5	<.5	<.5	E .020	<.5	<2.0	<5.0	<1
19	12/13/2005	1100	<.5	E .02	<.5	E .13	E .1	E 2.1	E 2.1	E .3
19	3/30/2006	1245	<.5	<.5	<.5	E .14	E .02	E 1.2	E 1.6	<1
19	10/31/2006	1045	<.2	E .1	<.2	.47	<.2	E 4.6	E 5.6	E 1
219	10/31/2006	1046	<.2	E .1	<.2	.49	<.2	E 4.5	E 5.4	E 1
19	12/18/2006	1015	<.2	<.2	<.2	<.20	<.2	<2.0	<3.2	<1
19	3/7/2007	0945	<.2	<.2	<.2	E .12	<.2	E 0.71	E 1.8	E .1
19	6/20/2007	1001	E .4	E .4	E .4	E .40	E .4	E 2.6	E 8.5	E .7
219	6/20/2007	1002	1	2	1	1.8	E 1	E 9.1	E 28	E 2
22	5/4/2005	1145	<.5	<.5	E .03	E .16	<.5	<2.0	<5.0	<1
22	8/2/2005	0930	<.5	<.5	E .03	E .24	E .03	<2.0	<5.0	E .5
22	10/6/2005	1120	<.5	<.5	E .03	E .18	E .09	<2.0	<5.0	<1
22	3/29/2006	1400	<.5	<.5	<.5	E .15	E .08	E .64	E 1.9	<1
22	11/2/2006	1015	<.2	E .03	<.2	E .11	E .06	<2.0	<3.2	<1
22	3/8/2007	1000	<.2	<.2	<.2	E .070	<.2	<2.0	<3.2	<1
22	3/8/2007	1001	<.2	<.2	<.2	E .040	<.2	<2.0	<3.2	<1
22	3/8/2007	1026	2	1	2	E 2.9	E 2	E 14	E 34	E 3
26	8/30/2006	1115	<.2	<.2	<.2	E .13	<.2	<2.0	<3.2	<1
Bottom sediment sample										
26	8/30/2006	1200	--	--	< 115	< 230	113	< 1,150	< 2,300	--

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Octylphenol diethoxylate	para-Cresol	Pentachloro- phenol	Phenan- threne	Phenol	Prometon	Pyrene	Sitosterol	Stigma- stanol
Whole-water samples											
2	5/3/2005	1030	<1	<1	<2	<0.5	E 0.1	<0.5	<0.5	<2.0	<2
2	8/1/2005	0930	<1	<1	<2	<.5	<.5	E .05	<.5	<2.0	<2
2	10/6/2005	0940	<1	<1	<2	<.5	<.5	<.5	<.5	<2.0	<2
2	3/29/2006	1045	<1	<1	<2	E .01	<.5	<.5	<.5	<2.0	<2
2	11/1/2006	1330	<1	<2	<.8	E .02	<2	E .06	E .03	--	--
2	3/7/2007	1400	<.3	<2	<.8	E .08	<2	<2	E .2	<1.6	<0.8
6	5/3/2005	1400	E .2	<1	<2	E .02	<.5	<.5	E .02	E .93	E .3
6	8/1/2005	1345	<1	<1	<2	<.5	E .3	E .05	E .02	E 1.2	<2
6	10/11/2005	1000	<1	<1	<2	<.5	.7	<.5	<.5	<2.0	<2
6	10/11/2005	1130	E .4	<1	<2	<.5	E .3	<.5	E .04	3.7	<2
6	10/11/2005	1131	E .2	<1	<2	<.5	<.5	<.5	<.5	<2.0	<2
6	3/29/2006	0945	E .3	<1	<2	E .03	<.5	<.5	E .04	2.6	<2
6	3/29/2006	0946	E .2	<1	<2	E .02	<.5	<.5	E .02	E 1.5	<2
6	11/1/2006	1200	E .3	<2	<.8	<2	<2	<2	E .02	--	E 2.6
6	3/7/2007	1315	E .1	<2	<.8	E .03	<2	<2	E .04	E 3.1	<.8
7	5/3/2005	1200	<1	<1	<2	E .03	<.5	E .04	E .05	E .98	<2
7	8/1/2005	1045	<1	<1	<2	<.5	E .1	E .07	E .03	E .59	<2
7	10/6/2005	1245	<1	<1	<2	<.5	E .2	<.5	<.5	<2.0	<2
7	3/29/2006	1230	<1	<1	<2	E .02	<.5	<.5	E .03	E .95	<2
7	11/2/2006	1215	<1	<2	<.8	<2	<2	<2	E .01	--	--
7	3/8/2007	1230	<.3	<2	<.8	<2	<2	<2	E .05	E 1.3	<.8
13	5/10/2005	1045	E .2	<1	<2	<.5	<.5	<.5	<.5	E .77	<2
13	5/10/2005	1046	E .2	<1	<2	<.5	<.5	E .04	<.5	E .47	<2
13	8/3/2005	0945	<1	<1	<2	E .04	<.5	E .04	E .04	<2.0	<2
13	10/13/2005	0945	<1	<1	<2	E .02	E .2	<.5	E .03	<2.0	<2
13	3/30/2006	0945	<1	<1	<2	E .02	<.5	<.5	E .03	<2.0	<2
13	11/1/2006	1015	<1	<2	<.8	E .02	<2	<2	E .02	--	--
13	12/14/2006	1330	<.3	<2	<.8	<2	<2	<2	<2	<3.2	<.8
13	3/7/2007	1130	<.3	<2	<.8	E .03	<2	<2	E .04	<1.6	<.8

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Octylphenol diethoxylate	para-Cresol	Pentachloro- phenol	Phenan- threne	Phenol	Prometon	Pyrene	Sitosterol	Stigma- stanol
Whole-water samples—Continued											
15	8/3/2005	1100	<1	<1	<2	<0.5	E 0.4	E 0.06	E 0.03	E 0.91	<2
16	5/11/2005	1030	E 2	<1	E 0.1	<.5	E 1	<.5	E 0.3	E 1.7	E 8
16	8/11/2005	0930	<1	<1	<2	E 0.7	E 1	E 0.6	E 0.6	E .79	<2
16	10/13/2005	1045	<1	<1	<2	<.5	E 3	<.5	<.5	<2.0	<2
16	3/30/2006	1100	E 2	<1	E .6	E .04	<.5	<.5	E 1	E 1.4	<2
16	10/31/2006	1245	<1	<2	<.8	E .02	<2	<2	E .04	--	--
16	12/15/2006	1230	<3	<2	<.8	<2	<2	<2	<2	<3.2	<.8
16	1/29/2007	1201	E 3	5	E 20	4	4	4	4	E 15	E 20
16	1/29/2007	1206	E 3	5	E 20	4	4	4	4	E 14	E 10
16	3/7/2007	1045	<3	<2	<.8	<2	<2	<2	E 0.3	E 2.8	<.8
19	10/12/2005	1100	<1	E .07	<2	E .02	.7	<.5	E .02	<2.0	<2
19	12/13/2005	1100	E 2	<1	E 2	E .06	<.5	<.5	E .06	2.0	<2
19	3/30/2006	1245	E 2	<1	<2	E .06	<.5	<.5	E .08	<2.0	<2
19	10/31/2006	1045	E 5	E 1	<.8	E .03	E .08	<2	E 0.3	E 11	--
219	10/31/2006	1046	E 5	E 2	<.8	E .02	E 1	<2	E 0.3	E 8.0	--
19	12/18/2006	1015	<3	<2	<.8	<2	<2	<2	<2	<3.2	<.8
19	3/7/2007	0945	<3	<2	E .4	E .04	<2	<2	E .06	E 3.8	<.8
19	6/20/2007	1001	E 5	E .4	E 0	E .4	E .5	E .4	E 1	E 1.5	E 1
219	6/20/2007	1002	E 1	2	E 2	1	2	1	1	E 5.1	E 4
22	5/4/2005	1145	<1	<1	<2	<.5	<.5	E .02	<.5	<2.0	<2
22	8/2/2005	0930	<1	<1	<2	<.5	E 2	E 1	E .05	<2.0	<2
22	10/6/2005	1120	<1	<1	<2	E 1	.6	<.5	E 1	<2.0	<2
22	3/29/2006	1400	<1	<1	<2	E .06	<.5	<.5	E .07	E 1.4	<2
22	11/2/2006	1015	<1	E .03	<.8	E .01	<2	<2	E .02	--	--
22	3/8/2007	1000	<3	<2	<.8	E .06	<2	<2	E 1	E 1.6	<.8
22	3/8/2007	1001	<3	<2	<.8	E .04	<2	<2	E .07	<1.6	<.8
22	3/8/2007	1026	E 2	<2	E 9	.8	E 1	2	2	E 7.1	E 8
26	8/30/2006	1115	<3	<4	<.8	<2	<4	<2	E .04	<1.6	<2
Bottom sediment sample											
26	8/30/2006	1200	<115	71.8	--	2,020	264	<115	3,160	<711	<1,150

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Tetra- chloroethyl- ene	Tribromo- methane	Tributyl phosphate	Triclosan	Triethyl citrate	Triphenyl phosphate	Tris (2-bu- toxy-ethyl) phosphate	Tris (2-chloro-ethyl) phosphate	Tris (dichloro- isopropyl) phosphate
Whole-water samples											
2	5/3/2005	1030	<0.5	<0.5	E 0.03	<1.0	E 0.06	<0.5	<0.50	<0.50	<0.50
2	8/1/2005	0930	<5	<5	E .07	<1.0	E .03	<5	<50	E .16	E .16
2	10/6/2005	0940	<5	<5	<5	<1.0	E .03	<5	<50	E .080	<50
2	3/29/2006	1045	<5	<5	<5	<1.0	E .08	<5	<50	E .10	E .07
2	11/1/2006	1330	<4	<2	<2	E .10	E .1	E .08	<20	E .11	E .18
2	3/7/2007	1400	<4	<2	<2	<20	<2	<2	<20	<20	<20
6	5/3/2005	1400	E.01	<5	E .06	E .29	E .1	E .03	E 1.1	E .19	E .13
6	8/1/2005	1345	<5	<5	E .09	E .41	E .07	E .04	1.7	E .40	E .25
6	10/11/2005	1000	<5	<5	<5	<1.0	<5	<5	<50	<50	<50
6	10/11/2005	1130	<5	<5	E .09	E .79	E .2	<5	3.2	E .22	E .22
6	10/11/2005	1131	<5	<5	<5	E .37	E .04	<5	1.3	E .090	E .11
6	3/29/2006	0945	<5	<5	E .1	E .83	E .2	E .1	2.0	E .22	E .19
6	3/29/2006	0946	<5	<5	<5	E .52	E .1	E .09	1.3	E .15	E .15
6	11/1/2006	1200	E 0	<2	<2	E .46	E .1	E .07	.94	E .16	.22
6	3/7/2007	1315	<4	<2	<2	.52	E .07	<2	E .95	<20	<20
7	5/3/2005	1200	<5	<5	E .06	E .28	E .1	E .02	1.2	E .17	E .14
7	8/1/2005	1045	<5	<5	E .09	E .23	E .04	E .02	1.0	E .25	E .20
7	10/6/2005	1245	<5	<5	<5	E .11	E .05	<5	E .26	E .090	<50
7	3/29/2006	1230	<5	<5	<5	E .32	E .1	E .08	.73	E .15	E .12
7	11/2/2006	1215	<4	<2	<2	E .22	E .1	E .06	.54	E .10	E .15
7	3/8/2007	1230	<4	<2	<2	<20	<2	<2	<20	<20	<20
13	5/10/2005	1045	<5	<5	E .05	<1.0	<5	<5	E .43	<50	<50
13	5/10/2005	1046	<5	<5	E .04	<1.0	<5	<5	E .30	<50	<50
13	8/3/2005	0945	<5	<5	E .02	E .050	<5	<5	<50	<50	E .06
13	10/13/2005	0945	<5	<5	<5	<1.0	<5	<5	<50	E .050	<50
13	3/30/2006	0945	<5	<5	<5	<1.0	<5	<5	E .38	<50	<50
13	11/1/2006	1015	<4	<2	<2	<20	<2	<2	<20	<20	<20
13	12/14/2006	1330	<4	<2	<2	<20	<2	<2	<20	<20	<20
13	3/7/2007	1130	<4	<2	<2	<20	<2	<2	<20	<20	<20

Table 10. Concentrations of selected organic wastewater compounds in base-flow water and bottom sediment samples collected between May 2005 and June 2007.—
Continued

[All concentrations from whole-water samples in units of micrograms per liter; bottom sediment concentrations in micrograms per kilogram; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Date	Time	Tetra- chloroethyl- ene	Tribromo- methane	Tributyl phosphate	Triclosan	Triethyl citrate	Triphenyl phosphate	Tris (2-bu- toxy-ethyl) phosphate	Tris (2-chloro-ethyl) phosphate	Tris (dichloro- isopropyl) phosphate
Whole-water samples—Continued											
15	8/3/2005	1100	<0.5	<0.5	E 0.03	<1	<0.5	E 0.02	E 0.30	<0.50	E 0.080
16	5/11/2005	1030	<.5	<.5	E .04	E .060	<.5	E .02	1.0	<.50	E .060
16	8/11/2005	0930	<.5	<.5	<.5	E .050	<.5	E .03	E .24	E .060	E .090
16	10/13/2005	1045	<.5	<.5	<.5	<1.0	<.5	<.5	E .32	<.50	<.50
16	3/30/2006	1100	<.5	<.5	E .08	E .090	<.5	E .1	1.2	E .12	E .10
16	10/31/2006	1245	<.4	<.2	<.2	<.20	<.2	<.2	.30	E .040	E .13
16	12/15/2006	1230	<.4	<.2	<.2	<.20	<.2	<.2	E .28	<.20	<.20
16	1/29/2007	1201	E 2	E 4	4	5.1	4	4	E 4.3	4.1	4.1
16	1/29/2007	1206	E 3	E 4	4	5.3	4	4	E 4.0	4.2	4.1
16	3/7/2007	1045	<.4	<.2	<.2	<.20	<.2	<.2	E .67	E .12	<.20
19	10/12/2005	1100	<.5	<.5	<.5	E .060	<.5	<.5	<.50	<.50	<.50
19	12/13/2005	1100	E .01	<.5	E .05	E .31	<.5	E .05	.78	E .23	E .12
19	3/30/2006	1245	<.5	<.5	<.5	E .39	E .1	E .09	.74	E .090	E .090
19	10/31/2006	1045	<.4	<.2	<.2	E 1.0	E .2	E .09	.99	E .14	E .17
² 19	10/31/2006	1046	<.4	<.2	<.2	E .96	E .2	E .1	.81	E .12	E .19
19	12/18/2006	1015	<.4	<.2	<.2	<.20	<.2	<.2	<.20	<.20	<.20
19	3/7/2007	0945	<.4	<.2	<.2	.55	E .2	<.2	<.20	E .11	<.20
19	6/20/2007	1001	E .2	E .3	E .4	E .46	E .3	E .4	E .57	E .38	E .46
19	6/20/2007	1002	E .5	E 1	2	1.5	1	1	E 1.6	1.4	1.3
22	5/4/2005	1145	<.5	<.5	E .05	<1.0	E .06	<.5	.77	E .090	<.50
22	8/2/2005	0930	<.5	<.5	E .07	E .10	E .02	E .02	.62	E .13	E .14
22	10/6/2005	1120	<.5	<.5	E .05	E .080	E .04	<.5	E .26	E .12	E .09
22	3/29/2006	1400	<.5	<.5	E .2	E .21	E .09	E .09	.62	E .15	E .14
22	11/2/2006	1015	<.4	<.2	<.2	E .14	E .1	<.2	.47	E .090	<.20
22	3/8/2007	1000	<.4	<.2	<.2	<.20	<.2	<.2	E .78	<.20	<.20
² 22	3/8/2007	1001	<.4	<.2	<.2	<.20	<.2	<.2	E .60	<.20	<.20
22	3/8/2007	1026	E 1	E 2	E 2.73	3.0	2	2	E 2.8	2.2	2.4
26	8/30/2006	1115	<.4	<.2	E .05	<.40	<.2	E .03	E .20	<.20	<.20
Bottom sediment sample											
26	8/30/2006	1200	--	--	< 115	< 115	--	< 115	< 345	< 230	< 230

¹Field equipment blank.

²Replicate Samples.

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	1,4-Dichloro-benzene	1-Methyl-naphthalene	2,6-Dimethyl-naphthalene	2-Methyl-naphthalene	2,2',4,4'-tetrabromodiphenyl ether	3-tert-Butyl-4-hydroxyanisole (BHA)	3,4-Dichlorophenyl isocyanate	3-beta-Coprostanol
2	4/24/2006	0115	4/24/2006	1045	<0.5	<0.5	E 0.01	<0.5	<0.5	--	E 25	E 0.3
2	4/29/2006	0430	4/29/2006	0915	<5	<5	<5	<5	<5	--	E 3.6	<2
2	6/5/2006	2145	6/6/2006	0545	<5	<5	<5	<5	<5	--	E 5.9	<2
2	7/11/2006	2130	7/12/2006	0515	<5	<5	<5	<5	<5	--	E 23	<2
2	7/12/2006	0805	7/12/2006	0830	<5	<5	<5	<5	<5	--	E 4.2	<2
2	2/24/2007	1200	2/24/2007	1900	<2	<2	<2	<2	<2	<0.2	E .45	<8
2	3/30/2007	1030	3/31/2007	0130	<2	<2	<2	<2	<2	--	<2.0	<8
2	4/25/2007	1815	4/26/2007	0000	<2	<2	<2	<2	<2	<2	E 2.4	<8
2	5/7/2007	0930	--	--	<2	<2	<2	<2	<2	<2	E 1.2	<8
6	10/20/2005	0115	10/20/2005	1145	<5	<5	<5	<5	<5	--	E 1.1	<2
6	4/28/2006	1430	4/28/2006	2045	<5	E .01	<5	E .01	<5	--	E 14	E .4
6	4/29/2006	2200	4/30/2006	0525	<5	E .01	<5	E .02	<5	--	E 11	E .4
6	4/29/2006	2201	4/30/2006	0526	<5	E .01	<5	E .01	<5	--	E 8.7	E .3
6	6/5/2006	2015	6/6/2006	0640	<5	<5	<5	<5	<5	--	E 3.3	<2
6	2/24/2007	0915	2/25/2007	0630	<2	E .03	<2	E .04	<2	<2	E .78	E 2
6	3/30/2007	0120	3/30/2007	0910	<2	<2	<2	<2	<2	--	E 9.7	<8
6	4/25/2007	1700	4/26/2007	0830	<2	<2	<2	<2	<2	<2	E 3.3	<8
6	5/7/2007	1100	--	--	E .02	<2	<2	E .02	<2	<2	E 1.9	E 1
7	4/24/2006	0230	4/24/2006	1015	<5	E .01	E .01	E .01	<5	--	E 3.3	E .7
7	4/28/2006	1500	4/28/2006	2045	<5	E .01	<5	E .01	<5	--	E 9.4	<2
7	4/28/2006	2345	4/29/2006	1500	<5	E .01	<5	E .01	<5	--	E 9.8	<2
7	6/5/2006	2130	6/6/2006	0445	<5	E .01	E .01	E .02	<5	--	E 3.5	E .4
7	2/24/2007	0945	2/25/2007	0700	<2	E .02	<2	E .03	<2	<2	E .59	E .5
7	2/24/2007	0946	2/25/2007	0701	<2	<2	<2	E .03	<2	<2	E .59	E .8
7	2/24/2007	0947	2/25/2007	0702	E 3	E 3	E 2	E 2	<2	E 1	E 1.4	E 9
7	4/25/2007	1800	4/25/2007	2215	<2	<2	<2	E .02	<2	<2	E 8.8	E 1
7	5/7/2007	1200	--	--	<2	<2	<2	<2	<2	<2	E 1.7	E .3
12	6/28/2007	1015	6/28/2007	--	<2	<2	<2	<2	<2	--	E 1.0	<8
12	6/28/2007	1016	6/28/2007	--	E .7	E .6	E .7	E .6	E .09	E .5	E 6.1	E 2
12	6/28/2007	1021	6/28/2007	--	E 1	E 1	E 1	E 1	E .1	E 1	E 20	E 5
13	10/20/2005	0200	10/20/2005	0320	<5	E .04	<5	E .04	<5	--	<50	<2
13	11/21/2005	1000	--	--	<5	E .01	<5	E .01	<5	--	<50	<2
13	4/28/2006	1255	4/28/2006	1530	<5	E .01	<5	E .02	<5	--	E 2.8	<2
13	4/29/2006	2130	4/30/2006	0005	E .01	E .02	E .02	E .02	<5	--	E .61	E 2

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	1,4-Dichloro- ro-benzene	1-Methyl- naphthalene	2,6-Dimeth- yl-naphtha- lene	2-Methyl- naphthalene	2,2',4,4'-tet- rabromo- diphenyl ether	3-tert- Butyl-4- hydroxyani- sole (BHA)	3,4-Di- chloro- phenyl isocyanate	3- beta- Coprostanol
13	6/5/2006	2030	6/5/2006	2215	<0.5	E 0.04	E 0.05	E 0.05	<0.5	--	<0.50	E 0.7
13	2/24/2007	0940	2/24/2007	1400	<2	E .05	<2	E .08	<2	<0.2	<2.0	<.8
13	3/29/2007	2315	3/30/2007	0100	<2	<2	<2	<2	<2	--	<2.0	<.8
13	4/25/2007	1700	4/25/2007	2225	<2	E .04	<2	E .05	<2	<2	E 1.1	E .8
13	6/30/2007	0900	6/30/2007	1645	<2	E .02	<2	E .02	<2	--	E 1.1	<.8
16	10/20/2005	0130	10/20/2005	0415	E .02	E .04	<.5	E .04	<.5	--	<.50	8
16	4/28/2006	1320	4/28/2006	1600	E .01	E .01	<.5	E .01	<.5	--	E 2.7	E 1
16	4/29/2006	2140	4/30/2006	0155	<.5	E .01	<.5	E .01	<.5	--	E 1.0	E 2
16	6/5/2006	2015	6/5/2006	2300	<.5	E .03	E .07	E .04	<.5	--	<.50	E 7
16	2/24/2007	0815	2/24/2007	1500	<2	E .05	<2	E .09	<2	<2	E .34	E 4
16	3/29/2007	2240	3/30/2007	0135	E .05	E .05	E .05	E .07	<2	--	<2.0	5
16	4/25/2007	1700	4/25/2007	2355	E .04	E .03	<2	E .05	<2	<2	E 1.1	E 5
16	4/25/2007	1701	4/25/2007	2356	E .05	E .03	<2	E .04	<2	<2	E 1.0	E 3
16	6/30/2007	0915	6/30/2007	1530	E .02	<2	<2	<2	<2	--	E 1.8	E .6
16	6/30/2007	0916	6/30/2007	1531	E .02	<2	<2	<2	<2	--	E 1.8	E .6
19	10/19/2005	2000	10/20/2005	0300	E .1	E .4	E .2	E .4	<.5	--	E 2.0	E 270
19	6/5/2006	2030	6/5/2006	2140	E .1	E .09	E .06	E .1	<.5	--	<.50	E 17
19	6/10/2006	2150	6/11/2006	0055	E 2	E .05	E .04	E .06	<.5	--	<.50	E 10
19	6/24/2006	1505	6/24/2006	1805	E .3	E .1	E .04	E .2	<.5	--	E 2.0	E 21
19	6/24/2006	1506	6/24/2006	1806	E .2	E .1	E .05	E .2	<.5	--	E 2.3	29
19	2/28/2007	1920	2/28/2007	2320	E .3	E .3	E .2	E .4	<2	<2	E 1.1	E 29
19	3/1/2007	0550	3/1/2007	0630	E .08	E .02	<2	E .03	<2	<2	E .64	E 3
19	4/25/2007	1730	4/25/2007	2100	E .06	<2	<2	<2	<2	<2	E 2.5	E 4
19	6/18/2007	1050	6/18/2007	1130	E .08	E .04	E .04	E .04	<2	<2	E 3.5	E 33
22	4/24/2006	0715	4/24/2006	1215	E .02	E .02	<.5	E .02	<.5	--	E 2.8	E .8
22	4/28/2006	1615	4/29/2006	0815	E .02	<.5	<.5	<.5	<.5	--	E 3.9	<2
22	6/6/2006	1030	6/6/2006	1100	<.5	<.5	<.5	<.5	<.5	--	E 3.0	<2
22	6/25/2006	0700	6/25/2006	1805	<.5	<.5	<.5	<.5	<.5	--	E 6.9	<2
22	2/24/2007	0945	2/25/2007	0345	E .02	E .04	<2	E .05	<2	<2	E .77	E 2
22	3/29/2007	2315	3/30/2007	0915	E .07	<2	<2	<2	<2	--	E 43	2

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	3-Methyl-1H- indole (skatol)	4-Cumylphenol	4-n-Octylphenol	4-Nonyl- phenol	4-tert-Octyl- phenol	5-Methyl-1H- benzo-triazole
2	4/24/2006	0115	4/24/2006	1045	<1	<1	<1	E 0.59	E 0.2	<2.0
2	4/29/2006	0430	4/29/2006	0915	<1	<1	<1	<5.0	<1	<2.0
2	6/5/2006	2145	6/6/2006	0545	<1	<1	<1	<5.0	E .2	<2.0
2	7/11/2006	2130	7/12/2006	0515	<1	<1	<1	<5.0	<1	<2.0
2	7/12/2006	0805	7/12/2006	0830	<1	<1	<1	<5.0	<1	<2.0
2	2/24/2007	1200	2/24/2007	1900	<2	<2	<2	<1.6	<2	<1.6
2	3/30/2007	1030	3/31/2007	0130	<2	<2	<2	<1.6	<2	<1.6
2	4/25/2007	1815	4/26/2007	0000	<2	<2	<2	<1.6	<2	<1.6
2	5/7/2007	0930	--	--	<2	<2	<2	<1.6	<3	<1.6
6	10/20/2005	0115	10/20/2005	1145	<1	<1	<1	<5.0	E .3	<2.0
6	4/28/2006	1430	4/28/2006	2045	<1	<1	<1	E .42	<1	E .32
6	4/29/2006	2200	4/30/2006	0525	<1	<1	<1	E .57	E .3	<2.0
6	4/29/2006	2201	4/30/2006	0526	<1	<1	<1	E .34	<1	<2.0
6	6/5/2006	2015	6/6/2006	0640	<1	<1	<1	<5.0	<1	<2.0
6	2/24/2007	0915	2/25/2007	0630	<2	<2	<2	E .70	<2	<1.6
6	3/30/2007	0120	3/30/2007	0910	<2	<2	<2	<1.6	<2	<2.1
6	4/25/2007	1700	4/26/2007	0830	<2	<2	<2	<1.6	<2	<1.6
6	5/7/2007	1100	--	--	<2	<2	<2	E .38	<3	<1.6
7	4/24/2006	0230	4/24/2006	1015	<1	<1	<1	E .74	<1	<2.0
7	4/28/2006	1500	4/28/2006	2045	<1	<1	<1	E .56	E .4	<2.0
7	4/28/2006	2345	4/29/2006	1500	<1	<1	<1	<5.0	<1	E .18
7	6/5/2006	2130	6/6/2006	0445	E .02	<1	<1	E .75	<1	<2.0
7	2/24/2007	0945	2/25/2007	0700	<2	<2	<2	<1.6	<2	<1.6
7	2/24/2007	0946	2/25/2007	0701	<2	<2	<2	<1.6	<2	<1.6
7	2/24/2007	0947	2/25/2007	0702	2	3	E 1	E 19	3	22
7	4/25/2007	1800	4/25/2007	2215	<2	<2	<2	<1.6	<2	<1.6
7	5/7/2007	1200	--	--	<2	<2	<2	<1.6	<2	<1.6
12	6/28/2007	1015	6/28/2007	--	<2	<2	<2	<1.6	<2	E 1.9
12	6/28/2007	1016	6/28/2007	--	E .1	.8	<2	E 7.6	1	E 10
12	6/28/2007	1021	6/28/2007	--	.30	2	<2	E 13	1	E 17
13	10/20/2005	0200	10/20/2005	0320	<1	<1	<1	<5.0	E .3	E 1.1
13	11/21/2005	1000	--	--	<1	<1	<1	<5.0	<1	<2.0
13	4/28/2006	1255	4/28/2006	1530	<1	<1	<1	<5.0	<1	E .27
13	4/29/2006	2130	4/30/2006	0005	E .02	<1	<1	E .50	<1	E .20

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	3-Methyl-1H- indole (skatol)	4-Cumylphenol	4-n-Octylphenol	4-Nonyl- phenol	4-tert-Octyl- phenol	5-Methyl-1H- benzotriazole
13	6/5/2006	2030	6/5/2006	2215	E 0.05	<1	<1	E 9.8	E 0.2	<2.0
13	2/24/2007	0940	2/24/2007	1400	<2	<2	<2	<1.6	<2	<1.6
13	3/29/2007	2315	3/30/2007	0100	<2	<2	<2	<1.6	<2	<1.6
13	4/25/2007	1700	4/25/2007	2225	E .05	<2	<2	E .85	<2	<1.6
13	6/30/2007	0900	6/30/2007	1645	<2	<2	<2	<1.6	<2	<1.6
16	10/20/2005	0130	10/20/2005	0415	<1	<1	<1	E 1.4	E .4	E .32
16	4/28/2006	1320	4/28/2006	1600	<1	<1	<1	E .43	<1	E .39
16	4/29/2006	2140	4/30/2006	0155	E .02	<1	<1	E .45	<1	<2.0
16	6/5/2006	2015	6/5/2006	2300	E .1	<1	<1	E 1.5	E .2	<2.0
16	2/24/2007	0815	2/24/2007	1500	E .04	E .05	<2	<1.6	E .2	<1.6
16	3/29/2007	2240	3/30/2007	0135	<2	<2	<2	E 1.1	<2	E .69
16	4/25/2007	1700	4/25/2007	2355	E .08	<2	<2	E .65	<2	<1.6
16	4/25/2007	1701	4/25/2007	2356	E .05	<2	<2	<1.6	<2	<1.6
16	6/30/2007	0915	6/30/2007	1530	<2	<2	<2	E .37	<2	E .41
16	6/30/2007	0916	6/30/2007	1531	<2	<2	<2	E .36	<2	E .32
19	10/19/2005	2000	10/20/2005	0300	E .2	<1	<1	E 22	E .6	E 1.1
19	6/5/2006	2030	6/5/2006	2140	E .07	<1	<1	E 4.7	E .3	<2.0
19	6/10/2006	2150	6/11/2006	0055	E .1	<1	<1	E 3.4	<1	<2.0
19	6/24/2006	1505	6/24/2006	1805	E .03	<1	<1	E 3.0	E .2	<2.0
19	6/24/2006	1506	6/24/2006	1806	E .03	<1	<1	E 3.9	E .2	<2.0
19	2/28/2007	1920	2/28/2007	2320	E .4	<2	<2	E 3.0	<2	E 1.3
19	3/1/2007	0550	3/1/2007	0630	E .05	<2	<2	E .49	<2	<1.6
19	4/25/2007	1730	4/25/2007	2100	E .03	<2	<2	<1.6	<2	<1.6
19	6/18/2007	1050	6/18/2007	1130	<2	<2	<2	E 2.1	.2	E .73
22	4/24/2006	0715	4/24/2006	1215	<1	<1	<1	E 1.0	<1	<2.0
22	4/28/2006	1615	4/29/2006	0815	<1	<1	<1	<5.0	E .3	<2.0
22	6/6/2006	1030	6/6/2006	1100	<1	<1	<1	<5.0	<1	<2.0
22	6/25/2006	0700	6/25/2006	1805	<1	<1	<1	<5.0	<1	<2.0
22	2/24/2007	0945	2/25/2007	0345	<2	<2	<2	<1.6	<2	<1.6
22	3/29/2007	2315	3/30/2007	0915	<2	<2	<2	<1.6	<2	E .45

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Aceto-phenone	Acetyl-hexamethyl-tetrahydronaphthalene (AHTN)	Anthracene	Anthraquinone	Atrazine	Benzo[a]pyrene	Benzo-phenone	Bis(2-ethylhexyl) phthalate
2	4/24/2006	0115	4/24/2006	1045	<0.5	E 0.12	E 0.01	E 0.22	E 0.17	E 0.13	<0.50	<2.0
2	4/29/2006	0430	4/29/2006	0915	<5	E 0.7	E .01	<.50	.73	E .010	<.50	E 50
2	6/5/2006	2145	6/6/2006	0545	<5	E .07	<.5	E .17	E .16	E .10	E .090	<2.0
2	7/11/2006	2130	7/12/2006	0515	<5	E .09	<.5	E .18	<.50	E .12	E .11	<2.0
2	7/12/2006	0805	7/12/2006	0830	<5	<.50	<.5	<.50	E .03	<.50	<.50	<2.0
2	2/24/2007	1200	2/24/2007	1900	<2	<20	E .04	E .39	<20	.21	<20	<2.0
2	3/30/2007	1030	3/31/2007	0130	<2	<20	<.2	<.25	<20	<20	<20	<2.0
2	4/25/2007	1815	4/26/2007	0000	<2	<20	<.2	<20	<20	<20	<20	<2.0
2	5/7/2007	0930	--	--	<2	<20	<.2	<20	E .11	<20	<20	<4.2
6	10/20/2005	0115	10/20/2005	1145	<5	E .20	E .08	.74	<.50	.54	E .12	<2.0
6	4/28/2006	1430	4/28/2006	2045	E .2	E .19	E .03	.80	E .16	E .10	<.50	<2.0
6	4/29/2006	2200	4/30/2006	0525	<5	E .20	E .07	.77	E .11	.89	<.50	<2.0
6	4/29/2006	2201	4/30/2006	0526	<5	E .10	E .06	.65	E .11	.69	<.50	<2.0
6	6/5/2006	2015	6/6/2006	0640	<5	E .10	E .10	.80	E .13	.99	E .070	<2.0
6	2/24/2007	0915	2/25/2007	0630	<3	<20	.29	E 3.7	<20	3.0	<20	2.4
6	3/30/2007	0120	3/30/2007	0910	<2	<20	<.2	<.77	<20	<.76	<20	<2.0
6	4/25/2007	1700	4/26/2007	0830	<2	<20	<.2	E .32	<20	E .32	<20	<2.0
6	5/7/2007	1100	--	--	<2	E .08	E .03	.30	<20	.25	<20	<3.8
7	4/24/2006	0230	4/24/2006	1015	E .2	E .15	E .06	E 1.0	E .30	E .67	<.50	<2.0
7	4/28/2006	1500	4/28/2006	2045	<5	E .15	<.5	E .49	E .35	E .03	<.50	<2.0
7	4/28/2006	2345	4/29/2006	1500	<5	E .11	E .02	E .31	E .36	E .12	<.50	<2.0
7	6/5/2006	2130	6/6/2006	0445	E .1	E .10	E .60	1.3	E .12	2.4	E .080	<2.0
7	2/24/2007	0945	2/25/2007	0700	<2	<20	E .20	E 2.1	<20	1.6	<20	E .85
7	2/24/2007	0946	2/25/2007	0701	<2	<20	.23	E 2.5	<20	2.0	<20	E 1.1
7	2/24/2007	0947	2/25/2007	0702	3	1.6	1.92	E 4.7	2.2	2.9	2.9	2.5
7	4/25/2007	1800	4/25/2007	2215	<2	<20	E .30	1.5	<20	2.4	<20	E 1.3
7	5/7/2007	1200	--	--	<2	<20	<.2	E .09	E .18	E .050	<20	<3.5
12	6/28/2007	1015	6/28/2007	--	<2	<20	<.2	E .52	<.04	E .12	E .24	<2.0
12	6/28/2007	1016	6/28/2007	--	1	.73	.67	1.7	.51	.64	1.2	<2.0
12	6/28/2007	1021	6/28/2007	--	1	1.0	1.17	2.3	1.1	.89	2.1	<2.0
13	10/20/2005	0200	10/20/2005	0320	E .4	<.50	E .20	1.1	<.50	.57	<.50	<2.0
13	11/21/2005	1000	--	--	<5	<.50	<.5	<.5	<.50	<.50	2.1	<2.0
13	4/28/2006	1255	4/28/2006	1530	E .2	<.50	E .04	.90	E .24	E .21	<.50	<2.0
13	4/29/2006	2130	4/30/2006	0005	E .2	E .03	E .30	1.2	E .10	2.3	<.50	<2.0

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Aceto-phenone	Acetyl-hexamethyl-tetrahydronaphthalene (AHTN)	Anthracene	Anthraquinone	Atrazine	Benzo[a]-pyrene	Benzo-phenone	Bis (2-ethylhexyl) phthalate
13	6/5/2006	2030	6/5/2006	2215	E 0.30	<0.5	0.96	2.5	E 0.080	5.2	<0.50	<2.0
13	2/24/2007	0940	2/24/2007	1400	<43	<2	.40	E 5.9	<20	E 4.2	<20	3.7
13	3/29/2007	2315	3/30/2007	0100	<20	<2	.22	E 1.5	E .11	<1.6	<20	E 1.3
13	4/25/2007	1700	4/25/2007	2225	<20	<2	E .72	E 2.1	<20	E 4.8	<20	E .97
13	6/30/2007	0900	6/30/2007	1645	<20	<2	E .10	.33	E .020	.70	E .11	<2.0
16	10/20/2005	0130	10/20/2005	0415	<50	E .1	E .34	.63	<.50	.76	E .090	<2.0
16	4/28/2006	1320	4/28/2006	1600	E .12	E .06	E .020	E .46	E .20	E .050	<50	<2.0
16	4/29/2006	2140	4/30/2006	0155	E .16	E .05	E .020	E .36	E .080	E .080	<50	<2.0
16	6/5/2006	2015	6/5/2006	2300	E .24	E .08	E .48	1.9	E .11	3.7	E .070	4.1
16	2/24/2007	0815	2/24/2007	1500	<35	E .08	.21	E 2.0	<20	E 1.6	E .11	2.7
16	3/29/2007	2240	3/30/2007	0135	<20	<2	.33	<1.2	E .11	E 2.2	E .15	E 1.5
16	4/25/2007	1700	4/25/2007	2355	<20	<2	E .59	E 1.9	<20	4.1	<20	E 1.6
16	4/25/2007	1701	4/25/2007	2356	<20	<2	E .49	E 1.6	<20	2.9	<20	E 1.3
16	6/30/2007	0915	6/30/2007	1530	<20	E .06	E .060	.21	E .060	.26	E .14	<2.0
16	6/30/2007	0916	6/30/2007	1531	<20	E .07	E .040	E .17	E .050	.21	E .10	<2.0
19	10/19/2005	2000	10/20/2005	0300	E .45	1	1.4	3.0	<.50	4.5	E .19	8.5
19	6/5/2006	2030	6/5/2006	2140	E .26	E .3	E .59	2.1	E .20	E 3.9	E .10	<3.0
19	6/10/2006	2150	6/11/2006	0055	E .36	E .3	.82	3.4	E .25	4.7	E .11	<2.0
19	6/24/2006	1505	6/24/2006	1805	E .23	E .3	E .75	E 3.0	<.50	E 4.7	E .12	E 2.2
19	6/24/2006	1506	6/24/2006	1806	E .25	E .4	.54	2.8	<.50	4.5	E .14	2.3
19	2/28/2007	1920	2/28/2007	2320	<.52	<2	2.2	E 7.2	<20	E 14.0	<20	7.0
19	3/1/2007	0550	3/1/2007	0630	<20	<2	E .030	<.25	<20	<20	E .080	<2.0
19	4/25/2007	1730	4/25/2007	2100	<20	<2	E .070	E .54	<20	E .52	<20	<2.0
19	6/18/2007	1050	6/18/2007	1130	.93	.5	E .14	1.5	<20	.67	E .13	<2.0
22	4/24/2006	0715	4/24/2006	1215	E .28	E .2	<.50	1.0	E .39	E .18	<50	<2.0
22	4/28/2006	1615	4/29/2006	0815	<.50	<.5	<.50	<.50	E .18	E .030	<50	<2.0
22	6/6/2006	1030	6/6/2006	1100	<.50	E .05	E .010	E .15	E .080	E .17	<50	<2.0
22	6/25/2006	0700	6/25/2006	1805	<.50	<.5	<.50	E .34	E .040	E .18	E .070	<2.0
22	2/24/2007	0945	2/25/2007	0345	<.21	<2	.29	E 2.4	<20	1.8	<20	E .94
22	3/29/2007	2315	3/30/2007	0915	<20	<2	<20	<.79	<20	<1.3	<20	<2.0

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Bisphenol A	Bromacil	Caffeine	Camphor	Carbaryl	Carbazole	Chlorpyrifos	Cholesterol
2	4/24/2006	0115	4/24/2006	1045	E 0.11	E 0.67	E 0.040	<0.5	E 0.08	E 0.05	<0.5	E 1.3
2	4/29/2006	0430	4/29/2006	0915	E 0.040	E .31	<.50	E .01	E .02	E .01	<.5	<2.0
2	6/5/2006	2145	6/6/2006	0545	<1.0	E .36	<.50	<.5	<1	E .04	<.5	E .65
2	7/11/2006	2130	7/12/2006	0515	<1.0	E .41	<.50	<.5	<1	<.50	<.5	E .73
2	7/12/2006	0805	7/12/2006	0830	<1.0	<.50	<.50	<.5	E .06	<.50	<.5	E .56
2	2/24/2007	1200	2/24/2007	1900	<.40	<.20	E .10	<.2	<.2	E .13	<.2	E .36
2	3/30/2007	1030	3/31/2007	0130	<.40	<.20	<.20	<.2	<.2	<.20	<.2	E 0
2	4/25/2007	1815	4/26/2007	0000	<.40	<.20	<.20	<.2	<.2	<.20	<.2	E 1.0
2	5/7/2007	0930	--	--	<.40	<.20	<.20	<.2	<.2	<.20	<.2	<.80
6	10/20/2005	0115	10/20/2005	1145	E .11	<.50	.54	<.5	<1	E .20	<.5	E 1.8
6	4/28/2006	1430	4/28/2006	2045	E .25	E .30	.64	E .04	E .06	E .27	<.5	E .97
6	4/29/2006	2200	4/30/2006	0525	E .14	<.50	E .39	E .02	<1	E .28	<.5	E 1.9
6	4/29/2006	2201	4/30/2006	0526	E .13	E .29	E .25	<.5	E .06	E .25	<.5	E 1.1
6	6/5/2006	2015	6/6/2006	0640	E .19	E .22	E .27	<.5	E .1	E .32	<.5	E 1.3
6	2/24/2007	0915	2/25/2007	0630	E .19	<.20	.93	<.2	<.2	1.2	<.2	E 3.6
6	3/30/2007	0120	3/30/2007	0910	<.40	<.20	E .40	<.2	<.2	E .33	<.2	E 1.4
6	4/25/2007	1700	4/26/2007	0830	<.40	<.20	<.20	<.2	<.2	E .11	<.2	E 1.6
6	5/7/2007	1100	--	--	E .060	<.20	.36	<.2	<.2	<.20	<.2	E 1.5
7	4/24/2006	0230	4/24/2006	1015	E .19	E .40	E .16	<.5	E .07	E .31	<.5	E 2.0
7	4/28/2006	1500	4/28/2006	2045	E .19	<.50	E .48	E .03	<1	E .15	<.5	E .75
7	4/28/2006	2345	4/29/2006	1500	E .12	E .33	E .32	<.5	E .05	E .10	<.5	E .59
7	6/5/2006	2130	6/6/2006	0445	E .24	<.50	E .17	<.5	E .1	.53	<.5	E 1.3
7	2/24/2007	0945	2/25/2007	0700	E .14	<.20	.40	<.2	<.2	.77	<.2	E 1.5
7	2/24/2007	0946	2/25/2007	0701	<.40	<.20	.41	<.2	<.2	.89	<.2	E 1.5
7	2/24/2007	0947	2/25/2007	0702	E 4.0	12	3.0	3	E 3	3.3	1.5	E 10
7	4/25/2007	1800	4/25/2007	2215	E .19	<.20	E .42	<.2	<.2	E .63	<.2	E 4.1
7	5/7/2007	1200	--	--	<.40	<.20	E .20	E .03	<.2	<.20	<.2	E .69
12	6/28/2007	1015	6/28/2007	--	E .20	E .15	E .51	E .06	<.2	E .10	<.2	<.80
12	6/28/2007	1016	6/28/2007	--	1.4	3.8	1.5	1	E .6	.80	.6	E 2.9
12	6/28/2007	1021	6/28/2007	--	2.1	6.4	2.1	2	E 1	1.2	1	E 4.7
13	10/20/2005	0200	10/20/2005	0320	E .19	<.50	1.1	E .10	E .2	E .31	<.5	2.1
13	11/21/2005	1000	--	--	<1.0	<.50	<.50	<.5	<1	<.50	<.5	<2.0
13	4/28/2006	1255	4/28/2006	1530	E .28	E .30	.53	E .2	E .05	E .38	<.5	E .91
13	4/29/2006	2130	4/30/2006	0005	E .18	E .28	E .31	E .06	E .05	.66	<.5	3.2

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Bisphenol A	Bromacil	Caffeine	Camphor	Carbaryl	Carbazole	Chlorpyrifos	Cholesterol
13	6/5/2006	2030	6/5/2006	2215	3.2	<.50	E .20	E .07	E .01	1.1	<.5	E .49
13	2/24/2007	0940	2/24/2007	1400	E .40	<.20	.78	<.2	<.2	1.8	<.2	E .84
13	3/29/2007	2315	3/30/2007	0100	E .19	<.20	.55	<.2	E .2	.59	<.2	E 1.9
13	4/25/2007	1700	4/25/2007	2225	E .43	<.20	E .33	<.2	<.2	E 1.0	<.2	E 2.2
13	6/30/2007	0900	6/30/2007	1645	E .10	E .13	E .20	E .04	<.2	E .12	<.2	E .65
16	10/20/2005	0130	10/20/2005	0415	E .16	<.50	1.1	<.5	<.1	E .28	<.5	7.1
16	4/28/2006	1320	4/28/2006	1600	E .29	<.50	1.2	E .04	E .05	E .26	<.5	E 1.8
16	4/29/2006	2140	4/30/2006	0155	E .16	<.50	E .41	E .07	E .04	E .15	<.5	2.5
16	6/5/2006	2015	6/5/2006	2300	E .44	E .27	.56	E .04	E .1	.83	<.5	E 10
16	2/24/2007	0815	2/24/2007	1500	E .28	E .31	1.4	<.2	<.2	.70	<.2	E 5.3
16	3/29/2007	2240	3/30/2007	0135	E .27	<.27	1.4	<.2	E .09	.66	<.2	E 5.4
16	4/25/2007	1700	4/25/2007	2355	E .22	<.20	E .63	E .1	<.2	E .92	<.2	E 7.9
16	4/25/2007	1701	4/25/2007	2356	E .18	<.20	E .55	E .07	<.2	E .76	<.2	E 5.1
16	6/30/2007	0915	6/30/2007	1530	E .29	E .14	.80	<.2	<.2	E .070	<.2	E .85
16	6/30/2007	0916	6/30/2007	1531	E .17	E .16	.66	<.2	<.2	E .060	<.2	E .93
19	10/19/2005	2000	10/20/2005	0300	1.8	<.50	1.4	E .3	<.1	1.2	<.5	E 120
19	6/5/2006	2030	6/5/2006	2140	E .58	<.50	1.2	E .2	<.1	E .89	<.5	E 23
19	6/10/2006	2150	6/11/2006	0055	E .60	<.50	.82	E .2	<.1	1.4	<.5	E 13
19	6/24/2006	1505	6/24/2006	1805	E 1.1	E .47	E .95	E .2	<.1	E 1.3	<.5	E 14
19	6/24/2006	1506	6/24/2006	1806	E .95	E .49	1.1	E .2	<.1	1.1	<.5	15
19	2/28/2007	1920	2/28/2007	2320	E 1.3	<.20	1.5	E .2	<.2	3.4	<.2	E 41
19	3/1/2007	0550	3/1/2007	0630	<.40	<.20	.49	E .07	<.2	<.20	<.2	E 3.0
19	4/25/2007	1730	4/25/2007	2100	E .11	<.20	E .72	E .2	<.2	E .18	<.2	E 5.1
19	6/18/2007	1050	6/18/2007	1130	.71	<.20	2.3	E .2	<.2	.47	<.2	E 30
22	4/24/2006	0715	4/24/2006	1215	E .39	E .36	E .37	E .07	E .08	E .25	<.5	2.5
22	4/28/2006	1615	4/29/2006	0815	E .070	E .38	E .18	<.5	<.1	<.50	<.5	E .36
22	6/6/2006	1030	6/6/2006	1100	<.10	<.50	E .060	<.5	E .08	E .050	<.5	E .57
22	6/25/2006	0700	6/25/2006	1805	E .080	<.50	E .25	<.5	<.1	E .13	<.5	E .73
22	2/24/2007	0945	2/25/2007	0345	E .17	<.20	.73	<.2	<.2	.85	<.2	E 2.6
22	3/29/2007	2315	3/30/2007	0915	E .19	E .87	E 1.0	<.2	<.2	E .37	<.2	E 2.7

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Cotinine	Diazinon	Dichlorvos	Diethyl phthalate	d-Limonene	Fluoranth- ene	Hexahydrohexa- methylcyclo- pentabenzopyran (HHCb)
2	4/24/2006	0115	4/24/2006	1045	<1	<0.5	<1	E 1.5	<0.5	E 0.35	<0.5
2	4/29/2006	0430	4/29/2006	0915	<1	<5	E.04	E.27	<5	E.030	<5
2	6/5/2006	2145	6/6/2006	0545	<1	<5	<1	E.24	<5	E.23	<5
2	7/11/2006	2130	7/12/2006	0515	<1	<5	<1	.57	<5	E.23	<5
2	7/12/2006	0805	7/12/2006	0830	<1	<5	<1	<.50	<5	E.020	<5
2	2/24/2007	1200	2/24/2007	1900	<.8	<2	<2	<.20	<2	.86	E.06
2	3/30/2007	1030	3/31/2007	0130	<.8	<2	<2	.37	<2	<.74	<2
2	4/25/2007	1815	4/26/2007	0000	<.8	<2	<2	E.18	<2	<.20	<2
2	5/7/2007	0930	--	--	<.8	<2	<2	<.20	<2	<.20	<2
6	10/20/2005	0115	10/20/2005	1145	<1	<5	<1	1.3	<5	1.2	E.04
6	4/28/2006	1430	4/28/2006	2045	<1	<5	<1	E.41	<5	.52	<5
6	4/29/2006	2200	4/30/2006	0525	<1	<5	<1	E.24	<5	2.6	<5
6	4/29/2006	2201	4/30/2006	0526	<1	<5	<1	E.20	<5	2.2	<5
6	6/5/2006	2015	6/6/2006	0640	<1	<5	<1	E.31	<5	2.9	<5
6	2/24/2007	0915	2/25/2007	0630	<.8	<2	<2	.31	<2	E 10	E.2
6	3/30/2007	0120	3/30/2007	0910	<.8	<2	<2	<.20	<2	<.22	<2
6	4/25/2007	1700	4/26/2007	0830	<.8	<2	<2	<.20	<2	E.75	<2
6	5/7/2007	1100	--	--	<.8	<2	E.03	E.13	<2	.67	<2
7	4/24/2006	0230	4/24/2006	1015	<1	<5	<1	E.44	<5	E 2.0	E.06
7	4/28/2006	1500	4/28/2006	2045	<1	<5	<1	.71	<5	E.25	<5
7	4/28/2006	2345	4/29/2006	1500	<1	<5	E.03	.53	<5	E.49	<5
7	6/5/2006	2130	6/6/2006	0445	<1	<5	<1	E.37	E.1	6.2	<5
7	2/24/2007	0945	2/25/2007	0700	<.8	<2	<2	E.19	<2	6.1	E.1
7	2/24/2007	0946	2/25/2007	0701	<.8	<2	<2	.21	<2	7.5	<2
7	2/24/2007	0947	2/25/2007	0702	E 7	2	E 3	3.2	E 2	7.2	2
7	4/25/2007	1800	4/25/2007	2215	<.8	<2	<2	<.20	<2	E 6.8	E.1
7	5/7/2007	1200	--	--	<.8	<2	<2	<.20	<2	E.13	<2
12	6/28/2007	1015	6/28/2007	--	<.8	<2	E.06	<.20	<2	E.41	<2
12	6/28/2007	1016	6/28/2007	--	E 3	.6	E 1	.96	E.5	1.3	.5
12	6/28/2007	1021	6/28/2007	--	E 5	1	E 2	1.9	E.8	1.7	.9
13	10/20/2005	0200	10/20/2005	0320	<1	<5	<1	.52	<5	1.4	<5
13	11/21/2005	1000	--	--	<1	<5	<1	<.50	<5	<.50	<5
13	4/28/2006	1255	4/28/2006	1530	<1	<5	<1	.51	<5	.73	<5
13	4/29/2006	2130	4/30/2006	0005	<1	<5	<1	E.20	E 1	7.0	<5

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Cotinine	Diazinon	Dichlorvos	Diethyl phthalate	d-Limonene	Fluoranth- ene	Hexahydrohexa- methylcyclo- pentabenzopyran (HHCb)
13	6/5/2006	2030	6/5/2006	2215	<1	<0.5	<1	E 0.35	E 0.4	15	<0.5
13	2/24/2007	0940	2/24/2007	1400	<8	<2	<2	<20	<2	E 12	<2
13	3/29/2007	2315	3/30/2007	0100	<8	<2	<2	.36	<2	E 5.1	<2
13	4/25/2007	1700	4/25/2007	2225	<8	<2	<2	E .18	<2	E 13	<2
13	6/30/2007	0900	6/30/2007	1645	<8	<2	<2	.34	<2	1.6	<2
16	10/20/2005	0130	10/20/2005	0415	<1	<.5	<1	<.50	<.5	2.0	<.5
16	4/28/2006	1320	4/28/2006	1600	E .2	<.5	<1	.62	E .3	E .24	<.5
16	4/29/2006	2140	4/30/2006	0155	<1	<.5	<1	E .25	<.5	E .33	<.5
16	6/5/2006	2015	6/5/2006	2300	<1	<.5	<1	E .36	<.5	11	<.5
16	2/24/2007	0815	2/24/2007	1500	E .3	<2	<2	.50	<2	6.4	E .1
16	3/29/2007	2240	3/30/2007	0135	<8	<2	<2	.70	<2	E 6.0	E .2
16	4/25/2007	1700	4/25/2007	2355	<8	<2	<2	E .32	E .1	E 11	E .07
16	4/25/2007	1701	4/25/2007	2356	<8	<2	<2	E .25	E .06	E 8.5	<2
16	6/30/2007	0915	6/30/2007	1530	<8	<2	<2	.63	<2	.73	<2
16	6/30/2007	0916	6/30/2007	1531	<8	<2	<2	.54	<2	.59	<2
19	10/19/2005	2000	10/20/2005	0300	<1	<.5	<1	<.50	E .4	14	E .2
19	6/5/2006	2030	6/5/2006	2140	<1	<.5	<1	E .19	E .3	E 11	E .08
19	6/10/2006	2150	6/11/2006	0055	<1	<.5	<1	.51	E .2	13	E .06
19	6/24/2006	1505	6/24/2006	1805	<1	<.5	<1	<.50	E 1	E 15	E .07
19	6/24/2006	1506	6/24/2006	1806	<1	<.5	<1	<.50	E .4	13	E .07
19	2/28/2007	1920	2/28/2007	2320	<8	<2	<2	.21	E .7	E 43	.5
19	3/1/2007	0550	3/1/2007	0630	<8	<2	E .03	.21	<2	<40	E .2
19	4/25/2007	1730	4/25/2007	2100	<8	<2	<2	E .27	<2	E 1.1	E .1
19	6/18/2007	1050	6/18/2007	1130	<8	<2	<2	.31	E .2	2.1	E .06
22	4/24/2006	0715	4/24/2006	1215	<1	<.5	<1	E .35	<.5	.62	<.5
22	4/28/2006	1615	4/29/2006	0815	<1	<.5	<1	<.50	<.5	E .13	<.5
22	6/6/2006	1030	6/6/2006	1100	<1	<.5	<1	<.50	<.5	E .38	<.5
22	6/25/2006	0700	6/25/2006	1805	<1	<.5	<1	<.50	<.5	.57	E .06
22	2/24/2007	0945	2/25/2007	0345	<8	<2	<2	<.20	<2	6.4	E .2
22	3/29/2007	2315	3/30/2007	0915	<8	<2	<2	.21	<2	<3.2	<2

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Indole	Isoborneol	Isophorone	Isopropylbenzene (cumene)	Isoquinoline	Menthol	Metalaxyl	Methyl salicylate
2	4/24/2006	0115	4/24/2006	1045	<0.5	<0.5	E 0.05	<0.5	<0.5	<0.5	<0.5	<0.5
2	4/29/2006	0430	4/29/2006	0915	<5	<5	<5	<5	<5	<5	<5	<5
2	6/5/2006	2145	6/6/2006	0545	<5	<5	<5	<5	<5	<5	<5	<5
2	7/11/2006	2130	7/12/2006	0515	<5	<5	<5	<5	<5	<5	<5	<5
2	7/12/2006	0805	7/12/2006	0830	<5	<5	<5	<5	<5	<5	<5	<5
2	2/24/2007	1200	2/24/2007	1900	<2	--	<2	<2	<2	--	<2	<2
2	3/30/2007	1030	3/31/2007	0130	<2	<2	<2	<2	<2	<2	<2	<2
2	4/25/2007	1815	4/26/2007	0000	<2	<2	<2	<2	<2	<2	<2	<2
2	5/7/2007	0930	--	--	<2	<2	<2	<2	<2	<2	<2	<2
6	10/20/2005	0115	10/20/2005	1145	<5	<5	<5	<5	<5	<5	<5	<5
6	4/28/2006	1430	4/28/2006	2045	<5	<5	E .04	<5	<5	E .09	<5	<5
6	4/29/2006	2200	4/30/2006	0525	<5	<5	<5	<5	<5	<5	<5	<5
6	4/29/2006	2201	4/30/2006	0526	<5	<5	<5	<5	<5	E .04	<5	<5
6	6/5/2006	2015	6/6/2006	0640	<5	<5	<5	<5	<5	<5	<5	<5
6	2/24/2007	0915	2/25/2007	0630	<2	--	<2	<2	<2	E .2	<2	<2
6	3/30/2007	0120	3/30/2007	0910	<2	<2	<2	<2	<2	<2	<2	<2
6	4/25/2007	1700	4/26/2007	0830	<2	<2	<2	<2	<2	<2	<2	<2
6	5/7/2007	1100	--	--	<2	<2	<2	<2	<2	E .09	<2	<2
7	4/24/2006	0230	4/24/2006	1015	E .03	<5	E .05	<5	<5	<5	<5	<5
7	4/28/2006	1500	4/28/2006	2045	<5	<5	<5	<5	<5	E .09	<5	<5
7	4/28/2006	2345	4/29/2006	1500	<5	<5	E .02	<5	<5	E .04	<5	<5
7	6/5/2006	2130	6/6/2006	0445	<5	<5	<5	<5	<5	<5	<5	<5
7	2/24/2007	0945	2/25/2007	0700	<2	--	<2	<2	<2	--	<2	<2
7	2/24/2007	0946	2/25/2007	0701	<2	--	<2	<2	<2	--	<2	<2
7	2/24/2007	0947	2/25/2007	0702	.9	E 3	3	E 2	3	E 3	3	2
7	4/25/2007	1800	4/25/2007	2215	<2	<2	<2	<2	<2	<2	<2	<2
7	5/7/2007	1200	--	--	<2	<2	<2	<2	<2	E .06	<2	<2
12	6/28/2007	1015	6/28/2007	--	<2	<2	<2	<2	<2	<2	<2	<2
12	6/28/2007	1016	6/28/2007	--	E .06	.7	1	E .7	1	1	.9	E .2
12	6/28/2007	1021	6/28/2007	--	E .1	1	2	E 1	2	2	2	.3
13	10/20/2005	0200	10/20/2005	0320	<5	<5	E .08	<5	<5	<5	<5	<5
13	11/21/2005	1000	--	--	<5	<5	<5	<5	<5	<5	<5	<5
13	4/28/2006	1255	4/28/2006	1530	<5	<5	E .05	<5	<5	E .1	<5	<5
13	4/29/2006	2130	4/30/2006	0005	E .04	<5	E .03	<5	<5	E .08	<5	<5

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Metachlor	n, n-diethyl-metachloride (DEET)	Naphthalene	Nonyl-phenol mono-ethoxylate	Nonylphenol diethoxylate	Octylphenol mono-ethoxylate	Octylphenol diethoxylate	para-Cresol
2	4/24/2006	0115	4/24/2006	1045	E.05	E.32	E.01	<2	<5.0	<1	<1.0	E.05
2	4/29/2006	0430	4/29/2006	0915	E.23	E.14	<.5	<2	<5.0	<1	<1.0	<1
2	6/5/2006	2145	6/6/2006	0545	E.33	E.33	<.5	<2	<5.0	<1	E.82	<1
2	7/11/2006	2130	7/12/2006	0515	<.5	E.49	<.5	<2	<5.0	<1	<1.0	<1
2	7/12/2006	0805	7/12/2006	0830	E.04	E.13	<.5	<2	<5.0	<1	<1.0	<1
2	2/24/2007	1200	2/24/2007	1900	<.2	E.090	<.2	<2	<3.2	<1	--	<.2
2	3/30/2007	1030	3/31/2007	0130	<.2	E.18	<.2	<2	<3.2	<1	<.32	<.2
2	4/25/2007	1815	4/26/2007	0000	<.2	E.14	<.2	<2	<3.2	<1	<.32	<.2
2	5/7/2007	0930	--	--	E.07	<.20	<.2	<2	<3.2	<1	<.32	<.2
6	10/20/2005	0115	10/20/2005	1145	<.5	.62	E.03	<2	<5.0	<1	<1.0	<1
6	4/28/2006	1430	4/28/2006	2045	E.05	E.33	E.03	E.1	E.14	<1	<1.0	E.04
6	4/29/2006	2200	4/30/2006	0525	E.04	E.19	E.03	<2	<5.0	E.05	E.18	E.05
6	4/29/2006	2201	4/30/2006	0526	E.04	E.15	E.02	<2	<5.0	E.3	E.99	E.05
6	6/5/2006	2015	6/6/2006	0640	<.5	E.27	E.02	<2	<5.0	<1	<1.0	<1
6	2/24/2007	0915	2/25/2007	0630	<.2	E.15	E.1	<2	<3.2	<1	--	<.2
6	3/30/2007	0120	3/30/2007	0910	<.2	E.11	<.2	<2	<3.2	<1	<.32	<.2
6	4/25/2007	1700	4/26/2007	0830	<.2	<.20	<.2	<2	<3.2	<1	<.32	<.2
6	5/7/2007	1100	--	--	<.2	E.070	<.2	<2	<3.2	<1	<.32	.2
7	4/24/2006	0230	4/24/2006	1015	E.07	E.43	E.03	E.6	E.13	<1	E.14	E.09
7	4/28/2006	1500	4/28/2006	2045	E.1	E.39	E.02	<2	E.12	E.7	E.2.1	<1
7	4/28/2006	2345	4/29/2006	1500	E.1	E.25	<.5	<2	<5.0	<1	<1.0	E.03
7	6/5/2006	2130	6/6/2006	0445	E.03	E.38	E.04	<2	<5.0	<1	<1.0	E.1
7	2/24/2007	0945	2/25/2007	0700	<.2	E.19	E.08	<2	<3.2	<1	--	<.2
7	2/24/2007	0946	2/25/2007	0701	<.2	E.18	E.09	<2	<3.2	<1	--	<.2
7	2/24/2007	0947	2/25/2007	0702	3	3.4	E.3	E.16	E.32	E.5	E.1.8	E.2
7	4/25/2007	1800	4/25/2007	2215	<.2	E.12	<.2	<2	<3.2	<1	<.32	E.09
7	5/7/2007	1200	--	--	E.1	<.20	<.2	<2	<3.2	<1	<.32	<.2
12	6/28/2007	1015	6/28/2007	--	E.03	.41	<.2	<2	<3.2	<1	<.32	<.2
12	6/28/2007	1016	6/28/2007	--	.8	1.3	E.8	E.4	E.14	E.2	E.87	<.2
12	6/28/2007	1021	6/28/2007	--	2	2.4	E.1	E.8	E.22	E.3	E.1.2	<.2
13	10/20/2005	0200	10/20/2005	0320	<.5	.89	E.1	<2	<5.0	E.3	E.16	<1
13	11/21/2005	1000	--	--	<.5	E.16	E.03	<2	<5.0	<1	<1.0	<1
13	4/28/2006	1255	4/28/2006	1530	E.06	.54	E.04	<2	<5.0	<1	<1.0	E.05
13	4/29/2006	2130	4/30/2006	0005	<.5	E.29	E.05	<2	E.1.0	<1	<1.0	E.2

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Metolachlor	n, n-diethyl-meta-toluidide (DEET)	Naphthalene	Nonylphenol ethoxylate	Nonylphenol diethoxylate	Octylphenol monoethoxylate	Octylphenol diethoxylate	para-Cresol
13	6/5/2006	2030	6/5/2006	2215	<0.5	.64	E 0.2	<2	<5.0	<1	<1.0	E 0.3
13	2/24/2007	0940	2/24/2007	1400	<2	.23	E 2	<2	<3.2	<1	--	E 2
13	3/29/2007	2315	3/30/2007	0100	<2	.52	<2	<2	<3.2	<1	<32	<2
13	4/25/2007	1700	4/25/2007	2225	<2	E .23	E 1	<2	<3.2	<1	<32	E 2
13	6/30/2007	0900	6/30/2007	1645	E .02	.42	E .04	<2	<3.2	<1	<32	<2
16	10/20/2005	0130	10/20/2005	0415	<5	2.4	E 2	<2	<5.0	<1	<1.0	<1
16	4/28/2006	1320	4/28/2006	1600	E .06	1.6	<5	E .4	E .96	<1	<1.0	E .03
16	4/29/2006	2140	4/30/2006	0155	E .04	.52	E .02	<2	<5.0	<1	<1.0	E .04
16	6/5/2006	2015	6/5/2006	2300	<5	1.8	E .07	<2	<5.0	<1	<1.0	E .6
16	2/24/2007	0815	2/24/2007	1500	<2	.77	E 2	<2	E 1.6	E 2	--	E .07
16	3/29/2007	2240	3/30/2007	0135	<2	.97	<2	E 1	<1.5	<1	<32	<2
16	4/25/2007	1700	4/25/2007	2355	<2	E .80	E .09	<2	<3.2	<1	<32	E .4
16	4/25/2007	1701	4/25/2007	2356	<2	E .62	E .1	<2	<3.2	<1	<32	E .3
16	6/30/2007	0915	6/30/2007	1530	E .04	1.6	<2	<2	<3.2	<1	<32	<2
16	6/30/2007	0916	6/30/2007	1531	E .03	1.4	<2	<2	<3.2	<1	<32	<2
19	10/19/2005	2000	10/20/2005	0300	<5	.64	1	E 10	E 4.2	E .3	<1.0	E 2
19	6/5/2006	2030	6/5/2006	2140	<5	E .44	E 2	E 3	E 1.8	<1	<1.0	E .4
19	6/10/2006	2150	6/11/2006	0055	<5	E .41	E .1	E 2	E 1.4	<1	<1.0	<1
19	6/24/2006	1505	6/24/2006	1805	<5	E .52	E .6	E 2	E 2.8	<1	<1.0	E .1
19	6/24/2006	1506	6/24/2006	1806	<5	.57	.6	E 2	E 2.5	<1	<1.0	E .1
19	2/28/2007	1920	2/28/2007	2320	<2	E .12	E .6	<10	<3.7	<1	<84	.3
19	3/1/2007	0550	3/1/2007	0630	<2	E .10	E .05	<2	<3.2	<1	<32	.5
19	4/25/2007	1730	4/25/2007	2100	<2	E .10	<2	<2	<3.2	<1	<32	E 2
19	6/18/2007	1050	6/18/2007	1130	<2	.61	E .06	E 2	E 1.4	<4	<1.4	E .1
22	4/24/2006	0715	4/24/2006	1215	E .09	E .33	E .03	E 1	E 2.1	<1	E .21	E .07
22	4/28/2006	1615	4/29/2006	0815	E .07	E .070	E .01	<2	<5.0	E .9	E 3.0	<1
22	6/6/2006	1030	6/6/2006	1100	E .03	E .11	<5	<2	<5.0	<1	<1.0	<1
22	6/25/2006	0700	6/25/2006	1805	<5	E .36	E .03	<2	<5.0	<1	<1.0	<1
22	2/24/2007	0945	2/25/2007	0345	<2	E .10	E .1	<2	<3.2	<1	--	<2
22	3/29/2007	2315	3/30/2007	0915	<2	E .19	<2	<2	<3.2	<1	<32	<2

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Pentachloro-phenol	Phenanthrene	Phenol	Prometon	Pyrene	Sitosterol	Stigmastanol	Tetra-chloro-ethylene
2	4/24/2006	0115	4/24/2006	1045	E 0.33	E 0.13	<0.5	<0.5	E 0.26	E 1.9	<2	<0.5
2	4/29/2006	0430	4/29/2006	0915	<2.0	E .020	<.5	E .05	E .020	<2.0	<2	<.5
2	6/5/2006	2145	6/6/2006	0545	<2.0	E .080	<.5	<.5	E .17	<2.0	<2	<.5
2	7/11/2006	2130	7/12/2006	0515	<2.0	E .060	<.5	<.5	E .18	<2.0	<2	<.5
2	7/12/2006	0805	7/12/2006	0830	<2.0	<.50	<.5	<.5	E .010	<2.0	<2	<.5
2	2/24/2007	1200	2/24/2007	1900	<.80	.46	<.2	<.2	.57	<.80	<.8	<.4
2	3/30/2007	1030	3/31/2007	0130	<.80	<.44	<.2	<.2	<.51	<.80	<.8	<.4
2	4/25/2007	1815	4/26/2007	0000	<.80	<.20	<.2	<.2	<.20	<1.6	<.8	<.4
2	5/7/2007	0930	--	--	<.80	<.20	<.2	<.2	<.20	<.80	<.8	<.4
6	10/20/2005	0115	10/20/2005	1145	<2.0	.52	E .1	<.5	.96	E 1.6	<2	<.5
6	4/28/2006	1430	4/28/2006	2045	E .30	E .24	<.5	E .06	E .33	E 1.0	<2	<.5
6	4/29/2006	2200	4/30/2006	0525	E .30	1.0	<.5	E .06	1.8	2.1	<2	<.5
6	4/29/2006	2201	4/30/2006	0526	E .29	.87	<.5	E .06	1.5	E 1.4	<2	<.5
6	6/5/2006	2015	6/6/2006	0640	E .55	.98	<.5	<.5	2.2	E 1.5	<2	<.5
6	2/24/2007	0915	2/25/2007	0630	E .13	5.1	<.2	<.2	7.8	E 2.1	<.8	<.4
6	3/30/2007	0120	3/30/2007	0910	<.80	<.95	<.2	<.2	<1.5	E 1.2	<.8	<.4
6	4/25/2007	1700	4/26/2007	0830	<.80	E .28	<.2	<.2	E .55	<.87	<.8	<.4
6	5/7/2007	1100	--	--	<.80	.31	<.2	<.2	.52	E 1.2	<.8	<.4
7	4/24/2006	0230	4/24/2006	1015	E .35	E .81	<.5	<.5	E 1.4	E 3.3	<2	<.5
7	4/28/2006	1500	4/28/2006	2045	<2.0	E .090	<.5	E .06	E .14	<2.0	<2	<.5
7	4/28/2006	2345	4/29/2006	1500	E .29	E .20	<.5	E .06	E .33	<2.0	<2	<.5
7	6/5/2006	2130	6/6/2006	0445	E .51	2.2	<.5	<.5	4.8	E 2.3	<2	<.5
7	2/24/2007	0945	2/25/2007	0700	<.80	3.0	<.2	<.2	4.5	E 1.2	<.8	<.4
7	2/24/2007	0946	2/25/2007	0701	<.80	3.8	<.2	<.2	5.6	E 1.1	<.8	<.4
7	2/24/2007	0947	2/25/2007	0702	E 12	4.1	1	3	5.7	E 7.4	E 7	E 2
7	4/25/2007	1800	4/25/2007	2215	E .58	E 2.7	<.2	<.2	E 5.1	E 2.2	<.8	<.4
7	5/7/2007	1200	--	--	<.80	E .060	<.2	<.2	E .10	E .76	<.8	<.4
12	6/28/2007	1015	6/28/2007	--	E .13	E .15	<.2	<.2	E .28	E .32	<.8	<.4
12	6/28/2007	1016	6/28/2007	--	E 3.5	.74	E .1	.9	1.1	E 2.9	E 2	E .5
12	6/28/2007	1021	6/28/2007	--	E 3.7	1.1	E .1	2	1.5	E 5.5	E 4	E .9
13	10/20/2005	0200	10/20/2005	0320	E .23	.79	E .1	<.5	1.0	3.5	<2	<.5
13	11/21/2005	1000	--	--	<2.0	<.50	<.5	<.5	<.50	<2.0	<2	<.5
13	4/28/2006	1255	4/28/2006	1530	E .32	E .35	<.5	E .06	E .49	2.8	<2	<.5
13	4/29/2006	2130	4/30/2006	0005	E .35	2.8	<.5	E .11	5.0	9.1	<2	<.5

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Pentachloro-phenol	Phen-anthrene	Phenol	Prometon	Pyrene	Sitosterol	Stigmastanol	Tetra-chloro-ethylene
13	6/5/2006	2030	6/5/2006	2215	E 0.54	7.1	<0.5	E 0.05	12	E 5.9	<2	<0.5
13	2/24/2007	0940	2/24/2007	1400	E .26	7.3	.2	<2	E 9.9	E 1.8	<.8	<.4
13	3/29/2007	2315	3/30/2007	0100	E .34	2.0	<2	<2	E 3.5	E 4.9	E .6	<.4
13	4/25/2007	1700	4/25/2007	2225	E .55	E 5.2	<2	<2	E 10	E 3.4	<.8	<.4
13	6/30/2007	0900	6/30/2007	1645	E .15	.54	<2	<2	1.3	E .67	<.8	<.4
16	10/20/2005	0130	10/20/2005	0415	<2.0	1.2	E .3	<.5	1.6	3.3	<2	<.5
16	4/28/2006	1320	4/28/2006	1600	E .31	E .14	<.5	E .05	E .14	2.4	<2	<.5
16	4/29/2006	2140	4/30/2006	0155	E .34	E .15	<.5	E .08	E .21	E 1.7	<2	<.5
16	6/5/2006	2015	6/5/2006	2300	E .56	4.5	<.5	<.5	8.2	E 9.9	E 1	<.5
16	2/24/2007	0815	2/24/2007	1500	E .52	2.4	E .2	<2	4.7	E 3.6	<.8	<.4
16	3/29/2007	2240	3/30/2007	0135	E .66	2.5	<2	<2	E 4.5	E 4.3	E 1	E .01
16	4/25/2007	1700	4/25/2007	2355	E .59	E 4.4	<2	<2	E 8.5	E 7.1	<.8	<.4
16	4/25/2007	1701	4/25/2007	2356	E .59	E 3.4	<2	<2	E 6.5	E 5.2	<.8	<.4
16	6/30/2007	0915	6/30/2007	1530	E .15	.24	<2	E .02	.54	E .52	<.8	<.4
16	6/30/2007	0916	6/30/2007	1531	E .13	E .19	<2	<2	.44	E .49	<.8	<.4
19	10/19/2005	2000	10/20/2005	0300	E .38	9.5	.7	<.5	12	20	4	<.5
19	6/5/2006	2030	6/5/2006	2140	E .60	E 4.9	<.5	<.5	E 8.5	E 7.1	E 1	<.5
19	6/10/2006	2150	6/11/2006	0055	E 1.3	7.0	<.5	<.5	10	E 3.9	<2	<.5
19	6/24/2006	1505	6/24/2006	1805	E .50	E 6.4	<.5	<.5	E 12	E 5.6	E .8	<.5
19 ¹	6/24/2006	1506	6/24/2006	1806	E .49	4.8	<.5	<.5	10	6.7	E .7	<.5
19	2/28/2007	1920	2/28/2007	2320	E .62	E 20	.3	<2	E 33	E 12	E 2	E .02
19	3/1/2007	0550	3/1/2007	0630	E .18	<.21	.2	E .03	<.26	E .98	<.8	<.4
19	4/25/2007	1730	4/25/2007	2100	E .59	E .46	<2	<2	E .88	E 1.9	<.8	<.4
19	6/18/2007	1050	6/18/2007	1130	E .16	.82	E .1	<2	1.8	E 12	E 1	<.4
22	4/24/2006	0715	4/24/2006	1215	E .52	E .30	<.5	<.5	E .43	3.4	E 1	<.5
22	4/28/2006	1615	4/29/2006	0815	<2.0	E .060	<.5	<.5	E .090	<2.0	<2	<.5
22	6/6/2006	1030	6/6/2006	1100	<2.0	E .13	<.5	<.5	E .27	<2.0	<2	<.5
22	6/25/2006	0700	6/25/2006	1805	<2.0	E .22	<.5	<.5	E .36	<2.0	<2	<.5
22	2/24/2007	0945	2/25/2007	0345	E .16	3.6	<2	<2	5.0	E 1.7	<.8	<.4
22	3/29/2007	2315	3/30/2007	0915	E .28	<1.0	<2	<2	<2.2	E 2.6	E .4	<.4

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Tribromo-methane	Tributyl phosphate	Triclosan	Triethyl citrate	Triphenyl phosphate	Tris (2-butoxyethyl) phosphate	Tris (2-chloroethyl) phosphate	Tris (dichloro-propyl) phosphate
2	4/24/2006	0115	4/24/2006	1045	<0.5	<0.50	<1.0	<0.5	E 0.05	E 0.19	E 0.13	E 0.10
2	4/29/2006	0430	4/29/2006	0915	<.5	E .060	<1.0	E .05	E .04	E .18	E .070	E .070
2	6/5/2006	2145	6/6/2006	0545	<.5	2.2	<1.0	<.5	<.5	E .25	E .10	<.50
2	7/11/2006	2130	7/12/2006	0515	<.5	.73	<1.0	<.5	<.5	<.50	E .10	<.50
2	7/12/2006	0805	7/12/2006	0830	<.5	<.50	<1.0	<.5	<.5	<.50	<.50	<.50
2	2/24/2007	1200	2/24/2007	1900	<.2	<.20	<.20	<.2	<.2	<.20	<.20	<.20
2	3/30/2007	1030	3/31/2007	0130	<.2	<.20	<.20	<.2	<.2	<.20	<.20	<.20
2	4/25/2007	1815	4/26/2007	0000	<.2	<.20	<.20	<.2	<.2	<.20	<.20	<.20
2	5/7/2007	0930	--	--	<.2	<.20	<.20	<.2	<.2	<.20	<.20	<.20
6	10/20/2005	0115	10/20/2005	1145	<.5	E .10	E .13	<.5	<.5	.73	.64	<.50
6	4/28/2006	1430	4/28/2006	2045	<.5	E .080	E .15	E .1	E .08	1.0	.52	E .16
6	4/29/2006	2200	4/30/2006	0525	<.5	<.50	E .14	<.5	E .07	.78	E .37	E .11
6	4/29/2006	2201	4/30/2006	0526	<.5	E .030	E .15	E .06	E .05	.59	E .27	E .09
6	6/5/2006	2015	6/6/2006	0640	<.5	E .070	E .11	<.5	E .04	E .64	E .39	E .14
6	2/24/2007	0915	2/25/2007	0630	<.2	<.20	E .18	<.2	E .07	E .70	.30	E .080
6	3/30/2007	0120	3/30/2007	0910	<.2	<.20	<.20	<.2	<.2	<.41	E .28	<.20
6	4/25/2007	1700	4/26/2007	0830	<.2	<.20	<.20	<.2	<.2	<.20	<.20	<.20
6	5/7/2007	1100	--	--	<.2	<.20	<.20	<.2	<.2	E .25	<.20	E .050
7	4/24/2006	0230	4/24/2006	1015	<.5	E .070	E .25	E .09	E .05	E .56	E .29	E .14
7	4/28/2006	1500	4/28/2006	2045	<.5	E .080	E .25	E .09	<.5	.79	E .29	E .14
7	4/28/2006	2345	4/29/2006	1500	<.5	E .090	E .13	E .06	<.5	.55	E .22	E .10
7	6/5/2006	2130	6/6/2006	0445	<.5	E .36	E .16	E .05	E .04	E .54	E .18	E .080
7	2/24/2007	0945	2/25/2007	0700	<.2	<.20	E .080	<.2	<.2	E .35	E .13	<.20
7	2/24/2007	0946	2/25/2007	0701	<.2	<.20	E 0	<.2	<.2	E .35	E .12	<.20
7	2/24/2007	0947	2/25/2007	0702	E 3	E 2.8	E 3.5	3	2	E 3.1	2.9	2.7
7	4/25/2007	1800	4/25/2007	2215	<.2	<.20	E .090	<.2	<.2	E .21	E .15	<.20
7	5/7/2007	1200	--	--	<.2	<.20	<.20	<.2	<.2	E .12	<.20	E .030
12	6/28/2007	1015	6/28/2007	--	<.2	E .030	<.20	.2	E .03	E .51	E .070	E .060
12	6/28/2007	1016	6/28/2007	--	E .7	E .94	1.0	.8	.8	E 1.7	.85	.99
12	6/28/2007	1021	6/28/2007	--	E 1	E 2.0	1.7	1	1	E 2.1	1.6	1.7
13	10/20/2005	0200	10/20/2005	0320	<.5	<.50	<1.0	<.5	<.5	.95	E .10	<.50
13	11/21/2005	1000	--	--	<.5	<.50	<1.0	<.5	<.5	<.50	<.50	<.50
13	4/28/2006	1255	4/28/2006	1530	<.5	E .060	<1.0	<.5	E .09	.71	E .090	E .090
13	4/29/2006	2130	4/30/2006	0005	<.5	<.50	<1.0	<.5	<.5	.56	<.50	E .080

Table 11. Concentrations of selected organic wastewater compounds in stormflow samples collected between May 2005 and June 2007.—Continued

[All concentrations in units of micrograms per liter; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Tribromo-methane	Tributyl phosphate	Triclosan	Triethyl citrate	Triphenyl phosphate	Tris (2-bu-toxyethyl) phosphate	Tris (2-chlo-roethyl) phosphate	Tris (dichlo-riso-propyl) phosphate
13	6/5/2006	2030	6/5/2006	2215	<.5	<.5	<1.0	<.5	E.05	E.036	E.050	E.080
13	2/24/2007	0940	2/24/2007	1400	<.2	<.2	<.20	<.2	E.09	E.14	E.040	E.050
13	3/29/2007	2315	3/30/2007	0100	<.2	<.2	<.20	<.2	<.2	E.72	<.20	<.20
13	4/25/2007	1700	4/25/2007	2225	<.2	<.2	<.20	<.2	<.2	E.37	<.20	<.20
13	6/30/2007	0900	6/30/2007	1645	<.2	<.2	<.20	<.2	E.04	E.67	E.020	E.070
16	10/20/2005	0130	10/20/2005	0415	<.5	<.5	E.18	<.5	E.07	1.1	E.18	<.50
16	4/28/2006	1320	4/28/2006	1600	<.5	E.06	E.13	E.05	E.07	.88	E.090	E.090
16	4/29/2006	2140	4/30/2006	0155	<.5	E.04	E.090	<.5	<.5	.64	<.50	E.090
16	6/5/2006	2015	6/5/2006	2300	<.5	<.5	E.25	<.5	E.05	.88	E.090	E.090
16	2/24/2007	0815	2/24/2007	1500	<.2	<.2	E.15	<.2	E.1	E.16	E.070	E.10
16	3/29/2007	2240	3/30/2007	0135	<.2	E.1	.24	E.1	<.2	E.81	E.13	<.20
16	4/25/2007	1700	4/25/2007	2355	<.2	<.2	E.12	<.2	<.2	E.11	<.20	E.050
16	4/25/2007	1701	4/25/2007	2356	<.2	<.2	E.12	<.2	<.2	E.50	<.20	E.070
16	6/30/2007	0915	6/30/2007	1530	<.2	E.03	E.090	<.2	E.04	E.28	E.090	E.070
16	6/30/2007	0916	6/30/2007	1531	<.2	E.03	E.060	<.2	E.04	E.25	E.11	E.070
19	10/19/2005	2000	10/20/2005	0300	<.5	<.5	2.3	<.5	<.5	5.1	E.17	E.12
19	6/5/2006	2030	6/5/2006	2140	<.5	<.5	E.90	<.5	E.06	E.67	E.10	<.50
19	6/10/2006	2150	6/11/2006	0055	<.5	<.5	E.52	<.5	E.06	E.12	E.090	<.50
19	6/24/2006	1505	6/24/2006	1805	<.5	<.5	E.72	<.5	E.07	E.94	E.070	E.12
19	6/24/2006	1506	6/24/2006	1806	<.5	<.5	E.86	<.5	E.08	.75	E.070	<.50
19	2/28/2007	1920	2/28/2007	2320	<.2	<.2	E.114	<.2	E.1	E.19	E.060	E.13
19	3/1/2007	0550	3/1/2007	0630	<.2	<.2	E.14	<.2	<.2	E.82	E.11	<.20
19	4/25/2007	1730	4/25/2007	2100	<.2	<.2	E.22	<.2	<.2	E.21	<.20	E.040
19	6/18/2007	1050	6/18/2007	1130	<.2	<.2	1.3	E.04	E.05	E.92	E.10	E.12
22	4/24/2006	0715	4/24/2006	1215	<.5	E.08	E.26	E.09	E.06	.93	E.19	E.18
22	4/28/2006	1615	4/29/2006	0815	<.5	E.03	<1.0	<.5	<.5	E.41	<.50	E.070
22	6/6/2006	1030	6/6/2006	1100	<.5	E.3	<1.0	<.5	<.5	E.18	E.020	E.060
22	6/25/2006	0700	6/25/2006	1805	<.5	E.09	E.070	<.5	E.04	E.27	E.050	E.10
22	2/24/2007	0945	2/25/2007	0345	<.2	<.2	E.14	<.2	<.2	E.47	E.050	E.11
22	3/29/2007	2315	3/30/2007	0915	<.2	<.2	E.18	<.2	<.2	E.72	<.20	<.20

¹Replicate samples.²Field equipment blank.

Table 12. Concentrations of selected pharmaceutical compounds in base-flow samples collected between May 2005 and March 2007.

[All concentrations in units of micrograms per liter from filtered samples except for site 26 which is bottom sediment data measured in micrograms per kilogram; <, less than; E, estimated; nd, not detected]

Site number (fig. 1)	Date	Time	1,7-dimethylxanthine	Acetaminophen	Caffeine	Carbamazepine	Codeine	Cotinine	Dehydronifedipine	Diltiazem
2	5/3/2005	1030	<0.021	<0.024	<0.015	0.023	<0.022	E 0.004	<0.022	<0.018
2	8/1/2005	0930	<0.021	<0.024	.052	.038	<0.022	.021	.005	<0.018
2	10/6/2005	0940	<0.021	<0.024	<.223	.017	<0.022	.007	<0.022	<0.018
2	3/29/2006	1045	<0.021	<0.024	.023	E .010	E .004	E .007	<0.022	<0.018
2	11/1/2006	1330	<0.021	<0.024	<0.015	<0.018	<0.022	<0.028	<0.022	<0.018
2	3/7/2007	1400	<0.021	E .009	E .014	E .008	<0.022	<0.028	<0.022	<0.018
6	5/3/2005	1400	.256	.115	1.36	.066	.047	.089	<0.022	.030
6	8/1/2005	1345	.233	.351	1.30	.072	.015	.099	<0.022	<0.018
6	10/11/2005	1000	<0.021	<0.024	<0.015	<0.018	<0.022	<0.028	<0.022	<0.018
6	10/11/2005	1130	.482	.516	1.88	.048	.022	.083	<0.022	.015
6	10/11/2005	1131	.568	.520	2.10	.051	.022	.090	<0.022	<0.018
6	3/29/2006	0945	.671	1.38	4.07	.023	E .026	.123	<0.022	E .006
6	3/29/2006	0946	.735	1.87	3.80	.024	E .027	.117	<0.022	E .006
6	11/1/2006	1200	.420	.538	4.46	E .083	<0.022	.108	<0.022	<0.018
6	3/7/2007	1315	.798	2.05	3.87	.046	E .010	.092	<0.022	E .010
7	5/3/2005	1200	.092	.057	.521	.042	.027	.052	<0.022	<0.018
7	8/1/2005	1045	.055	.079	.396	.055	.008	.072	<0.022	<0.018
7	10/6/2005	1245	.066	.196	.493	.023	.006	.048	<0.022	<0.018
7	3/29/2006	1230	.183	.259	1.22	E .015	<0.022	.048	<0.022	E .003
7	11/2/2006	1215	.190	.220	1.45	E .051	<0.022	.054	<0.022	<0.018
7	3/8/2007	1230	.126	.406	.860	.021	<0.022	.030	<0.022	E .003
12	8/16/2007	0915	<0.021	<0.024	.016	E .003	<0.022	E .014	<0.022	<0.018
13	5/10/2005	1045	<0.021	<0.024	.473	<0.018	<0.022	.050	<0.022	<0.018
13	5/10/2005	1046	<0.021	<0.024	.473	<0.018	<0.022	.050	<0.022	<0.018
13	8/3/2005	0945	<0.021	E .004	.043	<0.018	<0.022	.014	<0.022	<0.018
13	10/13/2005	0945	<0.021	.013	<.223	<0.018	<0.022	<0.028	<0.022	<0.018
13	3/30/2006	0945	<0.021	.095	.410	<0.018	<0.022	.055	<0.022	<0.018
13	11/1/2006	1015	<0.021	E .020	.055	<0.018	<0.022	<0.028	<0.022	<0.018
13	12/14/2006	1330	<0.021	.070	.049	<0.018	<0.022	<0.028	<0.022	<0.018
13	3/7/2007	1130	.054	.044	.549	E .003	<0.022	E .018	<0.022	<0.018
15	8/3/2005	1100	<0.021	.029	.572	<0.018	<0.022	.030	<0.022	<0.018
16	5/11/2005	1030	<0.021	.074	1.11	<0.018	<0.022	<0.028	<0.022	<0.018
16	8/11/2005	0930	<0.021	<0.024	.120	<0.018	<0.022	.036	<0.022	<0.018
16	10/13/2005	1045	.027	.042	.407	.008	<0.022	<0.037	<0.022	<0.018
16	3/30/2006	1100	.054	.205	1.63	<0.018	<0.022	.088	<0.022	<0.018
16	10/31/2006	1245	<.075	.319	.765	<0.018	<0.022	E .016	<0.022	<0.018
16	12/15/2006	1230	<0.021	.130	.734	<0.018	<0.022	E .026	<0.022	<0.018
16	3/7/2007	1045	.779	4.81	4.48	.021	<0.022	.137	<0.022	<0.018
19	10/12/2005	1100	<0.021	E .006	<.223	<0.018	E .003	<0.028	<0.022	<0.018
19	12/13/2005	1100	E .223	.075	E .540	<0.02	E .007	.069	<0.022	<0.018
19	3/30/2006	1245	.212	.236	1.46	.018	<0.022	.123	<0.022	<0.018
19	10/31/2006	1045	.883	22.9	6.75	E .039	<0.022	E .233	<0.022	<0.018
19	10/31/2006	1046	.824	32.9	E7.86	<0.041	<0.022	E .404	<0.022	<0.018
19	3/7/2007	0945	1.719	7.55	7.64	.088	<0.022	.228	<0.022	<0.018
22	5/4/2005	1145	.18	<0.024	.483	.034	.018	.047	<0.022	.033
22	8/2/2005	0930	<0.021	<0.024	.462	.030	<0.022	.078	<0.022	<0.018
22	10/6/2005	1120	E .035	.080	E .243	.017	<0.022	<0.029	<0.022	<0.018
22	3/29/2006	1400	<.030	.129	.612	E .017	E .005	.044	<0.022	<0.018
22	11/2/2006	1015	.149	.318	1.20	E .022	<0.022	.059	<0.022	<0.018
22	3/8/2007	1000	.223	.655	1.13	E .017	<0.022	.042	<0.022	E .003
22	3/8/2007	1001	.200	.645	1.18	<0.018	<0.022	.039	<0.022	E .003
26	8/30/2006	1115	nd	E .024	.126	nd	nd	nd	nd	nd

Table 12. Concentrations of selected pharmaceutical compounds in base-flow samples collected between May 2005 and March 2007.—Continued

[All concentrations in units of micrograms per liter from filtered samples except for site 26 which is bottom sediment data measured in micrograms per kilogram; <, less than; E, estimated; nd, not detected]

Site number (fig. 1)	Date	Time	Diphenhydramine	Fluoxetine	Ranitidine	Salbutamol	Sulfamethoxazole	Thiabendazole	Trimethoprim	Warfarin
2	5/3/2005	1030	<0.023	<0.016	<0.025	<0.014	0.110	<0.025	0.041	<0.019
2	8/1/2005	0930	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
2	10/6/2005	0940	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
2	3/29/2006	1045	<.023	<.016	<.025	<.014	.030	<.025	.037	<.019
2	11/1/2006	1330	<.023	<.016	<.025	<.014	E .015	<.025	<.020	<.019
2	3/7/2007	1400	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
6	5/3/2005	1400	.041	<.016	<.025	E .001	.118	<.025	.112	<.019
6	8/1/2005	1345	<.023	<.016	<.025	.011	<.024	<.025	.036	<.019
¹ 6	10/11/2005	1000	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
6	10/11/2005	1130	<.023	<.016	<.025	<.014	.168	<.025	.026	<.019
² 6	10/11/2005	1131	<.023	<.016	<.025	<.014	.201	<.025	.029	<.019
6	3/29/2006	0945	<.023	<.016	<.025	<.014	<.024	<.025	.054	<.019
² 6	3/29/2006	0946	<.023	<.016	<.025	<.014	<.024	<.025	.064	<.019
6	11/1/2006	1200	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
6	3/7/2007	1315	E .007	<.016	<.025	<.014	.134	<.025	.067	<.019
7	5/3/2005	1200	<.023	<.016	<.025	<.014	.144	<.025	<.020	<.019
7	8/1/2005	1045	<.023	<.016	<.025	<.014	.218	<.025	.035	<.019
7	10/6/2005	1245	<.023	<.016	<.025	<.014	<.024	<.025	.01	<.019
7	3/29/2006	1230	<.023	<.016	<.025	<.014	.041	<.025	.037	<.019
7	11/2/2006	1215	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
7	3/8/2007	1230	<.023	<.016	<.025	<.014	E .019	<.025	<.020	<.019
12	8/16/2007	0915	<.023	<.016	<.025	<.014	E .004	<.025	<.020	<.019
13	5/10/2005	1045	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
² 13	5/10/2005	1046	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
13	8/3/2005	0945	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
13	10/13/2005	0945	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
13	3/30/2006	0945	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
13	11/1/2006	1015	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
13	12/14/2006	1330	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
13	3/7/2007	1130	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
15	8/3/2005	1100	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
16	5/11/2005	1030	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
16	8/11/2005	0930	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
16	10/13/2005	1045	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
16	3/30/2006	1100	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
16	10/31/2006	1245	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
16	12/15/2006	1230	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
16	3/7/2007	1045	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
19	10/12/2005	1100	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
19	12/13/2005	1100	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
19	3/30/2006	1245	<.023	<.016	<.025	<.014	<.024	<.025	E .008	<.019
19	10/31/2006	1045	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
² 19	10/31/2006	1046	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
19	3/7/2007	0945	E .003	<.016	<.025	<.014	.166	<.025	.131	<.019
22	5/4/2005	1145	<.023	<.016	<.025	<.014	.129	<.025	.041	<.019
22	8/2/2005	0930	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
22	10/6/2005	1120	<.023	<.016	<.025	<.014	E .243	<.025	<.020	<.019
22	3/29/2006	1400	<.023	<.016	<.025	<.014	E .019	<.025	.031	<.019
22	11/2/2006	1015	<.023	<.016	<.025	<.014	<.024	<.025	<.020	<.019
22	3/8/2007	1000	<.023	<.016	<.025	<.014	.035	<.025	<.020	<.019
² 22	3/8/2007	1001	<.023	<.016	<.025	<.014	E .018	<.025	<.020	<.019
26	8/30/2006	1115	nd	nd	nd	nd	nd	nd	nd	nd

¹Field equipment blank

²Replicate sample

Table 13. Concentrations of selected pharmaceutical compounds in stormflow samples collected between April 2006 and October 2007.

[All concentrations in units of micrograms per liter from filtered samples; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	1,7-dimethyl-xanthine	Acetaminophen	Caffeine	Carbamazepine	Codeine	Cotinine	Dehydronifedipine	Diltiazem	Diphenhydramine
2	4/24/2006	0115	4/24/2006	1045	<.021	E .014	0.118	<.018	<.022	<.028	<.022	<.018	<.023
2	7/11/2006	2130	7/12/2006	0515	<.021	E .004	.0355	<.018	<.022	<.028	<.022	<.018	<.023
2	7/12/2006	0805	7/12/2006	0830	<.021	<.024	<.0150	<.018	<.022	<.028	<.022	<.018	<.023
2	2/24/2007	1200	2/24/2007	1900	<.021	E .003	.0186	E .0040	<.022	<.028	<.022	<.018	<.023
6	4/29/2006	2200	4/30/2006	0525	.027	.077	.382	E .0050	<.022	.030	<.022	<.018	<.023
6	4/29/2006	2201	4/30/2006	0526	.026	.074	.382	E .0040	<.022	.030	<.022	<.018	<.023
6	2/24/2007	0915	2/25/2007	0630	<.021	.096	.684	E .014	<.022	.087	<.022	<.018	<.023
7	4/24/2006	0230	4/24/2006	1015	.027	.069	.364	<.018	<.022	<.028	<.022	<.018	<.023
7	4/28/2006	2345	4/29/2006	1500	.034	E .114	.341	<.018	<.022	<.028	<.022	<.018	<.023
7	2/24/2007	0945	2/25/2007	0700	<.021	E .012	.0696	E .0080	<.022	<.028	<.022	<.018	<.023
7	2/24/2007	0946	2/25/2007	0701	<.021	E .015	.0856	E .0080	<.022	<.028	<.022	<.018	<.023
12	6/28/2007	1015	--	--	<.021	E .024	.490	<.018	<.022	E .025	<.022	<.018	<.023
12	10/22/2007	1015	--	--	<.10	E .041	.227	<.040	<.040	E .029	<.060	<.040	<.023
213	11/21/2005	1000	--	--	<.021	<.024	<.015	<.018	<.022	<.028	<.022	<.018	<.023
13	4/29/2006	2130	4/30/2006	0005	.023	E .199	.291	<.018	<.022	<.028	<.022	<.018	<.023
13	12/14/2006	1330											
13	2/24/2007	0940	2/24/2007	1400	<.021	.059	.499	<.018	<.022	.076	<.022	<.018	<.023
16	4/29/2006	2140	4/30/2006	0155	.057	E .509	.435	<.018	<.022	<.028	<.022	<.018	<.023
16	12/15/2006												
16	2/24/2007	0815	2/24/2007	1500	<.021	.165	.944	<.018	<.022	.065	<.022	<.018	<.023
19	6/10/2006	2150	6/11/2006	0055	.051	E 1.04	E .420	<.018	<.022	.059	<.022	<.018	<.023
19	6/24/2006	1505	6/24/2006	1805	.049	.749	.910	<.018	<.022	.041	<.022	<.018	<.023
19	6/24/2006	1506	6/24/2006	1806	.051	.762	.890	<.018	<.022	.041	<.022	<.018	<.023
19	2/28/2007	1920	2/28/2007	2320	.12	.224	.999	E .041	<.022	.070	<.022	<.018	<.023
19	3/1/2007	0550	3/1/2007	0630	.15	.627	.438	E .016	<.022	.040	<.022	<.018	<.023
22	4/24/2006	0715	4/24/2006	1215	.032	.077	.359	<.018	<.022	<.028	<.022	<.018	<.023
22	2/24/2007	0945	2/25/2007	0345	<.021	.049	.186	E .011	<.022	E .012	<.022	<.018	<.023

Table 13. Concentrations of selected pharmaceutical compounds in stormflow samples collected between April 2006 and October 2007.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; E, estimated; --, no data]

Site number (fig. 1)	Start date	Start time	End date	End time	Fluoxetine	Ranitidine	Salbutamol	Sulfamethoxazole	Thiabendazole	Trimethoprim	Warfarin
2	4/24/2006	0115	4/24/2006	1045	<0.016	<0.025	<0.014	<0.024	<0.025	E 0.007	<0.019
2	7/11/2006	2130	7/12/2006	0515	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
2	7/12/2006	0805	7/12/2006	0830	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
2	2/24/2007	1200	2/24/2007	1900	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
6	4/29/2006	2200	4/30/2006	0525	<0.016	<0.025	<0.014	<0.024	<0.025	E 0.007	<0.019
16	4/29/2006	2201	4/30/2006	0526	<0.016	<0.025	<0.014	<0.024	<0.025	E 0.006	<0.019
6	2/24/2007	0915	2/25/2007	0630	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
7	4/24/2006	0230	4/24/2006	1015	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
7	4/28/2006	2345	4/29/2006	1500	<0.016	<0.025	<0.014	<0.024	<0.025	E 0.007	<0.019
7	2/24/2007	0945	2/25/2007	0700	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
17	2/24/2007	0946	2/25/2007	0701	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
12	6/28/2007	1015	--	--	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
12	10/22/2007	1015	--	--	<0.016	<0.025	<0.040	<0.100	<0.040	<0.020	<0.060
213	11/21/2005	1000	--	--	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
13	4/29/2006	2130	4/30/2006	0005	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
13	12/14/2006	1330									
13	2/24/2007	0940	2/24/2007	1400	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
16	4/29/2006	2140	4/30/2006	0155	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
16	2/24/2007	0815	2/24/2007	1500	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
19	6/10/2006	2150	6/11/2006	0055	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
19	6/24/2006	1505	6/24/2006	1805	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
19	6/24/2006	1506	6/24/2006	1806	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
19	2/28/2007	1920	2/28/2007	2320	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
19	3/1/2007	0550	3/1/2007	0630	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
22	4/24/2006	0715	4/24/2006	1215	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019
22	2/24/2007	0945	2/25/2007	0345	<0.016	<0.025	<0.014	<0.024	<0.025	<0.020	<0.019

¹Replicate samples.²Field equipment blank.

Table 17. Regression models for estimating concentrations and densities of selected constituents in water from 1998 through 2007.

[RMSE, root mean square error; R², coefficient of determination; mg/L, milligrams per liter; Ln, natural logarithm; FLOW, discharge; Sin, sine; Cos, cosine; --, no data because of poor model fit; sites 2 and 6, 2003–07; sites 7, 13, 16, and 22, 1998–2007]

Site number (fig. 1)	Station ID	Regression model	RMSE	R ²
Organic nitrogen (OrgN), mg/L				
2	06893150	$\text{Ln}(\text{OrgN}) = 1.31\text{Ln}(\text{FLOW}) - 0.078\text{Time} + 6.14$	0.57	96.4
6	06893400	$\text{Ln}(\text{OrgN}) = 1.18\text{Ln}(\text{FLOW}) - 0.001\text{Time} + 7.18$	.57	94.6
7	06893500	$\text{Ln}(\text{OrgN}) = 1.27\text{Ln}(\text{FLOW}) + 0.103\text{Ln}(\text{FLOW}^2) + 0.024\text{Time} - 0.015\text{Time}^2 + 0.089\text{Sin}(\text{Time}) + 0.014\text{Cos}(\text{Time}) + 6.43$	.39	97.0
13	06893557	$\text{Ln}(\text{OrgN}) = 1.25\text{Ln}(\text{FLOW}) - 0.039\text{Time} + 3.60$	.58	97.6
16	06893562	$\text{Ln}(\text{OrgN}) = 1.12\text{Ln}(\text{FLOW}) + 0.035\text{Ln}(\text{FLOW}^2) - 0.023\text{Time} + 3.81$	.49	97.6
22	06893578	$\text{Ln}(\text{OrgN}) = 1.26\text{Ln}(\text{FLOW}) - 0.026\text{Time} + 6.68$	.41	95.7
Total nitrogen (TotN), mg/L				
2	06893150	$\text{Ln}(\text{TotN}) = 0.963\text{Ln}(\text{FLOW}) + 0.057\text{Ln}(\text{FLOW}^2) - 0.053\text{Time} + 6.88$	.49	95.1
6	06893400	$\text{Ln}(\text{TotN}) = 0.829\text{Ln}(\text{FLOW}) + 0.051\text{Ln}(\text{FLOW}^2) - 0.044\text{Time} + 0.064\text{Time}^2 + 0.081\text{Sin}(\text{Time}) + 0.162\text{Cos}(\text{Time}) + 7.99$	.36	95.9
7	06893500	$\text{Ln}(\text{TotN}) = 0.882\text{Ln}(\text{FLOW}) + 0.101\text{Ln}(\text{FLOW}^2) - 0.026\text{Time} + 7.57$	.30	96.3
13	06893557	$\text{Ln}(\text{TotN}) = 1.22\text{Ln}(\text{FLOW}) - 0.029\text{Ln}(\text{FLOW}^2) - 0.017\text{Time} + 0.123\text{Sin}(\text{Time}) + 0.076\text{Cos}(\text{Time}) + 4.36$	.52	98.0
16	06893562	$\text{Ln}(\text{TotN}) = 1.12\text{Ln}(\text{FLOW}) - 0.002\text{Ln}(\text{Time}) + 0.180\text{Sin}(\text{Time}) + 0.121\text{Cos}(\text{Time}) + 4.52$	.45	98.0
22	06893578	$\text{Ln}(\text{TotN}) = 0.937\text{Ln}(\text{FLOW}) + 0.035\text{Ln}(\text{FLOW}^2) - 0.001\text{Time} + 0.021\text{Sin}(\text{Time}) + 0.121\text{Cos}(\text{Time}) + 7.84$	.34	94.9
Orthophosphate (OrthoP), mg/L				
2	06893150	$\text{Ln}(\text{OrthoP}) = 0.604\text{Ln}(\text{FLOW}) + 0.083\text{Ln}(\text{FLOW}^2) - 0.068\text{Time} + 3.60$	.67	81.6
6	06893400	$\text{Ln}(\text{OrthoP}) = 0.515\text{Ln}(\text{FLOW}) + 0.066\text{Ln}(\text{FLOW}^2) - 0.097\text{Time} + 0.064\text{Time}^2 - 0.212\text{Sin}(\text{Time}) + 0.169\text{Cos}(\text{Time}) + 5.52$	.48	84.1
7	06893500	$\text{Ln}(\text{OrthoP}) = 0.492\text{Ln}(\text{FLOW}) - 0.068\text{Time} + 5.43$	.55	72.2
13	06893557	--	--	--
16	06893562	--	--	--
22	06893578	$\text{Ln}(\text{OrthoP}) = 0.650\text{Ln}(\text{FLOW}) - 0.073\text{Ln}(\text{FLOW}^2) - 0.129\text{Time} + 5.63$	.57	78.4
Dissolved phosphorus (DissP), mg/L				
2	06893150	$\text{Ln}(\text{DissP}) = 0.653\text{Ln}(\text{FLOW}) + 0.078\text{Ln}(\text{FLOW}^2) - 0.049\text{Time} + 3.83$	.59	86.6
6	06893400	$\text{Ln}(\text{DissP}) = 0.521\text{Ln}(\text{FLOW}) + 0.074\text{Ln}(\text{FLOW}^2) - 0.124\text{Time} + 0.073\text{Time}^2 - 0.153\text{Sin}(\text{Time}) + 0.101\text{Cos}(\text{Time}) + 5.54$	.46	86.0
7	06893500	$\text{Ln}(\text{DissP}) = 0.583\text{Ln}(\text{FLOW}) + 0.102\text{Ln}(\text{FLOW}^2) + 0.012\text{Time} - 0.027\text{Time}^2 - 0.116\text{Sin}(\text{Time}) + 0.231\text{Cos}(\text{Time}) + 5.49$	.46	82.0
13	06893557	$\text{Ln}(\text{DissP}) = 1.08\text{Ln}(\text{FLOW}) - 0.008\text{Time} + 0.809$	.57	96.9
16	06893562	$\text{Ln}(\text{DissP}) = 1.02\text{Ln}(\text{FLOW}) - 0.034\text{Ln}(\text{FLOW}^2) + 0.038\text{Time} + 1.48$	.65	94.9
22	06893578	$\text{Ln}(\text{DissP}) = 0.699\text{Ln}(\text{FLOW}) - 0.023\text{Ln}(\text{FLOW}^2) + 0.014\text{Time} - 0.032\text{Time}^2 - 0.015\text{Sin}(\text{Time}) + 0.306\text{Cos}(\text{Time}) + 5.79$	.53	80.3

Table 17. Regression models for estimating concentrations and densities of selected constituents in water from 1998 through 2007.—Continued

[RMSE, root mean square error; R², coefficient of determination; mg/L, milligrams per liter; Ln, natural logarithm; FLOW, discharge; Sin, sine; Cos, cosine; --, no data because of poor model fit; sites 2 and 6, 2003–07; sites 7, 13, 16, and 22, 1998–2007]

Site number (fig. 1)	Station ID	Regression model	RMSE	R ²
Total phosphorus (TotP), mg/L				
2	06893150	$\text{Ln}(\text{TotP}) = 1.14\text{Ln}(\text{FLOW}) + 0.074\text{Ln}(\text{FLOW}^2) - 0.087\text{Time} - 0.348\text{Sin}(\text{Time}) + 5.08$	0.72	92.3
6	06893400	$\text{Ln}(\text{TotP}) = 0.870\text{Ln}(\text{FLOW}) + 0.079\text{Ln}(\text{FLOW}^2) - 0.073\text{Time} + 0.075\text{Time}^2 + 0.087\text{Sin}(\text{Time}) + 0.142\text{Cos}(\text{Time}) + 6.30$	.48	93.5
7	06893500	$\text{Ln}(\text{TotP}) = 0.945\text{Ln}(\text{FLOW}) + 0.176\text{Ln}(\text{FLOW}^2) + 0.023\text{Time} + 5.75$	.47	92.3
13	06893557	$\text{Ln}(\text{TotP}) = 1.32\text{Ln}(\text{FLOW}) - 0.037\text{Time} + 1.94$	.72	96.8
16	06893562	$\text{Ln}(\text{TotP}) = 1.19\text{Ln}(\text{FLOW}) + 0.039\text{Ln}(\text{FLOW}^2) + 0.011\text{Time} + 2.11$	.58	97.0
22	06893578	$\text{Ln}(\text{TotP}) = 1.07\text{Ln}(\text{FLOW}) + 0.059\text{Ln}(\text{FLOW}^2) - 0.023\text{Time} - 0.015\text{Time}^2 + 0.0003\text{Sin}(\text{Time}) + 0.203\text{Cos}(\text{Time}) + 6.24$	.55	90.2
Dissolved organic carbon (DOC), mg/L				
2	06893150	$\text{Ln}(\text{DOC}) = 1.02\text{Ln}(\text{FLOW}) - 0.023\text{Time} + 7.03$	.20	99.1
6	06893400	$\text{Ln}(\text{DOC}) = 0.960\text{Ln}(\text{FLOW}) - 0.003\text{Time} + 8.35$	.17	99.2
7	06893500	$\text{Ln}(\text{DOC}) = 0.980\text{Ln}(\text{FLOW}) - 0.041\text{Time} + 8.13$	.18	99.0
13	06893557	$\text{Ln}(\text{DOC}) = 1.07\text{Ln}(\text{FLOW}) - 0.008\text{Ln}(\text{FLOW}^2) - 0.012\text{Time} - 0.085\text{Time}^2 + 0.088\text{Sin}(\text{Time}) + 0.076\text{Cos}(\text{Time}) + 5.63$	.39	98.8
16	06893562	$\text{Ln}(\text{DOC}) = 1.01\text{Ln}(\text{FLOW}) + 0.009\text{Ln}(\text{FLOW}^2) - 0.042\text{Time} - 0.068\text{Time}^2 + 0.083\text{Sin}(\text{Time}) + 0.036\text{Cos}(\text{Time}) + 5.54$	.35	99.0
22	06893578	$\text{Ln}(\text{DOC}) = 0.111\text{Ln}(\text{FLOW}) - 0.085\text{Time} + 0.001$	.19	98.8
Total organic carbon (TOC), mg/L				
2	06893150	$\text{Ln}(\text{TOC}) = 1.30\text{Ln}(\text{FLOW}) + 0.045\text{Ln}(\text{FLOW}^2) - 0.043\text{Time} + 7.53$	.41	97.8
6	06893400	$\text{Ln}(\text{TOC}) = 1.23\text{Ln}(\text{FLOW}) - 0.044\text{Ln}(\text{FLOW}^2) - 0.005\text{Time} + 9.47$	.46	96.6
7	06893500	$\text{Ln}(\text{TOC}) = 1.30\text{Ln}(\text{FLOW}) + 0.017\text{Time} + 8.98$	.49	95.6
13	06893557	$\text{Ln}(\text{TOC}) = 1.19\text{Ln}(\text{FLOW}) + 0.025\text{Ln}(\text{FLOW}^2) - 0.013\text{Time} + 5.73$	.66	96.7
16	06893562	$\text{Ln}(\text{TOC}) = 1.13\text{Ln}(\text{FLOW}) + 0.039\text{Ln}(\text{FLOW}^2) - 0.025\text{Time} + 5.89$	.65	96.0
22	06893578	$\text{Ln}(\text{TOC}) = 1.22\text{Ln}(\text{FLOW}) + 0.003\text{Ln}(\text{FLOW}^2) - 0.052\text{Time} + 0.032\text{Time}^2 - 0.012\text{Sin}(\text{Time}) - 0.186\text{Cos}(\text{Time}) + 8.70$	.39	96.7
Chemical oxygen demand (COD), mg/L				
2	06893150	$\text{Ln}(\text{COD}) = 1.27\text{Ln}(\text{FLOW}) + 0.071\text{Ln}(\text{FLOW}^2) - 0.050\text{Time} + 8.38$	.45	97.2
6	06893400	$\text{Ln}(\text{COD}) = 1.15\text{Ln}(\text{FLOW}) - 0.042\text{Ln}(\text{FLOW}^2) + 0.048\text{Time} + 0.211\text{Sin}(\text{Time}) - 0.018\text{Cos}(\text{Time}) + 10.4$	.40	97.4
7	06893500	$\text{Ln}(\text{COD}) = 1.29\text{Ln}(\text{FLOW}) - 0.057\text{Time} + 0.185\text{Sin}(\text{Time}) - 0.084\text{Cos}(\text{Time}) + 10.0$	.53	95.3
13	06893557	$\text{Ln}(\text{COD}) = 1.21\text{Ln}(\text{FLOW}) - 0.039\text{Time} + 7.07$	.64	97.0
16	06893562	$\text{Ln}(\text{COD}) = 1.13\text{Ln}(\text{FLOW}) - 0.044\text{Time} + 7.41$	.70	95.2
22	06893578	$\text{Ln}(\text{COD}) = 1.16\text{Ln}(\text{FLOW}) + 0.020\text{Ln}(\text{FLOW}^2) - 0.032\text{Time} + 0.032\text{Time}^2 + 0.089\text{Sin}(\text{Time}) - 0.172\text{Cos}(\text{Time}) + 9.56$	.50	94.0

Table 17. Regression models for estimating concentrations and densities of selected constituents in water from 1998 through 2007.—Continued[RMSE, root mean square error; R², coefficient of determination; mg/L, milligrams per liter; Ln, natural logarithm; FLOW, discharge; Sin, sine; Cos, cosine; --, no data because of poor model fit; sites 2 and 6, 2003–07; sites 7, 13, 16, and 22, 1998–2007]

Site number (fig. 1)	Station ID	Regression model	RMSE	R ²
<i>Escherichia coli</i> (Ecoli), mg/L				
2	06893150	$\text{Ln}(Ecoli) = 2.10\text{Ln}(\text{FLOW}) - 0.111\text{Ln}(\text{FLOW}^2) - 0.225\text{Time} - 0.721\text{Sin}(\text{Time}) - 1.37\text{Cos}(\text{Time}) + 15.5$	1.1	95.7
6	06893400	$\text{Ln}(Ecoli) = 1.93\text{Ln}(\text{FLOW}) - 0.092\text{Ln}(\text{FLOW}^2) + 0.036\text{Time} + 0.279\text{Sin}(\text{Time}) - 0.494\text{Cos}(\text{Time}) + 16.8$	1.1	92.5
7	06893500	$\text{Ln}(Ecoli) = 2.26\text{Ln}(\text{FLOW}) - 0.138\text{Ln}(\text{FLOW}^2) - 0.033\text{Time} - 0.542\text{Sin}(\text{Time}) - 0.552\text{Cos}(\text{Time}) + 16.5$	.94	95.6
13	06893557	$\text{Ln}(Ecoli) = 1.85\text{Ln}(\text{FLOW}) + 0.065\text{Ln}(\text{FLOW}^2) - 0.098\text{Time} - 0.285\text{Time}^2 - 0.453\text{Sin}(\text{Time}) - 0.556\text{Cos}(\text{Time}) + 13.2$	1.6	93.8
16	06893562	$\text{Ln}(Ecoli) = 2.02\text{Ln}(\text{FLOW}) + 0.067\text{Ln}(\text{FLOW}^2) - 0.294\text{Time} - 0.276\text{Time}^2 - 0.947\text{Sin}(\text{Time}) - 0.101\text{Cos}(\text{Time}) + 13.2$	1.5	95.3
22	06893578	$\text{Ln}(Ecoli) = 2.15\text{Ln}(\text{FLOW}) - 0.274\text{Time} - 0.684\text{Sin}(\text{Time}) - 0.763\text{Cos}(\text{Time}) + 16.2$	1.6	85.9
Fecal coliform (Fecoli), mg/L				
2	06893150	$\text{Ln}(\text{Fecoli}) = 2.00\text{Ln}(\text{FLOW}) - 0.085\text{Ln}(\text{FLOW}^2) - 0.319\text{Time} - 0.637\text{Sin}(\text{Time}) - 1.20\text{Cos}(\text{Time}) + 15.7$	1.3	93.4
6	06893400	$\text{Ln}(\text{Fecoli}) = 1.98\text{Ln}(\text{FLOW}) - 0.178\text{Ln}(\text{FLOW}^2) + 0.013\text{Time} - 0.166\text{Sin}(\text{Time}) - 0.972\text{Cos}(\text{Time}) + 17.5$	1.1	95.1
7	06893500	$\text{Ln}(\text{Fecoli}) = 2.26\text{Ln}(\text{FLOW}) - 0.100\text{Ln}(\text{FLOW}^2) - 0.224\text{Time} - 0.492\text{Sin}(\text{Time}) - 0.819\text{Cos}(\text{Time}) + 16.6$	1.1	94.6
13	06893557	$\text{Ln}(\text{Fecoli}) = 1.85\text{Ln}(\text{FLOW}) + 0.038\text{Ln}(\text{FLOW}^2) - 0.134\text{Time} - 0.223\text{Time}^2 - 0.578\text{Sin}(\text{Time}) - 1.15\text{Cos}(\text{Time}) + 13.6$	1.4	95.7
16	06893562	$\text{Ln}(\text{Fecoli}) = 1.97\text{Ln}(\text{FLOW}) + 0.070\text{Ln}(\text{FLOW}^2) - 0.252\text{Time} - 0.272\text{Time}^2 - 0.995\text{Sin}(\text{Time}) - 0.497\text{Cos}(\text{Time}) + 13.6$	1.2	96.8
22	06893578	$\text{Ln}(\text{Fecoli}) = 2.16\text{Ln}(\text{FLOW}) - 0.338\text{Time} - 0.980\text{Sin}(\text{Time}) - 1.18\text{Cos}(\text{Time}) + 16.5$	1.8	83.4
Suspended sediment (Sed), mg/L				
2	06893150	$\text{Ln}(\text{Sed}) = 1.82\text{Ln}(\text{FLOW}) - 0.254\text{Time} + 10.9$	1.1	92.4
6	06893400	$\text{Ln}(\text{Sed}) = 1.99\text{Ln}(\text{FLOW}) - 0.125\text{Ln}(\text{FLOW}^2) - 0.119\text{Time} + 11.8$	1.1	93.3
7	06893500	$\text{Ln}(\text{Sed}) = 1.79\text{Ln}(\text{FLOW}) - 0.158\text{Time} - 0.147\text{Sin}(\text{Time}) - 0.351\text{Cos}(\text{Time}) + 11.5$	.91	93.3
13	06893557	$\text{Ln}(\text{Sed}) = 1.38\text{Ln}(\text{FLOW}) + 0.069\text{Ln}(\text{FLOW}^2) - 0.141\text{Time} + 0.030\text{Time}^2 + 0.305\text{Sin}(\text{Time}) + 0.285\text{Cos}(\text{Time}) + 7.50$	1.0	95.2
16	06893562	$\text{Ln}(\text{Sed}) = 1.44\text{Ln}(\text{FLOW}) + 0.068\text{Ln}(\text{FLOW}^2) - 0.046\text{Time} - 0.048\text{Time}^2 + 0.108\text{Sin}(\text{Time}) + 0.042\text{Cos}(\text{Time}) + 7.43$	1.0	94.3
22	06893578	$\text{Ln}(\text{Sed}) = 1.65\text{Ln}(\text{FLOW}) - 0.170\text{Time} - 0.048\text{Sin}(\text{Time}) - 0.372\text{Cos}(\text{Time}) + 11.7$	.74	93.7
Dissolved nitrate plus nitrite (DissNO ₂ +NO ₃), mg/L				
2	06893150	$\text{Ln}(\text{DissNO}_2 + \text{NO}_3) = 0.674\text{Ln}(\text{FLOW}) + 0.048\text{Ln}(\text{FLOW}^2) - 0.070\text{Time} + 6.05$	.44	92.1
6	06893400	$\text{Ln}(\text{DissNO}_2 + \text{NO}_3) = 0.611\text{Ln}(\text{FLOW}) + 0.042\text{Ln}(\text{FLOW}^2) - 0.068\text{Time} + 0.065\text{Time}^2 - 0.125\text{Sin}(\text{Time}) + 0.148\text{Cos}(\text{Time}) + 7.28$	.40	91.1
7	06893500	$\text{Ln}(\text{DissNO}_2 + \text{NO}_3) = 0.667\text{Ln}(\text{FLOW}) + 0.052\text{Ln}(\text{FLOW}^2) + 0.026\text{Time} - 0.019\text{Time}^2 - 0.103\text{Sin}(\text{Time}) + 0.090\text{Cos}(\text{Time}) + 7.27$	.29	93.6
13	06893557	$\text{Ln}(\text{DissNO}_2 + \text{NO}_3) = 1.23\text{Ln}(\text{FLOW}) - 0.102\text{Ln}(\text{FLOW}^2) + 0.036\text{Time} + 0.105\text{Sin}(\text{Time}) + 0.415\text{Cos}(\text{Time}) + 3.47$	.91	94.2
16	06893562	--	--	--
22	06893578	$\text{Ln}(\text{DissNO}_2 + \text{NO}_3) = 0.739\text{Ln}(\text{FLOW}) - 0.011\text{Ln}(\text{FLOW}^2) + 0.020\text{Time} - 0.019\text{Time}^2 + 0.016\text{Sin}(\text{Time}) + 0.155\text{Cos}(\text{Time}) + 7.51$	.40	89.3

Table 17. Regression models for estimating concentrations and densities of selected constituents in water from 1998 through 2007.—Continued

[RMSE, root mean square error; R², coefficient of determination; mg/L, milligrams per liter; Ln, natural logarithm; FLOW, discharge; Sin, sine; Cos, cosine; --, no data because of poor model fit; sites 2 and 6, 2003–07; sites 7, 13, 16, and 22, 1998–2007]

Site number (fig. 1)	Station ID	Regression model	RMSE	R ²
Dissolved chloride (DissCl), mg/L				
2	06893150	$\text{Ln}(\text{DissCl}) = 0.724\text{Ln}(\text{FLOW}) - 0.019\text{Ln}(\text{FLOW}^2) + 0.015\text{Time} + 0.098\text{Time}^2 + 0.437\text{Sin}(\text{Time}) + 0.195\text{Cos}(\text{Time}) + 9.30$	0.45	94.0
6	06893400	$\text{Ln}(\text{DissCl}) = 0.687\text{Ln}(\text{FLOW}) - 0.019\text{Ln}(\text{Time}) + 0.510\text{Sin}(\text{Time}) + 0.790\text{Cos}(\text{Time}) + 10.9$	.59	84.5
7	06893500	$\text{Ln}(\text{DissCl}) = 0.769\text{Ln}(\text{FLOW}) - 0.065\text{Ln}(\text{Time}) + 0.321\text{Sin}(\text{Time}) + 0.348\text{Cos}(\text{Time}) + 10.5$	.35	94.0
13	06893557	$\text{Ln}(\text{DissCl}) = 0.753\text{Ln}(\text{FLOW}) - 0.021\text{Ln}(\text{FLOW}^2) - 0.034\text{Time} + 0.034\text{Time}^2 + 0.428\text{Sin}(\text{Time}) + 0.751\text{Cos}(\text{Time}) + 7.66$	.68	91.7
16	06893562	$\text{Ln}(\text{DissCl}) = 0.833\text{Ln}(\text{FLOW}) - 0.039\text{Ln}(\text{FLOW}^2) - 0.018\text{Time} + 0.394\text{Sin}(\text{Time}) + 0.724\text{Cos}(\text{Time}) + 8.14$	.83	88.1
22	06893578	$\text{Ln}(\text{DissCl}) = 0.822\text{Ln}(\text{FLOW}) - 0.039\text{Ln}(\text{FLOW}^2) + 0.054\text{Time} + 0.326\text{Sin}(\text{Time}) + 0.404\text{Cos}(\text{Time}) + 10.8$	.37	92.0
Ammonia plus organic nitrogen (Amm+OrgN), mg/L				
2	06893150	$\text{Ln}(\text{Amm+OrgN}) = 1.29\text{Ln}(\text{FLOW}) - 0.077\text{Time} + 6.17$	.59	95.8
6	06893400	$\text{Ln}(\text{Amm+OrgN}) = 1.07\text{Ln}(\text{FLOW}) + 0.027\text{Ln}(\text{FLOW}^2) - 0.020\text{Time} + 0.062\text{Time}^2 + 0.227\text{Sin}(\text{Time}) + 0.185\text{Cos}(\text{Time}) + 7.16$	.46	96.0
7	06893500	$\text{Ln}(\text{Amm+OrgN}) = 1.24\text{Ln}(\text{FLOW}) + 0.106\text{Ln}(\text{FLOW}^2) + 0.024\text{Time} - 0.015\text{Time}^2 + 0.136\text{Sin}(\text{Time}) + 0.146\text{Cos}(\text{Time}) + 6.57$	.41	96.5
13	06893557	$\text{Ln}(\text{Amm+OrgN}) = 1.24\text{Ln}(\text{FLOW}) - 0.035\text{Time} + 3.70$	.55	97.8
16	06893562	$\text{Ln}(\text{Amm+OrgN}) = 1.12\text{Ln}(\text{FLOW}) + 0.031\text{Ln}(\text{FLOW}^2) - 0.021\text{Time} + 0.151\text{Sin}(\text{Time}) + 0.062\text{Cos}(\text{Time}) + 3.95$	.45	98.0
22	06893578	$\text{Ln}(\text{Amm+OrgN}) = 1.21\text{Ln}(\text{FLOW}) - 0.029\text{Time} + 6.86$	.40	95.6
Caffeine (Caf), mg/L				
2	06893150	--	--	--
6	06893400	$\text{Ln}(\text{Caf}) = 0.607\text{Ln}(\text{FLOW}) + 0.049\text{Ln}(\text{FLOW}^2) + 0.084\text{Time} - 0.023\text{Time}^2 - 0.071\text{Sin}(\text{Time}) + 0.400\text{Cos}(\text{Time}) - 1.01$	.55	85.7
7	06893500	$\text{Ln}(\text{Caf}) = 0.815\text{Ln}(\text{FLOW}) + 0.008\text{Time} + 0.200\text{Sin}(\text{Time}) + 0.550\text{Cos}(\text{Time}) - 1.43$	.65	84.2
13	06893557	$\text{Ln}(\text{Caf}) = 1.24\text{Ln}(\text{FLOW}) - 0.066\text{Ln}(\text{FLOW}^2) - 0.115\text{Time} + 0.249\text{Sin}(\text{Time}) + 0.119\text{Cos}(\text{Time}) - 3.94$	.72	96.5
16	06893562	$\text{Ln}(\text{Caf}) = 1.07\text{Ln}(\text{FLOW}) - 0.039\text{Ln}(\text{FLOW}^2) - 0.062\text{Time} + 0.023\text{Time}^2 + 0.302\text{Sin}(\text{Time}) + 0.024\text{Cos}(\text{Time}) - 3.23$	.61	96.2
22	06893578	$\text{Ln}(\text{Caf}) = 0.900\text{Ln}(\text{FLOW}) - 0.092\text{Ln}(\text{FLOW}^2) - 0.072\text{Time} + 0.308\text{Sin}(\text{Time}) + 0.383\text{Cos}(\text{Time}) - 0.881$	.54	88.6
Cholesterol plus coprostanol (Sterol), mg/L				
2	06893150	--	--	--
6	06893400	$\text{Ln}(\text{Sterol}) = 0.695\text{Ln}(\text{FLOW}) - 0.015\text{Time} - 0.073\text{Sin}(\text{Time}) + 0.572\text{Cos}(\text{Time}) + 0.701$	.71	78.68
7	06893500	$\text{Ln}(\text{Sterol}) = 0.726\text{Ln}(\text{FLOW}) + 0.117\text{Ln}(\text{FLOW}^2) - 0.023\text{Time} - 0.031\text{Time}^2 + 0.763\text{Sin}(\text{Time}) + 0.331\text{Cos}(\text{Time}) - 0.336$	.92	70.94
13	06893557	$\text{Ln}(\text{Sterol}) = 1.18\text{Ln}(\text{FLOW}) + 0.039\text{Ln}(\text{FLOW}^2) - 0.108\text{Time} - 3.51$	.89	94.01
16	06893562	$\text{Ln}(\text{Sterol}) = 1.25\text{Ln}(\text{FLOW}) + 0.027\text{Ln}(\text{FLOW}^2) - 0.090\text{Time} - 2.27$	1.1	91.18
22	06893578	$\text{Ln}(\text{Sterol}) = 1.05\text{Ln}(\text{FLOW}) + 0.047\text{Ln}(\text{FLOW}^2) + 0.033\text{Time} - 0.041\text{Time}^2 + 0.257\text{Sin}(\text{Time}) + 0.673\text{Cos}(\text{Time}) + 0.092$	1.1	71.19

Table 17. Regression models for estimating concentrations and densities of selected constituents in water from 1998 through 2007.—Continued[RMSE, root mean square error; R², coefficient of determination; mg/L, milligrams per liter; Ln, natural logarithm; FLOW, discharge; Sin, sine; Cos, cosine; --, no data because of poor model fit; sites 2 and 6, 2003–07; sites 7, 13, 16, and 22, 1998–2007]

Site number (fig. 1)	Station ID	Regression model	RMSE	R ²
n,n-diethyl-meta-toluamide (DEET), mg/L				
2	06893150	$\text{Ln}(\text{DEET}) = 1.03\text{Ln}(\text{FLOW}) - 0.021\text{Ln}(\text{FLOW}^2) - 0.099\text{Time} - 0.078\text{Time}^2 + 0.132\text{Sin}(\text{Time}) - 0.413\text{Cos}(\text{Time}) - 3.23$	0.62	95.3
6	06893400	$\text{Ln}(\text{DEET}) = 0.847\text{Ln}(\text{FLOW}) - 0.064\text{Ln}(\text{FLOW}^2) - 0.064\text{Time} - 0.137\text{Sin}(\text{Time}) - 0.950\text{Cos}(\text{Time}) - 1.90$	.57	92.1
7	06893500	$\text{Ln}(\text{DEET}) = 1.06\text{Ln}(\text{FLOW}) - 0.106\text{Ln}(\text{FLOW}^2) - 0.138\text{Time} - 1.50$	.72	88.3
13	06893557	$\text{Ln}(\text{DEET}) = 1.28\text{Ln}(\text{FLOW}) - 0.031\text{Ln}(\text{FLOW}^2) - 0.071\text{Time} - 0.045\text{Time}^2 - 0.066\text{Sin}(\text{Time}) - 0.369\text{Cos}(\text{Time}) - 4.22$	.55	98.2
16	06893562	$\text{Ln}(\text{DEET}) = 1.34\text{Ln}(\text{FLOW}) - 0.075\text{Time} + 0.048\text{Sin}(\text{Time}) - 0.477\text{Cos}(\text{Time}) - 4.11$	.85	96.0
22	06893578	$\text{Ln}(\text{DEET}) = 1.03\text{Ln}(\text{FLOW}) - 0.160\text{Ln}(\text{FLOW}^2) - 0.111\text{Time} - 0.139\text{Sin}(\text{Time}) - 0.319\text{Cos}(\text{Time}) - 1.84$	.67	87.4
Triclosan (Tri), mg/L				
2	06893150	--	--	--
6	06893400	--	--	--
7	06893500	$\text{Ln}(\text{Tri}) = 0.810\text{Ln}(\text{FLOW}) - 0.129\text{Time} + 0.298\text{Sin}(\text{Time}) + 0.152\text{Cos}(\text{Time}) - 2.36$	.67	83.7
13	06893557	--	--	--
16	06893562	$\text{Ln}(\text{Tri}) = 1.19\text{Ln}(\text{FLOW}) - 0.156\text{Time} - 5.33$	.63	96.5
22	06893578	$\text{Ln}(\text{Tri}) = 1.04\text{Ln}(\text{FLOW}) - 0.152\text{Time} - 2.28$	.63	87.2
Sum of flavor and fragrance compounds (Flav+frag), mg/L				
2	06893150	$\text{Ln}(\text{Flav+frag}) = 0.880\text{Ln}(\text{FLOW}) - 0.075\text{Ln}(\text{FLOW}^2) - 0.066\text{Time} - 0.148\text{Time}^2 - 0.234\text{Sin}(\text{Time}) + 0.673\text{Cos}(\text{Time}) - 2.56$	.74	90.3
6	06893400	$\text{Ln}(\text{Flav+frag}) = 0.758\text{Ln}(\text{FLOW}) + 0.094\text{Ln}(\text{FLOW}^2) + 0.323\text{Time} - 0.162\text{Time}^2 + 0.083\text{Sin}(\text{Time}) + 0.850\text{Cos}(\text{Time}) - 1.46$	.80	88.5
7	06893500	--	--	--
13	06893557	--	--	--
16	06893562	--	--	--
22	06893578	--	--	--
Sum of polycyclic aromatic hydrocarbons (PAHs), mg/L				
2	06893150	--	--	--
6	06893400	--	--	--
7	06893500	--	--	--
13	06893557	$\text{Ln}(\text{PAHs}) = 1.62\text{Ln}(\text{FLOW}) - 0.049\text{Time} - 3.62$	1.4	92.5
16	06893562	$\text{Ln}(\text{PAHs}) = 1.63\text{Ln}(\text{FLOW}) + 0.060\text{Ln}(\text{FLOW}^2) - 0.045\text{Time} + 0.382\text{Time}^2 + 0.378\text{Sin}(\text{Time}) + 0.378\text{Cos}(\text{Time}) - 4.05$	1.1	93.9
22	06893578	$\text{Ln}(\text{PAHs}) = 1.37\text{Ln}(\text{FLOW}) - 0.021\text{Ln}(\text{FLOW}^2) - 0.160\text{Time} + 0.061\text{Time}^2 - 0.006\text{Sin}(\text{Time}) + 0.217\text{Cos}(\text{Time}) - 1.58$	1.3	77.1

Table 17. Regression models for estimating concentrations and densities of selected constituents in water from 1998 through 2007.—Continued

[RMSE, root mean square error; R², coefficient of determination; mg/L, milligrams per liter; Ln, natural logarithm; FLOW, discharge; Sin, sine; Cos, cosine; --, no data because of poor model fit; sites 2 and 6, 2003–07; sites 7, 13, 16, and 22, 1998–2007]

Site number (fig. 1)	Station ID	Regression model	RMSE	R ²
Sum of plastic (PLASTIC) compounds				
2	06893150	$\text{Ln(PLASTIC)} = 1.21\text{Ln(FLOW)} - 0.104\text{Ln(FLOW}^2) - 0.260\text{Time} - 0.251$	1.8	69.5
6	06893400	$\text{Ln(PLASTIC)} = 0.885\text{Ln(FLOW)} - 0.181\text{Time} - 0.499$	1.2	67.0
7	06893500	$\text{Ln(PLASTIC)} = 1.16\text{Ln(FLOW)} - 0.087\text{Ln(FLOW}^2) - 0.141\text{Time} - 0.050\text{Time}^2 + 0.321\text{Sin(Time)} + 0.433\text{Cos(Time)} - 0.492$	1.3	73.2
13	06893557	$\text{Ln(PLASTIC)} = 1.38\text{Ln(FLOW)} - 0.287\text{Time} + 366\text{Sin(Time)} + 0.740\text{Cos(Time)} - 3.367$	1.5	89.0
16	06893562	$\text{Ln(PLASTIC)} = 1.17\text{Ln(FLOW)} - 0.015\text{Ln(FLOW}^2) - 0.153\text{Time} + 0.052\text{Time}^2 + 0.195\text{Sin(Time)} + 0.070\text{Cos(Time)} - 3.01$	.83	94.4
22	06893578	$\text{Ln(PLASTIC)} = 1.14\text{Ln(FLOW)} - 0.086\text{Ln(FLOW}^2) - 0.244\text{Time} - 0.055\text{Time}^2 + 0.318\text{Sin(Time)} + 0.456\text{Cos(Time)} + 0.425$	.81	84.6
Sum of organic wastewater compounds (OWC)				
2	06893150	$\text{Ln(OWC)} = 1.15\text{Ln(FLOW)} - 0.281\text{Time} - 0.399$	1.2	82.3
6	06893400	$\text{Ln(OWC)} = 0.829\text{Ln(FLOW)} - 0.054\text{Time} + 2.24$	.61	87.7
7	06893500	$\text{Ln(OWC)} = 0.982\text{Ln(FLOW)} + 0.0004\text{Time} + 0.345\text{Sin(Time)} + 0.379\text{Cos(Time)} - 1.76$	.86	81.6
13	06893557	$\text{Ln(OWC)} = 1.33\text{Ln(FLOW)} - 0.147\text{Time} + 0.427\text{Sin(Time)} + 0.085\text{Cos(Time)} - 1.40$	1.1	92.4
16	06893562	$\text{Ln(OWC)} = 1.23\text{Ln(FLOW)} - 0.062\text{Time} + 0.191\text{Sin(Time)} - 0.020\text{Cos(Time)} - 0.589$	.65	96.5
22	06893578	$\text{Ln(OWC)} = 1.05\text{Ln(FLOW)} - 0.068\text{Ln(FLOW}^2) - 0.069\text{Time} - 0.033\text{Time}^2 + 0.222\text{Sin(Time)} + 0.396\text{Cos(Time)} + 2.11$	.62	88.0

Table 18. Model (adjusted maximum likelihood estimation method) output for flow-adjusted trends in concentration from 1998 through 2007.

[CI, confidence interval; n, number of observations; nC, number of censored observations; --, no data because of poor model fit; RMSE, root mean square error; R², coefficient of determination; bold numbers indicate significant flow-adjusted trend existed at site; <, less than]

Site number (fig.1)	Station ID	Reference concentration, in milligrams per liter (unless noted)	Flow-adjusted trend, in average percent per year				Properties of the calibration data set				Properties of the time term				Properties of the fitted model		
			Water years ¹	Modeled estimate	Upper 95 percent CI	Lower 95 percent CI	Start date	End date	n	nC	Central value of flow	Coef- ficient	Standard deviation	p-value	Central value of time	RMSE	R ²
Total nitrogen																	
2	06893150	4.39	2003–2007	-4.6	4.2	-14.7	11/5/2002	11/1/2007	46	0	130	-0.053	0.047	0.247	2005.27	0.49	95.1
6	06893400	9.12	2003–2007	-4.0	1.5	-10.3	10/27/2002	11/1/2007	74	0	281	-.044	.029	.120	2005.26	.36	95.9
7	06893500	5.42	1999–2007	3.0	4.8	.5	8/20/1998	11/1/2007	101	0	213	.026	.011	.013	2002.98	.30	96.3
13	06893557	1.27	1999–2007	-1.6	2.1	-5.6	8/21/1998	10/31/2007	99	0	13.9	-.017	.019	.351	2003.05	.52	98.0
16	06893562	1.91	1999–2007	-2	3.0	-3.5	8/26/1998	10/31/2007	91	0	17.1	-.002	.016	.897	2003.13	.45	98.0
22	06893578	5.21	1999–2007	-1	2.5	-2.8	9/9/1998	11/1/2007	98	0	236	-.001	.013	.906	2003.15	.34	94.9
Nitrate plus nitrite																	
2	06893150	2.95	2003–2007	-5.94	1.44	-15.5	11/5/2002	11/1/2007	46	0	130	-.070	.042	.087	2005.27	.44	92.1
6	06893400	6.80	2003–2007	-5.73	.011	-13.5	10/27/2002	11/1/2007	72	0	281	-.068	.034	.038	2005.25	.40	91.1
7	06893500	4.25	1999–2007	1.70	4.66	.242	8/20/1998	11/1/2007	100	0	207	.026	.011	.015	2002.99	.29	93.6
13	06893557	.451	1999–2007	4.27	10.4	-3.2	8/21/1998	10/31/2007	99	6	13.9	.036	.034	.272	2003.05	.91	94.2
16	06893562	--	--	--	--	--	--	--	--	--	--	--	--	2003.04	--	--	--
22	06893578	4.05	1999–2007	1.72	5.03	-1.2	9/9/1998	11/7/2007	98	0	236	.020	.015	.182	2003.15	.40	89.3
Dissolved chloride																	
2	06893150	66.8	2003–2007	-62	10.3	-8.08	2/11/2003	11/1/2007	43	0	144	.015	.048	.728	2005.36	.45	94.0
6	06893400	141	2003–2007	-1.80	8.34	-12.1	10/27/2002	11/1/2007	76	0	281	-.019	.051	.703	2005.30	.59	84.5
7	06893500	82.9	1999–2007	8.80	10.0	2.95	7/21/1999	11/1/2007	62	0	241	.065	.018	<.001	2003.39	.35	94.0
13	06893557	130	1999–2007	-2.90	2.54	-9.38	2/25/1999	10/31/2007	75	0	14.9	-.034	.030	.229	2003.24	.68	91.7
16	06893562	125	1999–2007	-1.64	4.92	-8.47	2/26/1999	10/31/2007	74	1	16.1	-.018	.033	.580	2003.24	.83	88.1
22	06893578	90.1	1999–2007	7.01	9.00	1.87	8/19/1999	11/7/2007	76	0	261	.054	.018	.002	2003.46	.37	92.0
Ammonia plus organic nitrogen																	
2	06893150	1.03	2003–2007	-6.36	3.67	-19.0	11/5/2002	11/1/2007	46	0	129.9	-.077	.057	.167	2005.27	.59	95.8
6	06893400	2.32	2003–2007	-1.91	3.84	-9.70	10/27/2002	11/1/2007	72	0	280.7	-.020	.038	.580	2005.25	.46	96.0
7	06893500	1.31	1999–2007	1.70	5.40	-.77	8/20/1998	11/1/2007	101	0	212.6	.024	.015	.099	2002.98	.41	96.5
13	06893557	.739	1999–2007	-3.04	0.43	-7.52	8/21/1998	10/31/2007	99	0	13.86	-.035	.020	.072	2003.05	.55	97.8
16	06893562	1.29	1999–2007	-1.95	1.25	-5.53	8/26/1998	10/31/2007	92	0	17.20	-.021	.017	.194	2003.13	.45	98.0
22	06893578	1.38	1999–2007	-2.52	.14	-5.85	9/9/1998	11/7/2007	98	0	236.3	-.029	.015	.055	2003.15	.40	95.6

Table 18. Model (adjusted maximum likelihood estimation method) output for flow-adjusted trends in concentration from 1998 through 2007.—Continued

[CI, confidence interval; n, number of observations; nC, number of censored observations; --, no data because of poor model fit; RMSE, root mean square error; R², coefficient of determination; bold numbers indicate significant flow-adjusted trend existed at site; <, less than]

Site number number (fig.1)	Station ID	Reference concentration, per liter (unless noted)	Flow-adjusted trend, in average percent per year				Properties of the calibration data set				Properties of the time term				Properties of the fitted model		
			Water years ¹	Modeled estimate	Upper 95 percent CI	Lower 95-percent CI	Start date	End date	n	nC	Central value of flow	Coef- ficient	Standard deviation	p-value	Central value of time	RMSE	R ²
Organic nitrogen																	
2	06893150	0.942	2003–2007	-6.44	3.54	-19.1	11/5/2002	11/1/2007	44	0	131	-0.078	0.057	0.159	2005.29	0.57	96.4
6	06893400	1.48	2003–2007	-1.14	9.43	- 9.70	10/27/2002	11/1/2007	72	0	288	-0.001	.048	.977	2005.29	.57	94.6
7	06893500	1.06	1999–2007	1.75	5.29	- .646	8/20/1998	11/1/2007	100	0	214	.024	.014	.088	2002.98	.39	97.0
13	06893557	.668	1999–2007	-3.31	.238	- 8.09	8/21/1998	10/31/2007	99	0	13.9	-0.039	.021	.058	2003.05	.58	97.6
16	06893562	1.15	1999–2007	-2.07	1.32	- 5.91	8/26/1998	10/31/2007	91	0	17.3	-0.023	.018	.196	2003.13	.49	97.6
22	06893578	1.10	1999–2007	-2.28	0.512	- 5.63	9/9/1998	11/7/2007	97	0	236	-0.026	.015	.093	2003.15	.41	95.7
Total phosphorus																	
2	06893150	.687	2003–2007	-7.03	5.33	-22.6	11/5/2002	11/1/2007	46	0	130	-0.087	.070	.188	2005.27	.72	92.3
6	06893400	1.87	2003–2007	-6.22	.611	-15.3	10/27/2002	11/1/2007	74	0	281	-0.073	.040	.057	2005.26	.48	93.5
7	06893500	.990	1999–2007	2.57	5.70	-1.08	8/20/1998	11/1/2007	101	0	213	.023	.017	.166	2002.98	.47	92.3
13	06893557	.117	1999–2007	-3.15	1.55	-8.95	8/21/1998	10/31/2007	99	1	13.9	-0.037	.026	.150	2003.05	.72	96.8
16	06893562	.192	1999–2007	1.11	5.34	-3.21	8/26/1998	10/31/2007	93	1	17.3	.011	.021	.612	2003.13	.58	97.0
22	06893578	.974	1999–2007	-2.28	2.06	-6.69	9/9/1998	11/1/2007	96	0	237	-0.023	.022	.274	2003.16	.55	90.2
Dissolved phosphorus																	
2	06893150	.395	2003–2007	-4.31	6.49	-16.2	11/5/2002	11/1/2007	46	1	130	-0.049	.057	.373	2005.27	.59	86.6
6	06893400	1.71	2003–2007	-9.31	-4.84	-20.0	10/27/2002	11/1/2007	74	0	281	-0.124	.038	.001	2005.26	.46	86.0
7	06893500	.824	1999–2007	-2.13	4.62	-2.44	8/20/1998	11/1/2007	101	0	213	.012	.017	.451	2002.98	.46	82.0
13	06893557	.064	1999–2007	-7.41	3.47	-5.01	8/21/1998	10/31/2007	99	11	13.9	-0.008	.021	.709	2003.05	.57	96.9
16	06893562	.102	1999–2007	4.51	8.64	-1.08	8/26/1998	10/31/2007	93	9	17.3	.038	.024	.111	2003.13	.65	94.9
22	06893578	.711	1999–2007	.812	5.51	-2.81	9/9/1998	11/1/2007	98	0	236	.014	.021	.473	2003.15	.53	80.3
Orthophosphate																	
2	06893150	.363	2003–2007	-5.77	5.95	-19.6	11/5/2002	11/1/2007	46	0	130	-0.068	.064	.267	2005.27	.67	81.6
6	06893400	1.62	2003–2007	-7.75	-1.83	-17.6	10/27/2002	11/1/2007	74	0	281	-0.097	.040	.012	2005.26	.48	84.1
7	06893500	.887	2003–2007	-5.75	5.26	-18.8	11/5/2002	11/1/2007	43	0	228	-0.068	.060	.247	2005.26	.55	72.2
13	06893557	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
16	06893562	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22	06893578	.657	2003–2007	-9.52	-1.53	-24.3	10/23/2002	11/1/2007	50	0	254	-0.129	.057	.021	2005.25	.57	78.4

Table 18. Model (adjusted maximum likelihood estimation method) output for flow-adjusted trends in concentration from 1998 through 2007.—Continued

[CI, confidence interval; n, number of observations; nC, number of censored observations; --, no data because of poor model fit; RMSE, root mean square error; R², coefficient of determination; bold numbers indicate significant flow-adjusted trend existed at site; <, less than]

Site number (fig.1)	Station ID	Reference concentration, in milligrams per liter (unless noted)	Flow-adjusted trend, in average percent per year				Properties of the calibration data set				Properties of the time term				"Properties of the fitted model"		
			Water years ¹	Modeled estimate	Upper 95 percent CI	Lower 95-percent CI	Start date	End date	n	nC	Central value of flow	Coef- ficient	Standard deviation	p-value	Central value of time	RMSE	R ²
Escherichia coli ²																	
2	06893150	191	2003–2007	-13.5	-1.45	-43.5	11/5/2002	11/1/2007	46	0	143	-0.225	0.105	0.026	2005.32	1.06	95.7
6	06893400	479	2003–2007	7.24	28.1	-15.8	10/27/2002	11/1/2007	57	0	279	.062	.110	.560	2005.37	1.15	93.5
7	06893500	379	2003–2007	-3.05	17.9	-24.5	11/5/2002	11/1/2007	43	0	276	-.033	.106	.739	2005.29	.941	95.6
13	06893557	477	2003–2007	-3.78	25.0	-42.3	11/6/2002	10/31/2007	45	0	14.5	-.098	.174	.538	2005.35	1.59	93.8
16	06893562	260	2003–2007	-13.6	3.32	-59.2	11/6/2002	10/31/2007	41	0	16.4	-.294	.163	.053	2005.37	1.52	95.3
22	06893578	987	2003–2007	-14.9	6.86	-61.7	11/7/2002	11/1/2007	50	1	315	-.274	.171	.096	2005.30	1.59	85.9
Fecal coliform ²																	
2	06893150	355	2003–2007	-16.0	-6.16	-57.7	11/5/2002	11/1/2007	45	1	145	-.319	.129	.010	2005.34	1.27	93.4
6	06893400	526	2003–2007	1.29	21.6	-19.1	10/27/2002	11/1/2007	62	0	288	.013	.102	.090	2005.44	1.05	95.1
7	06893500	461	2003–2007	-13.5	5.17	-49.9	11/5/2002	11/1/2007	38	0	287	-.224	.138	.086	2005.38	1.07	94.6
13	06893557	485	2003–2007	-3.98	22.5	-44.7	11/6/2002	10/31/2007	41	1	14.5	-.129	.177	.418	2005.43	1.36	95.7
16	06893562	343	2003–2007	-10.2	5.16	-50.7	11/6/2002	10/31/2007	38	0	16.1	-.252	.150	.068	2005.45	1.25	96.8
22	06893578	1,814	2003–2007	-16.3	6.03	-73.6	11/7/2002	11/1/2007	49	2	324	-.338	.199	.078	2005.33	1.77	83.4
Suspended sediment																	
2	06893150	69.0	2003–2007	-14.4	-2.95	-47.8	11/5/2002	11/1/2007	45	0	132	-.254	.112	.023	2005.30	1.15	92.4
6	06893400	21.0	2003–2007	-8.98	7.45	-31.3	10/27/2002	11/1/2007	68	0	289	-.119	.097	<.001	2005.13	1.10	93.3
7	06893500	80.4	1999–2007	-8.43	-6.98	-24.6	8/19/1999	11/1/2007	80	0	247	-.158	.041	.001	2003.39	0.908	93.3
13	06893557	65.7	1999–2007	-8.21	-5.93	-22.4	5/17/1999	10/31/2007	89	0	14.1	-.141	.042	.001	2003.39	1.00	95.2
16	06893562	31.3	1999–2007	-2.61	3.38	-12.2	5/16/1999	10/31/2007	80	0	16.8	-.046	.044	.268	2003.42	1.03	94.3
22	06893578	99.4	1999–2007	-8.71	-10.6	-23.5	8/19/1999	11/1/2007	86	0	280	-.170	.032	<.001	2003.54	.741	93.7
Total organic carbon																	
2	06893150	7.51	2003–2007	-3.83	5.04	-13.5	11/5/2002	11/1/2007	32	0	80.5	-.043	.046	.331	2005.26	.41	97.8
6	06893400	12.4	2003–2007	-53.1	8.81	-9.89	10/27/2002	11/1/2007	40	0	245	-.005	.047	.903	2005.19	.46	96.6
7	06893500	11.1	1999–2007	1.81	6.20	-2.85	9/12/1999	11/1/2007	74	0	225	.017	.023	.451	2003.53	.49	95.6
13	06893557	7.84	1999–2007	-1.25	4.35	-7.00	5/17/1999	10/31/2007	84	0	14.3	-.013	.028	.632	2003.34	.66	96.7
16	06893562	11.0	1999–2007	-2.20	2.69	-7.60	5/15/1999	10/31/2007	81	0	15.9	-.025	.026	.733	2003.30	.65	96.0
22	06893578	10.0	1999–2007	-5.23	-1.87	-8.93	11/23/1999	11/1/2007	81	0	242	-.052	.018	.004	2003.54	.39	96.7

Table 18. Model (adjusted maximum likelihood estimation method) output for flow-adjusted trends in concentration from 1998 through 2007.—Continued

[CI, confidence interval; n, number of observations; nC, number of censored observations; --, no data because of poor model fit; RMSE, root mean square error; R², coefficient of determination; bold numbers indicate significant flow-adjusted trend existed at site; <, less than]

Site number (fig.1)	Station ID	Reference concentration, in milligrams per liter (unless noted)	Flow-adjusted trend, in average percent per year				Properties of the calibration data set				Properties of the time term				“Properties of the fitted model”		
			Water years ¹	Modeled estimate	Upper 95 percent CI	Lower 95-percent CI	Start date	End date	n	nC	Central value of flow	Coef- ficient	Standard deviation	p-value	Central value of time	RMSE	R ²
Dissolved organic carbon																	
2	06893150	5.69	2003–2007	-2.13	2.21	-6.72	11/5/2002	11/1/2007	32	0	80.5	-0.023	0.022	0.293	2005.26	0.20	99.1
6	06893400	7.69	2003–2007	-2.93	3.18	-3.77	10/27/2002	11/1/2007	39	0	227	-0.003	.017	.860	2005.19	.17	99.2
7	06893500	6.19	2003–2007	-3.73	0.114	-8.38	11/5/2002	11/1/2007	40	0	234	-.041	.021	.048	2005.33	.18	99.0
13	06893557	5.92	2003–2007	-2.83	5.75	-8.84	10/23/2002	10/31/2007	50	0	14.3	-.012	.035	.718	2005.14	.39	98.8
16	06893562	6.87	2003–2007	-2.54	3.59	-11.4	11/6/2002	10/31/2007	40	0	14.9	-.042	.039	.236	2005.36	.35	99.0
22	06893578	5.92	2003–2007	-4.60	-1.21	-9.25	10/23/2002	11/1/2007	46	0	259	-.052	.020	.009	2005.30	.19	98.8
Chemical oxygen demand																	
2	06893150	20.8	2003–2007	-4.40	5.31	-15.3	11/5/2002	11/1/2007	33	1	79.7	-.050	.051	.265	2005.27	.45	97.2
6	06893400	38.4	2003–2007	5.37	12.7	-3.17	10/27/2002	11/1/2007	41	0	242	.048	.040	.305	2005.19	.40	97.4
7	06893500	30.6	1999–2007	-4.47	.244	-11.7	9/12/1999	11/1/2007	61	2	232	-.057	.030	.048	2003.49	.53	95.3
13	06893557	24.3	1999–2007	-3.27	1.92	-9.66	5/17/1999	10/31/2007	77	4	14.0	-.039	.029	.095	2003.30	.64	97.0
16	06893562	43.8	1999–2007	-3.65	1.26	-10.1	5/15/1999	10/31/2007	74	1	15.3	-.044	.028	.115	2003.27	.70	95.2
22	06893578	26.9	1999–2007	-3.94	1.67	-8.41	11/23/1999	11/7/2007	76	2	248	-.032	.026	.108	2003.51	.50	94.0
Caffeine ³																	
2	06893150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6	06893400	1.80	2003–2007	2.04	16.7	-2.86	12/17/1999	11/1/2007	49	1	235	.084	.039	.024	2003.86	.55	85.7
7	06893500	0.603	1999–2007	.848	6.98	-5.34	8/20/1999	11/1/2007	66	3	237	.008	.031	.783	2003.13	.65	84.2
13	06893557	236	1999–2007	-7.17	-5.34	-17.7	8/21/1998	10/31/2007	78	2	14.7	-.115	.031	<.001	2003.09	.72	96.5
16	06893562	812	1999–2007	-4.56	-.928	-11.4	8/28/1998	10/31/2007	81	0	19.0	-.062	.026	.014	2003.17	.61	96.2
22	06893578	.606	1999–2007	-5.28	-2.33	-12.0	9/9/1998	11/7/2007	73	1	287	-.072	.024	<.001	2003.28	.54	88.6
Cholesterol plus coprostanol ³																	
2	06893150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6	06893400	6.96	2003–2007	-1.43	7.70	-10.7	12/17/1999	11/1/2007	51	2	234	-.015	.046	.736	2003.88	0.705	78.7
7	06893500	2.58	1999–2007	-2.26	7.34	-11.1	8/20/1998	11/1/2007	66	16	237	-.018	.045	.594	2003.13	.924	72.4
13	06893557	1.06	1999–2007	-6.91	-2.97	-18.6	8/21/1998	10/31/2007	78	18	14.7	-.108	.039	.005	2003.09	.894	94.0
16	06893562	2.57	1999–2007	-5.12	1.23	-15.0	8/28/1998	10/31/2007	81	12	19.0	-.069	.041	.087	2003.17	1.06	91.2
22	06893578	2.18	1999–2007	4.16	13.5	-6.86	9/9/1998	11/7/2007	73	16	287	.033	.051	.504	2003.28	1.08	71.2

Table 18. Model (adjusted maximum likelihood estimation method) output for flow-adjusted trends in concentration from 1998 through 2007.—Continued

[CI, confidence interval; n, number of observations; nC, number of censored observations; --, no data because of poor model fit; RMSE, root mean square error; R², coefficient of determination; bold numbers indicate significant flow-adjusted trend existed at site; <, less than]

Site number number (fig.1)	Station ID	Reference concentration, in milligrams per liter (unless noted)	Flow-adjusted trend, in average percent per year				Properties of the calibration data set				Properties of the time term				"Properties of the fitted model"		
			Water years ¹	Modeled estimate	Upper 95 percent CI	Lower 95-percent CI	Start date	End date	n	nC	Central value of flow	Coef- ficient	Standard deviation	p-value	Central value of time	RMSE	R ²
2	06893150	0.134	2003–2007	-10.2	5.48	-27.0	10/11/2000	11/1/2007	29	1	94	-0.099	0.076	0.146	2004.77	0.62	95.3
6	06893400	.316	2003–2007	-5.41	2.29	-15.1	2/14/2000	11/1/2007	47	0	238	-0.064	.044	.120	2003.96	.57	92.1
7	06893500	.355	1999–2007	-2.63	6.88	-11.5	2/14/2000	11/1/2007	46	1	237	-0.023	.045	.001	2003.13	.72	88.3
13	06893557	.136	1999–2007	-1.91	-0.271	-12.7	2/16/2000	10/31/2007	48	0	15.1	-0.071	.033	.026	2003.80	.55	98.2
16	06893562	.275	1999–2007	-7.40	-2.05	-12.7	2/16/2000	10/31/2007	47	0	17.4	-0.075	.045	.083	2003.74	.85	96.0
22	06893578	.239	1999–2007	-7.00	-3.92	-18.2	2/15/2000	11/7/2007	55	0	232	-0.111	.036	.002	2003.63	.67	87.4
Triclosan ³																	
2	06893150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6	06893400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7	06893500	.243	1999–2007	-7.63	- 6.41	-19.4	12/3/1998	11/1/2007	62	6	245	-0.129	.032	<.001	2003.27	.67	83.7
13	06893557	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
16	06893562	.084	1999–2007	-8.39	-10.6	-20.7	12/2/1998	10/31/2007	79	14	18.7	-0.156	.025	<.001	2003.22	.63	96.5
22	06893578	.164	1999–2007	-8.28	-9.51	-20.9	9/9/1998	11/1/2007	66	5	276	-0.152	.028	<.001	2003.36	.63	87.2
Sum of flavor and fragrance compounds ³																	
2	06893150	.249	2003–2007	-13.8	8.39	-27.7	8/22/2000	11/1/2007	38	8	90.2	-0.066	.082	.397	2004.46	.74	90.3
6	06893400	.881	2003–2007	-4.13	40.0	13.3	12/17/1999	11/1/2007	51	6	234	.323	.060	<.001	2003.88	.80	88.5
7	06893500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	06893557	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
16	06893562	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
22	06893578	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sum of polycyclic aromatic hydrocarbons ³																	
2	06893150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
6	06893400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
7	06893500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
13	06893557	.357	1999–2007	-3.99	6.32	-16.20	8/21/1998	10/31/2007	77	7	14.7	-0.049	.056	.373	2003.08	1.36	92.5
16	06893562	.250	1999–2007	-3.71	5.14	-14.18	8/28/1998	10/31/2007	81	6	19.0	-0.045	.048	.332	2003.17	1.14	93.9
22	06893578	.468	1999–2007	-8.21	-4.48	-27.33	9/9/1998	11/7/2007	73	7	288	-0.160	.057	.004	2003.16	1.26	77.1

Table 18. Model (adjusted maximum likelihood estimation method) output for flow-adjusted trends in concentration from 1998 through 2007.—Continued

[CI, confidence interval; n, number of observations; nC, number of censored observations; --, no data because of poor model fit; RMSE, root mean square error; R², coefficient of determination; bold numbers indicate significant flow-adjusted trend existed at site; <, less than]

Site number (fig.1)	Station ID	Reference concentration, in milligrams per liter (unless noted)	Flow-adjusted trend, in average percent per year				Properties of the calibration data set				Properties of the time term				"Properties of the fitted model"		
			Water years ¹	Modeled estimate	Upper 95 percent CI	Lower 95 percent CI	Start date	End date	n	nC	Central value of flow	Coef-ficient	Standard deviation	p-value			Central value of time
Sum of plastic compounds ³																	
2	06893150	0.642	2003–2007	-14.1	13.1	-65.2	8/22/2000	11/1/2007	38	9	90.2	-0.260	0.196	0.146	2004.46	1.80	69.5
6	06893400	1.99	2003–2007	-11.5	-2.90	-33.3	12/17/1999	11/1/2007	51	2	234	-.181	.076	.006	2003.88	1.17	67.0
7	06893500	3.00	1999–2007	-8.30	-1.88	-26.6	8/20/1998	11/1/2007	66	0	237	-.141	.061	.017	2003.13	1.28	73.2
13	06893557	1.09	1999–2007	-10.3	-16.0	-41.4	8/21/1998	10/31/2007	77	11	14.7	-.287	.064	<.001	2003.08	1.47	89.0
16	06893562	1.21	1999–2007	-8.08	-8.04	-22.3	8/28/1998	10/31/2007	81	1	19.0	-.153	.035	<.001	2003.17	.83	94.4
22	06893578	1.57	1999–2007	-9.84	-17.1	-31.6	9/9/1998	11/7/2007	73	1	287	-.244	.036	<.001	2003.28	.81	84.6
Sum of organic wastewater compounds ³																	
2	06893150	4.14	2003–2007	-14.6	-6.27	-50.0	08/22/2000	11/1/2007	38	0	90.2	-.281	.109	.010	2004.46	1.17	82.3
6	06893400	25.2	2003–2007	-4.71	2.45	-13.3	12/17/1999	11/1/2007	49	0	234	-.054	.039	.159	2003.88	.61	87.7
7	06893500	14.4	1999–2007	0.037	8.17	-8.09	8/20/1998	11/1/2007	66	0	237	.000	.041	.992	2003.13	.86	81.6
13	06893557	5.28	1999–2007	-8.16	-5.59	-23.9	8/21/1998	10/31/2007	78	0	14.7	-.147	.046	.001	2003.09	1.10	93.0
16	06893562	9.01	1999–2007	-4.76	-1.29	-11.1	8/28/1998	10/31/2007	81	0	19.0	-.062	.025	.011	2003.17	.65	96.5
22	06893578	9.41	1999–2007	-5.02	-1.31	-12.4	9/9/1998	11/7/2007	73	0	287	-.069	.028	.011	2003.28	.62	88.0

¹Water year is from October 1 to September 30.

²Reference concentration in colonies per 100 milliliter.

³Reference concentration in micrograms per milliliter.

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Blue River at Blue Ridge Boulevard (site 2)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	--	--	--	--	--	--	--	--	--	--	--	--
November 2001	--	--	--	--	--	--	--	--	--	--	--	--
December 2001	--	--	--	--	--	--	--	--	--	--	--	--
January 2002	--	--	--	--	--	--	--	--	--	--	--	--
February 2002	--	--	--	--	--	--	--	--	--	--	--	--
March 2002	--	--	--	--	--	--	--	--	--	--	--	--
April 2002	--	--	--	--	--	--	--	--	--	--	--	--
May 2002	--	--	--	--	--	--	--	--	--	--	--	--
June 2002	18,624	10,609	30,418	3,161	1,097	7,227	--	--	--	1.01	.383	2.18
July 2002	3,133	1,946	4,785	432	190	848	--	--	--	.090	.038	.181
August 2002	2,894	1,765	4,484	470	204	933	--	--	--	.070	.029	.143
September 2002	2,575	1,536	4,061	491	206	997	--	--	--	.050	.020	.104
October 2002	3,751	2,487	5,436	761	364	1,410	--	--	--	.067	.032	.124
November 2002	3,111	2,039	4,552	586	272	1,108	--	--	--	.039	.017	.075
December 2002	3,481	2,331	5,006	583	268	1,114	--	--	--	.044	.018	.090
January 2003	3,054	2,003	4,466	419	183	828	--	--	--	.037	.015	.079
February 2003	4,796	3,040	7,206	657	259	1,388	--	--	--	.128	.046	.286
March 2003	4,300	2,908	6,133	462	209	889	--	--	--	.128	.058	.245
April 2003	11,472	7,463	16,886	1,473	671	2,825	--	--	--	.686	.322	1.29
May 2003	13,585	9,241	19,279	1,692	826	3,094	--	--	--	.873	.440	1.56
June 2003	13,881	9,732	19,212	1,900	1,016	3,252	--	--	--	.983	.502	1.74
July 2003	3,164	2,101	4,581	399	191	740	--	--	--	.115	.055	.214
August 2003	44,254	15,389	101,063	20,243	3,369	67,706	--	--	--	1.44	.308	4.30
September 2003	16,081	9,989	24,559	4,143	1,551	9,042	--	--	--	.781	.312	1.64
October 2003	3,625	2,521	5,051	707	369	1,231	--	--	--	.075	.034	.144
November 2003	3,521	2,464	4,879	660	335	1,172	--	--	--	.059	.024	.124
December 2003	20,829	14,850	28,424	4,577	2,051	8,883	--	--	--	.674	.229	1.56
January 2004	9,072	6,651	12,090	1,455	720	2,635	--	--	--	.262	.101	.561
February 2004	13,523	9,206	19,180	2,054	914	4,006	--	--	--	.547	.218	1.15
March 2004	139,834	70,742	249,292	39,558	10,946	103,063	--	--	--	4.36	1.35	10.7
April 2004	13,003	9,627	17,182	1,459	810	2,431	--	--	--	.796	.431	1.35
May 2004	128,382	50,411	271,800	38,294	7,629	117,987	--	--	--	5.37	1.73	12.9
June 2004	24,477	16,261	35,419	3,990	1,829	7,625	--	--	--	1.95	.958	3.56
July 2004	37,178	21,213	60,643	9,207	2,915	22,227	--	--	--	2.45	1.06	4.87
August 2004	42,246	23,220	70,878	13,827	4,169	34,337	--	--	--	2.13	.801	4.64
September 2004	16,154	10,846	23,174	4,026	1,732	8,027	--	--	--	.802	.325	1.66

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Cholesterol plus coprostanol (kg)				Suspended sediment (kg)				<i>Escherichia coli</i> (billions of colonies)				Fecal coliform (billions of colonies)			
	Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%	
October 2001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
November 2001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
December 2001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
June 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
July 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
August 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
September 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
October 2002	--	--	--	--	55,084	12,306	160,512	--	1,918	305	6,543	--	4,479	455	18,191	--
November 2002	--	--	--	--	18,709	5,523	47,021	--	147	32	434	--	461	66	1,647	--
December 2002	--	--	--	--	23,382	7,445	56,271	--	84	20	235	--	288	45	993	--
January 2003	--	--	--	--	15,628	4,964	37,664	--	31	7	88	--	116	17	410	--
February 2003	--	--	--	--	292,148	29,658	1,186,819	--	3,993	388	16,466	--	8,784	478	43,145	--
March 2003	--	--	--	--	109,495	19,771	353,116	--	1,541	245	5,261	--	3,643	349	15,099	--
April 2003	--	--	--	--	1,410,623	249,873	4,588,828	--	83,738	15,386	267,909	--	151,466	16,885	594,990	--
May 2003	--	--	--	--	1,296,700	186,500	4,613,917	--	115,524	15,104	427,126	--	199,263	15,768	879,228	--
June 2003	--	--	--	--	1,059,625	280,560	2,827,581	--	178,035	45,040	486,743	--	292,423	49,065	974,513	--
July 2003	--	--	--	--	42,924	6,874	145,978	--	5,449	782	19,411	--	10,144	880	43,457	--
August 2003	--	--	--	--	41,575,763	2,145,932	207,015,968	--	9,030,789	521,828	43,658,603	--	12,180,984	368,290	68,283,032	--
September 2003	--	--	--	--	2,949,613	259,706	12,576,580	--	822,325	70,977	3,529,143	--	1,132,811	54,907	5,729,963	--
October 2003	--	--	--	--	36,491	8,123	106,526	--	1,526	227	5,351	--	3,221	306	13,391	--
November 2003	--	--	--	--	28,650	8,219	73,167	--	299	64	889	--	787	114	2,791	--
December 2003	--	--	--	--	2,158,155	610,290	5,555,919	--	41,688	8,209	129,153	--	80,109	9,992	301,673	--
January 2004	--	--	--	--	330,821	90,743	866,050	--	3,300	639	10,306	--	7,402	944	27,635	--
February 2004	--	--	--	--	1,446,041	218,520	5,040,713	--	24,982	3,476	90,103	--	47,672	3,950	207,314	--
March 2004	--	--	--	--	118,561,113	11,592,450	486,871,461	--	1,924,958	226,833	7,407,558	--	3,452,148	224,826	16,145,241	--
April 2004	--	--	--	--	617,842	235,732	1,332,186	--	20,337	6,940	46,977	--	39,102	9,452	109,472	--
May 2004	--	--	--	--	129,035,760	7,215,461	629,295,268	--	10,315,180	775,746	46,236,583	--	15,304,984	606,553	81,145,218	--
June 2004	--	--	--	--	4,378,291	539,199	16,568,639	--	1,037,164	147,362	3,708,943	--	1,399,801	116,209	6,083,462	--
July 2004	--	--	--	--	13,105,235	1,022,636	58,078,191	--	4,688,467	440,349	19,564,260	--	5,753,118	297,147	28,641,282	--
August 2004	--	--	--	--	18,075,735	1,693,124	75,496,364	--	5,440,631	573,722	21,806,219	--	6,641,303	388,676	31,996,699	--
September 2004	--	--	--	--	2,104,618	307,248	7,442,754	--	510,512	68,341	1,869,987	--	663,630	52,404	2,930,114	--

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Date	Blue River at Blue Ridge Boulevard (site 2)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	14,442	10,472	19,428	3,506	1,695	6,453	--	--	--	.555	.215	1.18
November 2004	42,025	29,795	57,622	12,151	5,135	24,525	--	--	--	1.44	.474	3.41
December 2004	20,066	14,349	27,314	4,608	2,032	9,039	--	--	--	.637	.212	1.49
January 2005	54,014	35,209	79,375	14,091	5,121	31,322	--	--	--	1.67	.517	4.08
February 2005	45,178	28,778	67,634	9,250	3,451	20,227	--	--	--	1.71	.640	3.75
March 2005	10,865	8,219	14,094	1,235	683	2,061	--	--	--	.488	.251	.862
April 2005	8,883	6,561	11,764	932	497	1,598	--	--	--	.470	.248	.810
May 2005	13,053	7,915	20,317	1,783	655	3,939	--	--	--	.841	.365	1.67
June 2005	117,697	53,350	226,607	32,668	7,677	92,795	--	--	--	5.64	2.29	11.7
July 2005	4,792	3,473	6,448	607	324	1,041	--	--	--	.224	.105	.423
August 2005	49,370	30,741	75,258	14,853	5,612	32,224	--	--	--	2.44	1.05	4.89
September 2005	13,436	9,717	18,115	2,977	1,494	5,338	--	--	--	.568	.252	1.11
October 2005	11,484	8,325	15,452	2,603	1,293	4,703	--	--	--	.382	.159	.779
November 2005	6,543	4,881	8,590	1,269	687	2,153	--	--	--	.148	.062	.303
December 2005	6,437	4,792	8,467	1,090	581	1,870	--	--	--	.134	.055	.276
January 2006	6,103	4,534	8,042	852	454	1,462	--	--	--	.131	.058	.258
February 2006	4,666	3,413	6,230	531	276	929	--	--	--	.105	.050	.196
March 2006	9,153	6,772	12,102	987	531	1,683	--	--	--	.337	.185	.565
April 2006	21,660	12,826	34,339	3,191	1,150	7,129	--	--	--	1.09	.506	2.05
May 2006	12,458	8,860	17,037	1,400	725	2,455	--	--	--	.674	.358	1.16
June 2006	13,038	8,377	19,382	1,784	739	3,648	--	--	--	.722	.327	1.39
July 2006	14,502	8,043	24,165	2,718	834	6,683	--	--	--	.705	.269	1.52
August 2006	22,464	10,537	42,245	6,729	1,541	19,365	--	--	--	.751	.250	1.76
September 2006	5,548	3,978	7,535	990	536	1,680	--	--	--	.141	.067	.262
October 2006	9,683	6,278	14,292	2,264	899	4,762	--	--	--	.221	.089	.461
November 2006	7,007	4,620	10,201	1,456	625	2,908	--	--	--	.129	.051	.271
December 2006	18,844	12,997	26,438	3,912	1,757	7,578	--	--	--	.392	.168	.784
January 2007	11,383	8,085	15,584	1,772	882	3,195	--	--	--	.230	.110	.427
February 2007	18,720	12,829	26,405	2,704	1,313	4,964	--	--	--	.494	.249	.883
March 2007	30,102	18,187	46,985	4,860	1,723	10,967	--	--	--	.824	.398	1.52
April 2007	42,475	27,739	62,324	6,142	2,771	11,861	--	--	--	1.52	.768	2.71
May 2007	137,845	64,655	259,226	33,847	8,983	90,207	--	--	--	3.22	1.22	6.96
June 2007	100,378	46,372	190,760	29,248	7,798	77,757	--	--	--	2.34	.764	5.55
July 2007	29,568	15,481	51,420	6,070	1,753	15,444	--	--	--	.955	.329	2.19
August 2007	5,524	3,640	8,048	855	394	1,629	--	--	--	.122	.043	.279
September 2007	3,994	2,645	5,796	669	326	1,223	--	--	--	.056	.021	.121

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; --, no data]

Date	Cholesterol plus coprostanol (kg)				Suspended sediment (kg)				<i>Escherichia coli</i> (billions of colonies)				Fecal coliform (billions of colonies)			
	Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%	
October 2004	--	--	--		1,029,687	233,772	2,976,371		104,033	16,396	356,239		154,068	15,366	629,772	
November 2004	--	--	--		7,961,677	1,956,941	22,097,974		382,220	70,579	1,220,101		576,867	66,080	2,243,463	
December 2004	--	--	--		2,031,668	396,808	6,318,515		56,235	8,269	198,281		93,079	8,415	393,411	
January 2005	--	--	--		16,124,412	2,234,164	58,252,970		296,809	39,743	1,087,086		487,860	37,982	2,163,570	
February 2005	--	--	--		12,378,837	1,332,257	49,252,869		217,206	26,148	829,128		363,213	25,083	1,670,142	
March 2005	--	--	--		338,117	138,707	695,859		5,034	1,743	11,526		10,037	2,499	27,671	
April 2005	--	--	--		310,482	68,790	908,483		10,831	1,971	34,805		18,516	2,174	71,344	
May 2005	--	--	--		1,896,500	145,672	8,445,842		234,808	21,147	993,727		313,734	15,476	1,580,057	
June 2005	--	--	--		81,856,698	5,163,309	386,310,789		10,992,505	1,014,153	46,147,487		14,004,428	685,430	70,666,900	
July 2005	--	--	--		79,100	15,069	248,890		13,632	2,062	47,505		19,653	1,874	81,593	
August 2005	--	--	--		15,244,095	2,292,374	53,248,188		5,089,425	823,864	17,228,176		5,657,241	539,032	23,491,701	
September 2005	--	--	--		786,168	167,233	2,346,963		139,256	25,360	447,353		179,793	20,884	695,612	
October 2005	--	--	--		561,306	114,527	1,709,810		61,995	9,053	219,210		83,597	7,621	352,349	
November 2005	--	--	--		101,993	37,286	225,880		2,231	641	5,694		4,170	847	12,729	
December 2005	--	--	--		95,002	35,454	207,716		950	285	2,365		1,946	413	5,818	
January 2006	--	--	--		77,701	29,443	168,267		509	158	1,245		1,106	244	3,243	
February 2006	--	--	--		43,336	16,663	92,984		226	74	536		522	122	1,490	
March 2006	--	--	--		222,591	77,910	506,315		3,590	1,083	8,916		6,433	1,362	19,249	
April 2006	--	--	--		3,884,662	333,938	16,693,744		336,270	33,541	1,374,501		425,152	23,508	2,079,582	
May 2006	--	--	--		641,994	137,401	1,910,846		51,623	10,906	154,629		70,256	9,545	255,834	
June 2006	--	--	--		1,187,521	102,942	5,089,266		257,920	24,115	1,077,914		294,148	15,483	1,457,322	
July 2006	--	--	--		2,239,962	141,212	10,572,828		862,193	63,963	3,880,740		885,438	35,405	4,685,212	
August 2006	--	--	--		6,173,320	357,529	29,826,099		1,942,837	132,585	8,964,725		1,961,454	71,286	10,596,168	
September 2006	--	--	--		68,949	19,998	175,015		7,091	1,736	19,721		10,144	1,719	33,657	
October 2006	--	--	--		605,722	56,589	2,532,139		51,536	4,536	219,757		62,705	3,157	314,187	
November 2006	--	--	--		302,130	42,786	1,081,884		10,307	1,385	37,702		14,290	1,124	63,178	
December 2006	--	--	--		1,322,069	282,767	3,936,298		30,959	5,557	100,108		43,847	4,932	171,673	
January 2007	--	--	--		340,741	100,178	858,355		4,662	1,082	13,329		7,522	1,174	25,864	
February 2007	--	--	--		1,297,719	341,149	3,476,273		25,890	6,313	72,157		37,420	5,998	127,208	
March 2007	--	--	--		4,730,704	411,659	20,248,730		120,385	14,069	464,696		161,341	10,569	753,316	
April 2007	--	--	--		6,188,630	908,830	21,831,803		392,606	71,734	1,259,334		472,067	51,983	1,862,722	
May 2007	--	--	--		68,097,235	5,754,768	294,260,478		4,783,471	542,273	18,674,933		5,513,831	344,124	26,099,226	
June 2007	--	--	--		46,518,981	4,452,804	192,867,583		11,257,956	1,270,906	44,019,724		10,909,126	682,093	51,611,052	
July 2007	--	--	--		6,130,317	412,778	28,397,294		2,013,745	170,021	8,704,341		1,904,286	87,062	9,769,660	
August 2007	--	--	--		110,593	16,117	391,386		31,015	4,122	113,931		32,433	2,546	143,463	
September 2007	--	--	--		31,119	7,380	87,981		2,975	590	9,183		3,896	504	14,464	

[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

[illegible]

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued

[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Date	Indian Creek at 103rd Street (site 6)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	--	--	--	--	--	--	--	--	--	--	--	--
November 2001	--	--	--	--	--	--	--	--	--	--	--	--
December 2001	--	--	--	--	--	--	--	--	--	--	--	--
January 2002	--	--	--	--	--	--	--	--	--	--	--	--
February 2002	--	--	--	--	--	--	--	--	--	--	--	--
March 2002	--	--	--	--	--	--	--	--	--	--	--	--
April 2002	81,260	49,498	126,032	20,333	10,065	36,818	3.91	2.23	6.39	2.91	1.50	5.10
May 2002	138,527	88,804	206,324	34,718	18,433	59,759	6.68	4.04	10.4	7.58	4.28	12.4
June 2002	46,705	30,354	68,800	11,167	6,115	18,786	3.21	1.99	4.90	3.52	1.96	5.84
July 2002	36,280	23,769	53,096	8,725	4,840	14,538	3.02	1.90	4.57	2.89	1.57	4.89
August 2002	35,504	23,253	51,975	8,543	4,734	14,245	3.44	2.19	5.15	2.36	1.20	4.19
September 2002	28,651	19,719	40,269	6,768	4,030	10,683	3.71	2.47	5.37	1.14	.672	1.81
October 2002	46,907	33,182	64,434	10,459	6,472	16,022	6.30	3.95	9.55	1.37	.804	2.20
November 2002	30,868	22,411	41,480	7,062	4,528	10,517	5.39	3.47	8.00	.404	.263	.593
December 2002	27,647	19,987	37,287	6,461	4,117	9,670	5.30	3.18	8.30	.203	.128	.308
January 2003	28,227	20,463	37,978	6,571	4,203	9,804	5.15	2.99	8.30	.191	.117	.296
February 2003	34,191	25,000	45,669	7,753	5,032	11,435	4.98	2.99	7.82	.386	.217	.637
March 2003	34,354	25,913	44,672	7,756	5,247	11,057	4.64	2.92	7.00	.601	.384	.897
April 2003	62,619	45,636	83,877	14,402	9,176	21,557	5.73	3.63	8.61	2.62	1.48	4.30
May 2003	41,130	31,163	53,277	9,139	6,212	12,977	4.26	2.75	6.31	2.60	1.60	4.01
June 2003	54,452	40,137	72,232	12,217	7,958	17,964	5.00	3.05	7.74	5.93	3.30	9.84
July 2003	19,440	14,560	25,436	4,468	2,997	6,415	2.81	1.79	4.21	1.61	.956	2.54
August 2003	92,845	56,114	144,883	25,031	11,820	46,853	8.20	4.24	14.4	5.26	2.46	9.92
September 2003	36,235	27,092	47,481	7,700	5,148	11,085	5.86	3.63	8.96	2.56	1.43	4.25
October 2003	24,136	18,868	30,420	5,183	3,688	7,087	5.48	3.58	8.05	.737	.481	1.08
November 2003	25,185	19,655	31,790	5,358	3,806	7,335	6.23	3.89	9.49	.430	.270	.651
December 2003	54,207	41,669	69,337	10,989	7,627	15,338	11.0	6.46	17.5	.904	.527	1.45
January 2004	32,637	25,605	41,005	6,762	4,833	9,208	7.44	4.46	11.7	.384	.241	.581
February 2004	36,254	28,594	45,334	7,423	5,344	10,047	7.01	4.32	10.8	.592	.379	.883
March 2004	107,503	68,527	160,843	26,201	12,974	47,431	11.8	6.43	19.8	2.08	1.17	3.41
April 2004	30,317	23,875	37,962	6,349	4,558	8,613	4.74	3.09	6.95	1.36	.858	2.04
May 2004	53,689	40,558	69,726	11,491	7,678	16,549	6.30	4.02	9.43	4.76	2.80	7.58
June 2004	41,192	30,833	53,923	8,714	5,788	12,611	5.17	3.21	7.89	5.19	2.95	8.50
July 2004	58,264	40,068	81,947	13,281	7,586	21,645	6.76	3.99	10.7	7.12	3.79	12.22
August 2004	54,199	37,211	76,334	12,094	6,972	19,573	7.56	4.45	12.1	5.13	2.72	8.84
September 2004	26,559	19,854	34,806	5,428	3,623	7,826	5.72	3.64	8.57	1.91	1.08	3.13

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Date	Indian Creek at 103rd Street (site 6)															
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli (billions of colonies)			Fecal coliform (billions of colonies)						
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%				
October 2001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
November 2001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
December 2001	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
January 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
February 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
March 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
April 2002	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
May 2002	25.7	12.2	47.9	--	--	--	--	--	--	--	--	--	--	--	--	--
June 2002	41.0	22.4	69.0	--	--	--	--	--	--	--	--	--	--	--	--	--
July 2002	15.8	8.78	26.2	--	--	--	--	--	--	--	--	--	--	--	--	--
August 2002	13.5	7.46	22.7	--	--	--	--	--	--	--	--	--	--	--	--	--
September 2002	15.6	8.49	26.3	--	--	--	--	--	--	--	--	--	--	--	--	--
October 2002	17.0	10.1	27.0	--	--	--	--	--	--	--	--	--	--	--	--	--
November 2002	37.0	22.3	57.8	633,316	153,283	1,771,911	85,965	16,519	269,396	107,809	19,546	347,031	19,546	13,654	3,023	4,937
December 2002	27.8	16.8	43.4	54,478	18,159	127,613	7,775	2,273	19,648	5,283	1,484	13,654	1,484	1,665,292	8,308,362	372,703
January 2003	25.6	15.1	40.7	20,716	7,512	46,111	3,071	1,022	7,200	1,271	413	3,023	413	5,078,545	1,665,292	8,308,362
February 2003	24.7	14.5	39.5	26,880	6,712	73,994	4,010	901	11,649	1,634	339	4,937	339	198,553	103,557	5,078,545
March 2003	26.2	14.6	43.7	561,710	60,227	2,237,954	81,482	7,163	347,599	49,930	5,382	198,553	5,382	1,665,292	8,308,362	372,703
April 2003	22.5	13.5	35.2	233,726	40,390	768,796	34,503	4,960	122,797	30,606	4,960	103,557	4,960	5,078,545	1,665,292	8,308,362
May 2003	29.9	16.4	50.2	6,225,648	756,330	23,682,534	975,023	96,640	3,994,173	1,390,720	187,610	5,078,545	187,610	1,665,292	8,308,362	372,703
June 2003	19.8	11.6	31.7	1,306,439	141,178	5,190,412	200,478	17,791	852,593	425,787	48,034	1,665,292	48,034	5,078,545	1,665,292	8,308,362
July 2003	23.8	13.2	39.6	5,148,310	856,283	17,223,067	817,839	111,064	2,978,601	2,487,307	415,132	8,308,362	415,132	1,665,292	8,308,362	372,703
August 2003	9.60	5.42	15.8	161,297	14,899	676,864	25,306	1,980	112,062	88,278	8,008	372,703	8,008	42,000,999	1,691,998	52,046
September 2003	37.0	14.4	78.8	35,971,882	3,215,827	152,608,267	6,654,666	495,999	29,910,270	10,450,351	1,093,517	42,000,999	1,093,517	1,691,998	52,046	497,587
October 2003	28.6	17.0	45.1	1,406,268	239,000	4,659,994	228,945	32,014	824,053	488,083	74,733	1,691,998	74,733	52,046	62,202	497,587
November 2003	24.3	15.0	37.3	98,887	28,590	251,454	16,529	4,188	45,150	19,016	4,801	52,046	4,801	62,202	497,587	52,993
December 2003	29.7	17.4	47.3	160,169	26,325	538,623	27,011	3,798	97,003	18,260	2,913	62,202	2,913	497,587	52,993	107,256
January 2004	68.0	38.5	111	1,647,180	328,905	5,069,504	281,468	46,477	944,607	153,878	27,621	947,587	27,621	9,974,426	652,125	8,965,014
February 2004	38.7	22.6	62.2	204,478	40,468	631,979	35,623	6,092	117,721	16,469	2,988	52,993	2,988	107,256	9,974,426	652,125
March 2004	37.2	22.1	58.8	371,578	97,828	994,571	65,543	14,709	190,557	38,327	9,272	107,256	9,272	9,974,426	652,125	8,965,014
April 2004	63.6	29.8	120	25,566,992	1,874,202	115,494,258	5,186,095	317,904	24,670,892	2,352,977	210,857	9,974,426	210,857	9,974,426	652,125	8,965,014
May 2004	20.4	12.3	31.9	597,604	62,180	2,406,663	109,570	9,641	467,287	164,922	18,057	8,965,014	18,057	9,974,426	652,125	8,965,014
June 2004	28.8	16.5	46.9	6,114,420	764,965	22,998,824	1,181,345	122,469	4,763,681	2,505,765	355,605	8,965,014	355,605	9,974,426	652,125	8,965,014
July 2004	22.1	12.3	36.5	3,951,524	541,450	14,339,979	762,838	87,349	2,967,138	2,184,728	328,558	7,631,110	328,558	9,974,426	652,125	8,965,014
August 2004	28.7	14.4	51.5	14,834,082	1,412,309	61,615,046	3,105,074	246,183	13,692,557	7,801,121	873,648	30,593,071	873,648	20,630,289	1,836,318	1,836,318
September 2004	33.6	16.6	61.0	13,251,411	1,478,517	52,038,027	2,799,599	263,552	11,673,152	5,475,268	681,943	20,630,289	681,943	20,630,289	1,836,318	1,836,318
October 2004	24.3	13.9	39.7	1,258,174	121,753	5,196,934	251,932	20,518	1,101,583	456,780	47,763	1,836,318	47,763	20,630,289	1,836,318	1,836,318

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, DEET (n,n-diethyl-meta-toulamide), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 to September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Date	Indian Creek at 103rd Street (site 6)											
	Total nitrogen (kg)			Total phosphorus, (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	30,452	23,012	39,537	6,110	4,140	8,700	7,46	4,72	11,2	1,29	0,730	2,10
November 2004	48,038	36,131	62,623	9,357	6,303	13,386	11,4	6,79	17,9	1,30	.753	2,11
December 2004	33,241	25,624	42,416	6,520	4,548	9,062	9,18	5,58	14,3	0,544	.323	0,861
January 2005	60,090	44,898	78,783	11,869	7,883	17,178	12,8	7,62	20,3	.960	.550	1,56
February 2005	52,496	39,669	68,159	10,337	6,959	14,796	10,2	6,25	15,6	1,01	.606	1,58
March 2005	28,138	22,164	35,226	5,622	4,041	7,620	5,97	3,83	8,87	.671	.434	.991
April 2005	25,104	19,571	31,716	5,092	3,608	6,985	4,67	3,04	6,86	1,03	.643	1,56
May 2005	28,581	20,387	38,988	6,067	3,738	9,325	4,39	2,76	6,66	1,95	1,01	3,43
June 2005	96,542	64,503	139,051	22,935	12,121	39,611	9,63	5,68	15,3	9,27	5,36	15,0
July 2005	24,185	18,314	31,344	4,891	3,333	6,932	4,26	2,70	6,41	3,16	1,78	5,21
August 2005	68,136	49,207	91,974	14,341	9,039	21,651	9,78	5,86	15,4	7,59	4,20	12,7
September 2005	31,636	23,215	42,126	6,283	4,062	9,294	6,79	4,24	10,3	2,22	1,25	3,67
October 2005	28,383	21,421	36,890	5,583	3,772	7,969	7,37	4,73	11,0	1,17	.640	1,98
November 2005	22,172	17,401	27,849	4,349	3,114	5,913	6,98	4,41	10,5	.415	.251	.648
December 2005	23,031	18,092	28,903	4,533	3,247	6,161	7,35	4,47	11,4	.274	.163	.433
January 2006	22,634	17,578	28,693	4,509	3,179	6,211	6,73	3,96	10,7	.229	.130	.375
February 2006	17,990	13,825	23,019	3,656	2,537	5,103	4,96	2,85	8,06	.185	.105	.304
March 2006	30,184	24,108	37,323	5,894	4,318	7,860	6,18	4,04	9,06	.703	.443	1,06
April 2006	36,184	28,019	45,988	7,230	5,064	10,016	5,61	3,69	8,19	1,84	1,05	2,99
May 2006	23,710	18,788	29,525	4,734	3,431	6,371	4,03	2,60	5,97	1,50	.922	2,31
June 2006	26,732	20,613	34,100	5,322	3,716	7,389	4,09	2,55	6,24	2,83	1,62	4,61
July 2006	43,452	31,326	58,741	9,019	5,654	13,674	5,70	3,38	9,02	5,22	2,75	9,04
August 2006	50,917	34,067	73,254	11,083	6,129	18,511	7,01	3,96	11,5	4,03	2,04	7,18
September 2006	22,842	17,548	29,233	4,508	3,134	6,283	5,12	3,19	7,79	1,25	.717	2,03
October 2006	37,221	28,155	48,284	7,208	4,893	10,246	8,15	5,00	12,6	1,24	.696	2,04
November 2006	31,243	24,247	39,630	6,015	4,240	8,288	7,87	4,85	12,1	.538	.308	.873
December 2006	43,940	33,692	56,327	8,413	5,808	11,796	9,98	6,05	15,5	.571	.318	.951
January 2007	32,273	25,528	40,252	6,222	4,496	8,395	7,69	4,68	11,9	.321	.187	.515
February 2007	45,092	34,828	57,438	8,680	6,063	12,051	7,87	4,90	12,0	.681	.390	1,11
March 2007	62,216	45,029	83,829	12,617	7,883	19,180	8,38	5,09	13,0	1,23	.694	2,03
April 2007	64,914	49,391	83,781	12,794	8,724	18,121	7,48	4,65	11,4	2,63	1,58	4,14
May 2007	97,742	67,336	137,271	21,537	12,429	34,828	8,36	4,72	13,7	4,94	2,78	8,15
June 2007	54,300	37,827	75,556	11,295	6,760	17,760	5,29	2,86	8,97	4,87	2,55	8,47
July 2007	41,123	29,139	56,411	8,209	5,084	12,566	4,75	2,52	8,18	4,07	2,19	6,95
August 2007	35,792	23,027	53,157	7,614	4,036	13,122	4,49	2,33	7,88	2,36	1,06	4,57
September 2007	34,689	24,201	48,211	6,892	4,184	10,717	5,35	2,87	9,12	1,59	.840	2,76

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, DEET (n,n-diethyl-meta-toulamide), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1988 to September 2007.—Continued

[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Dates	Indian Creek at 103rd Street (site 6)				Escherichia coli (billions of colonies)				Fecal coliform (billions of colonies)			
	Cholesterol plus coprostanol (kg)				Suspended sediment (kg)							
	Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%	
October 2004	35.1	20.3	56.6		1,222,190	126,473	4,931,567		247,317	21,626	1,056,904	
November 2004	64.7	36.3	107		2,216,635	600,073	5,844,552		452,979	104,255	1,300,381	
December 2004	47.6	26.8	78.6		616,220	85,118	2,229,019		127,135	15,026	488,697	
January 2005	75.9	40.6	130		4,255,803	799,611	13,476,982		910,308	146,114	3,092,793	
February 2005	57.4	32.0	95.4		3,030,520	404,192	11,116,972		661,839	74,195	2,594,514	
March 2005	26.1	15.6	41.1		245,865	48,503	761,042		53,219	9,238	174,704	
April 2005	18.6	10.8	29.8		454,416	46,407	1,842,141		100,219	8,774	428,116	
May 2005	16.3	8.31	28.9		2,990,342	195,211	13,976,002		703,255	39,202	3,432,556	
June 2005	41.0	20.6	73.3		28,865,441	2,539,675	123,106,191		7,363,445	536,263	33,328,635	
July 2005	15.5	8.54	25.9		921,084	150,225	3,107,836		212,653	29,968	763,001	
August 2005	44.5	23.6	76.7		14,438,043	3,148,204	42,581,702		3,582,925	684,113	11,261,704	
September 2005	29.8	16.2	50.4		2,344,020	233,624	9,583,713		577,681	48,978	2,493,631	
October 2005	32.7	18.1	54.5		1,292,223	125,864	5,325,633		317,221	26,496	1,375,930	
November 2005	30.5	16.8	51.0		175,503	24,048	636,896		43,184	5,198	164,845	
December 2005	32.4	17.6	54.8		104,137	17,569	346,201		26,112	3,919	91,289	
January 2006	28.7	15.5	48.6		117,493	10,949	491,578		29,986	2,436	131,214	
February 2006	19.2	10.5	32.1		17,214	7,335	34,552		4,553	1,851	9,426	
March 2006	27.1	15.7	43.8		254,321	70,587	661,494		66,354	16,666	182,098	
April 2006	23.8	13.3	39.4		1,773,990	290,043	5,979,234		480,895	68,430	1,718,638	
May 2006	14.6	8.21	24.1		176,316	48,590	460,394		47,414	11,899	130,179	
June 2006	15.2	8.22	25.8		719,888	133,713	2,291,800		197,591	32,350	665,585	
July 2006	22.7	11.5	40.5		5,758,770	778,068	21,016,534		1,677,968	196,899	6,467,294	
August 2006	29.1	13.2	56.0		10,261,152	969,765	42,727,853		3,169,453	256,857	13,880,327	
September 2006	20.1	10.7	34.5		428,182	41,151	1,772,796		124,108	10,327	538,960	
October 2006	39.5	20.6	69.0		1,464,772	213,720	5,181,197		435,242	55,268	1,627,718	
November 2006	38.2	19.6	67.3		516,961	74,684	1,836,087		154,626	19,681	577,748	
December 2006	53.6	27.1	95.6		1,202,857	142,039	4,625,154		369,084	37,850	1,494,019	
January 2007	37.3	19.6	64.7		102,303	36,079	231,636		31,352	10,410	73,612	
February 2007	41.4	22.0	71.5		960,689	174,020	3,093,704		301,253	48,495	1,022,231	
March 2007	42.8	21.6	76.5		4,341,466	383,816	18,486,354		1,437,872	109,387	6,422,392	
April 2007	37.3	20.8	62.0		2,883,066	568,246	8,927,985		940,436	165,567	3,067,743	
May 2007	38.9	19.4	70.0		14,558,714	1,794,505	55,075,781		5,123,639	551,275	20,387,930	
June 2007	22.6	11.2	41.0		4,995,633	663,686	18,354,139		1,734,468	200,935	6,717,209	
July 2007	20.0	10.2	35.4		1,561,843	269,175	5,143,538		530,223	81,666	1,833,497	
August 2007	17.5	7.86	33.9		3,360,227	205,188	16,002,046		1,217,249	64,424	6,022,230	
September 2007	24.1	12.0	43.5		955,068	133,649	3,436,587		333,950	41,584	1,258,400	

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Blue River near Kansas City (site 7)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	244,968	161,969	355,857	98,991	41,263	201,609	13.9	7.49	23.7	26.8	12.4	50.7
November 1998	427,963	282,305	622,868	200,234	91,326	383,888	25.6	13.0	45.3	32.8	14.0	65.8
December 1998	100,084	74,305	131,945	26,677	14,282	45,640	14.5	7.95	24.4	17.0	8.18	31.4
January 1999	66,835	42,648	99,914	21,086	8,912	42,553	8.65	3.51	17.9	7.03	2.12	17.5
February 1999	54,540	45,712	64,570	9,939	7,389	13,087	12.6	7.51	19.8	13.2	7.14	22.5
March 1999	54,957	42,311	70,202	12,197	7,190	19,406	8.85	4.76	15.1	9.79	4.60	18.4
April 1999	278,233	193,598	387,529	105,961	48,842	201,680	18.3	9.87	31.0	30.4	14.9	55.6
May 1999	178,499	129,393	240,185	56,929	28,747	101,628	11.8	6.43	19.8	24.0	12.2	42.7
June 1999	409,576	219,468	700,248	258,472	77,151	645,567	9.48	4.34	18.1	20.3	8.40	41.5
July 1999	38,372	30,975	47,001	7,727	5,277	10,931	2.58	1.51	4.12	6.71	3.11	12.7
August 1999	21,043	17,748	24,770	4,194	3,194	5,409	1.46	0.899	2.24	2.82	1.31	5.34
September 1999	97,114	65,260	139,218	30,584	13,493	59,976	5.66	2.75	10.4	11.4	4.93	22.7
October 1999	16,170	13,857	18,756	3,367	2,615	4,268	1.64	1.07	2.42	1.46	.758	2.54
November 1999	16,117	12,785	20,050	3,773	2,620	5,264	2.06	1.03	3.70	1.57	.448	4.02
December 1999	33,629	27,220	41,091	6,731	4,610	9,500	6.21	3.58	10.0	5.27	2.44	10.0
January 2000	14,018	11,997	16,280	3,009	2,329	3,826	2.53	1.57	3.87	0.771	.433	1.27
February 2000	43,790	32,372	57,944	10,125	5,537	17,052	7.50	3.83	13.3	6.05	2.55	12.2
March 2000	44,912	37,762	53,016	8,341	6,211	10,968	8.00	4.86	12.4	8.16	4.44	13.8
April 2000	15,048	12,954	17,383	3,119	2,438	3,931	1.72	1.05	2.65	1.04	.576	1.75
May 2000	46,351	36,513	58,026	9,964	6,437	14,747	3.82	2.16	6.25	6.76	3.07	13.0
June 2000	93,600	69,466	123,435	24,888	13,580	41,983	5.18	2.87	8.63	11.8	5.64	21.8
July 2000	47,033	38,471	56,928	9,334	6,476	13,032	3.17	1.95	4.88	7.52	3.87	13.2
August 2000	17,181	14,881	19,734	3,453	2,730	4,309	1.13	.745	1.66	1.37	.764	2.26
September 2000	24,174	20,175	28,731	4,761	3,538	6,271	2.11	1.27	3.30	2.97	1.38	5.63
October 2000	44,764	36,442	54,416	9,062	6,317	12,604	4.87	2.90	7.71	6.58	3.21	12.0
November 2000	28,764	23,283	35,145	5,740	3,934	8,097	4.08	2.41	6.49	3.56	1.59	6.93
December 2000	17,130	14,936	19,554	3,386	2,700	4,193	3.11	2.01	4.61	1.18	.724	1.81
January 2001	41,951	34,334	50,750	8,144	5,583	11,484	9.03	5.36	14.3	5.89	3.08	10.3
February 2001	130,195	97,029	171,079	36,501	19,499	62,546	18.9	10.5	31.4	15.1	8.06	25.8
March 2001	84,763	68,649	103,517	18,287	12,051	26,636	13.4	8.09	20.9	12.5	7.05	20.5
April 2001	101,981	81,603	125,899	23,550	15,026	35,207	11.7	6.93	18.4	14.1	7.87	23.4
May 2001	75,193	62,803	89,304	14,881	10,735	20,106	7.08	4.53	10.5	11.8	6.77	19.1
June 2001	612,544	402,046	895,142	310,126	138,727	602,502	17.1	9.17	29.2	27.5	12.9	51.7
July 2001	39,384	33,024	46,608	7,371	5,417	9,803	2.76	1.76	4.12	5.31	2.88	8.99
August 2001	45,961	34,991	59,289	10,265	5,991	16,458	2.87	1.58	4.80	5.05	2.24	9.88
September 2001	42,140	34,186	51,387	8,409	5,732	11,915	3.48	2.09	5.47	5.26	2.63	9.46

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued

[kg, kilogram; Lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Dates	Blue River near Kansas City (site 7)											
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			<i>Escherichia coli</i> (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	27.6	6.53	78.3	137,961	22,764	463,140	--	--	--	--	--	--
November 1998	63.1	13.8	186	234,217	50,015	697,896	--	--	--	--	--	--
December 1998	29.1	9.63	68.4	28,324	5,025	92,076	--	--	--	--	--	--
January 1999	36.5	7.66	110	26,134	3,040	101,061	--	--	--	--	--	--
February 1999	39.5	16.3	81.2	6,845	2,554	14,968	--	--	--	--	--	--
March 1999	42.6	15.0	96.7	14,353	2,383	48,052	--	--	--	--	--	--
April 1999	131	35.3	346	216,153	43,550	662,417	--	--	--	--	--	--
May 1999	75.1	21.7	191	122,599	25,129	372,638	--	--	--	--	--	--
June 1999	74.5	10.1	271	442,339	54,672	1,671,612	--	--	--	--	--	--
July 1999	9.88	4.08	20.2	9,024	2,124	25,611	--	--	--	--	--	--
August 1999	5.08	2.38	9.57	1,559	407	4,192	--	--	--	--	--	--
September 1999	14.1	3.75	37.7	38,500	5,399	138,417	--	--	--	--	--	--
October 1999	4.99	2.47	9.04	313	114	695	--	--	--	--	--	--
November 1999	7.20	2.93	14.9	850	101	3,261	--	--	--	--	--	--
December 1999	16.7	7.43	32.4	3,072	580	9,709	--	--	--	--	--	--
January 2000	15.3	6.51	30.7	96	41	191	--	--	--	--	--	--
February 2000	39.6	13.5	91.9	8,941	1,182	32,914	--	--	--	--	--	--
March 2000	44.9	20.0	87.3	5,489	1,867	12,706	--	--	--	--	--	--
April 2000	18.6	8.09	36.7	272	97	612	--	--	--	--	--	--
May 2000	26.7	11.4	53.6	13,012	2,922	37,818	--	--	--	--	--	--
June 2000	30.3	10.8	68.3	44,557	8,941	136,807	--	--	--	--	--	--
July 2000	13.1	5.97	25.3	9,479	2,476	25,480	--	--	--	--	--	--
August 2000	5.27	2.72	9.27	387	153	818	--	--	--	--	--	--
September 2000	6.09	3.00	11.1	1,545	349	4,479	--	--	--	--	--	--
October 2000	11.0	4.90	21.5	5,306	1,467	13,827	--	--	--	--	--	--
November 2000	11.0	4.96	21.1	2,063	330	7,022	--	--	--	--	--	--
December 2000	13.0	6.00	24.8	150	71	281	--	--	--	--	--	--
January 2001	35.5	14.1	74.7	3,668	697	11,557	--	--	--	--	--	--
February 2001	105	31.0	262	35,893	6,851	112,836	--	--	--	--	--	--
March 2001	81.0	31.5	172	16,716	4,198	45,877	--	--	--	--	--	--
April 2001	82.8	31.5	179	27,689	7,392	73,560	--	--	--	--	--	--
May 2001	46.1	20.7	89.3	15,923	5,580	36,194	--	--	--	--	--	--
June 2001	184	38.2	555	452,894	113,430	1,244,749	--	--	--	--	--	--
July 2001	12.8	5.98	24.1	4,627	1,309	11,908	--	--	--	--	--	--
August 2001	10.3	4.05	21.7	8,341	1,297	28,727	--	--	--	--	--	--
September 2001	9.41	4.03	18.8	4,624	1,054	13,335	--	--	--	--	--	--

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Blue River near Kansas City (site 7)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	31,374	25,988	37,543	6,104	4,425	8,214	3.39	2.06	5.27	3.52	1.69	6.52
November 2001	17,737	15,333	20,409	3,522	2,780	4,401	2.54	1.61	3.83	1.20	.632	2.07
December 2001	19,831	17,315	22,607	3,793	3,037	4,680	3.70	2.38	5.49	1.45	.875	2.27
January 2002	27,298	22,426	32,912	5,370	3,806	7,364	5.48	3.16	8.87	2.57	1.15	5.00
February 2002	39,396	33,275	46,313	7,129	5,349	9,314	8.51	5.29	13.0	5.16	2.92	8.46
March 2002	23,964	20,807	27,462	4,419	3,505	5,498	4.19	2.66	6.28	2.12	1.24	3.38
April 2002	95,220	70,516	125,805	25,401	13,872	42,823	8.26	4.54	13.8	8.87	4.34	16.2
May 2002	391,188	260,708	564,599	173,765	75,744	343,533	16.4	9.04	27.4	20.5	10.8	35.4
June 2002	43,933	33,894	56,017	9,388	5,567	14,868	3.01	1.73	4.87	4.39	2.08	8.22
July 2002	23,239	19,570	27,394	4,641	3,520	6,007	1.45	.874	2.26	1.95	.907	3.69
August 2002	27,066	21,328	33,872	5,690	3,730	8,323	1.65	.903	2.76	2.17	.813	4.74
September 2002	18,280	15,694	21,168	3,694	2,891	4,652	1.41	.882	2.15	1.16	.580	2.08
October 2002	25,957	22,492	29,803	4,784	3,796	5,951	3.05	1.97	4.51	2.30	1.35	3.67
November 2002	15,634	13,518	17,984	3,246	2,553	4,068	1.99	1.28	2.94	0.663	.399	1.04
December 2002	14,497	12,411	16,831	3,163	2,449	4,020	2.17	1.38	3.24	.447	.266	0.707
January 2003	16,507	14,327	18,924	3,377	2,673	4,210	3.00	1.91	4.51	.686	.424	1.05
February 2003	20,988	17,609	24,824	4,145	3,130	5,385	3.90	2.25	6.29	1.57	.708	3.03
March 2003	25,168	21,655	29,084	4,708	3,690	5,920	4.17	2.61	6.32	1.98	1.09	3.32
April 2003	54,626	43,496	67,733	11,580	7,624	16,880	5.83	3.38	9.40	5.21	2.56	9.48
May 2003	38,521	31,961	46,028	7,270	5,187	9,916	3.76	2.35	5.71	3.66	1.95	6.27
June 2003	58,762	48,316	70,791	11,612	8,139	16,075	4.21	2.61	6.43	6.10	3.32	10.3
July 2003	18,167	15,621	21,007	3,704	2,901	4,661	1.06	.668	1.61	.898	.459	1.59
August 2003	345,941	178,683	607,560	215,203	65,531	531,421	6.40	2.16	14.9	5.77	1.51	15.5
September 2003	62,444	47,906	80,012	13,939	8,042	22,546	4.36	2.52	7.03	5.32	2.68	9.51
October 2003	21,807	18,943	24,980	4,107	3,263	5,103	2.31	1.49	3.44	1.28	.762	2.01
November 2003	20,741	17,904	23,897	3,965	3,122	4,964	2.98	1.85	4.54	1.18	.661	1.96
December 2003	67,304	57,052	78,858	12,323	9,329	15,975	13.2	8.22	20.0	7.30	4.28	11.7
January 2004	32,248	27,723	37,297	5,685	4,432	7,184	7.12	4.52	10.7	2.61	1.55	4.12
February 2004	45,158	37,920	53,370	8,172	6,057	10,789	9.23	5.75	14.1	4.28	2.40	7.06
March 2004	378,043	246,967	554,563	171,241	75,219	336,803	26.6	13.4	47.4	13.3	6.69	23.7
April 2004	38,527	32,721	45,061	6,797	5,170	8,776	5.10	3.33	7.48	3.35	1.93	5.43
May 2004	246,086	155,031	371,662	103,809	39,205	225,281	10.6	5.54	18.3	10.3	5.32	18.0
June 2004	82,808	66,037	102,539	17,956	11,439	26,878	5.30	3.21	8.28	6.93	3.76	11.7
July 2004	143,599	103,312	194,465	42,891	21,473	77,038	6.00	3.25	10.2	8.24	4.14	14.8
August 2004	153,851	107,665	213,265	49,760	24,849	89,537	6.23	3.10	11.2	7.38	3.42	14.0
September 2004	51,747	41,220	64,140	10,448	6,740	15,483	3.94	2.26	6.41	3.94	1.98	7.05

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Dates	Cholesterol plus coprostanol (kg)				Suspended sediment (kg)			<i>Escherichia coli</i> (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	9.08	4.05	17.6		2,020	477	5,727	--	--	--	--	--	--
November 2001	9.13	4.07	17.8		228	59	619	--	--	--	--	--	--
December 2001	14.9	6.46	29.7		226	91	471	--	--	--	--	--	--
January 2002	27.4	10.4	59.3		1,415	221	4,868	--	--	--	--	--	--
February 2002	43.2	17.2	90.3		2,344	772	5,528	--	--	--	--	--	--
March 2002	33.7	14.5	67.3		615	210	1,422	--	--	--	--	--	--
April 2002	72.3	23.0	174		29,249	5,860	89,878	--	--	--	--	--	--
May 2002	177	39.0	520		213,310	44,438	643,295	--	--	--	--	--	--
June 2002	20.6	7.95	44.1		8,058	1,151	28,751	--	--	--	--	--	--
July 2002	8.96	4.21	16.8		1,328	300	3,847	--	--	--	--	--	--
August 2002	7.51	3.16	15.2		2,561	335	9,461	--	--	--	--	--	--
September 2002	5.60	2.59	10.6		345	89	931	--	--	--	--	--	--
October 2002	8.33	3.71	16.2		556	238	1,113	70,528	14,429	214,561	116,523	15,425	428,720
November 2002	8.40	3.51	17.1		86	40	163	3,567	835	10,152	5,998	1,018	19,886
December 2002	12.5	4.80	26.9		48	23	88	721	182	1,977	1,219	216	3,970
January 2003	19.8	7.73	42.2		89	40	171	1,424	352	3,941	2,272	390	7,498
February 2003	27.7	10.6	59.5		641	145	1,857	39,667	5,721	140,986	57,600	5,179	243,901
March 2003	34.2	14.3	69.3		720	239	1,688	32,412	6,495	99,585	53,095	6,819	197,695
April 2003	47.7	18.4	102		8,278	2,086	22,678	776,805	149,130	2,435,434	1,572,390	190,907	5,982,811
May 2003	28.8	12.4	57.4		3,276	698	9,769	306,985	40,605	1,129,840	645,262	54,086	2,795,649
June 2003	25.0	10.4	50.8		8,195	2,464	20,380	1,268,451	277,927	3,732,066	2,808,002	396,791	10,063,946
July 2003	7.69	3.59	14.5		344	89	934	35,702	4,467	134,283	75,524	6,478	324,787
August 2003	42.3	4.44	170		132,124	15,359	511,028	25,357,700	1,429,304	123,406,164	64,794,200	1,850,102	367,135,545
September 2003	11.9	4.17	27.1		7,921	1,261	27,004	2,663,609	281,322	10,669,847	5,059,805	330,061	23,653,106
October 2003	6.98	3.10	13.6		244	105	489	27,696	6,455	79,001	40,896	7,067	134,524
November 2003	9.43	3.97	19.1		219	74	510	21,838	3,787	71,721	26,747	3,350	100,567
December 2003	33.2	12.6	71.6		3,138	1,292	6,443	443,773	104,432	1,259,646	503,831	79,855	1,721,104
January 2004	28.1	11.5	58.1		604	243	1,261	38,062	9,284	106,064	44,162	7,609	145,459
February 2004	44.9	17.9	94.1		9,268	686	4,857	157,508	34,887	460,940	199,287	29,607	699,657
March 2004	245	45.3	781		103,959	20,642	320,804	6,950,047	785,629	27,162,096	12,844,466	867,887	59,438,947
April 2004	35.7	16.1	69.0		1,734	647	3,790	119,001	27,911	338,358	189,983	30,218	648,008
May 2004	97.9	20.4	296		87,881	12,297	316,225	9,572,190	1,123,856	36,885,916	23,266,854	1,657,032	106,017,549
June 2004	29.2	11.5	61.7		13,242	3,241	36,836	2,510,315	493,977	7,779,632	4,948,973	635,711	18,425,360
July 2004	28.3	8.87	68.6		34,682	6,556	109,519	9,922,371	1,488,365	34,695,656	20,643,257	1,976,338	85,581,535
August 2004	22.0	5.99	57.9		33,036	6,318	103,760	11,907,554	1,581,350	43,755,448	21,819,785	1,874,429	93,787,848
September 2004	9.37	3.58	20.2		3,727	738	11,513	1,418,278	181,096	5,292,678	2,010,076	170,342	8,678,081

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Date	Blue River near Kansas City (site 7)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	45,423	37,797	54,131	8,437	6,142	11,310	4.94	2.97	7.74	3.66	1.95	6.27
November 2004	102,876	85,447	122,803	20,997	15,088	28,464	14.0	8.23	22.2	9.00	5.12	14.7
December 2004	51,792	43,202	61,584	9,529	6,961	12,738	9.45	5.71	14.8	4.28	2.34	7.20
January 2005	141,876	111,926	177,377	35,113	21,856	53,539	21.9	12.4	35.8	9.73	5.34	16.3
February 2005	124,935	96,525	159,101	30,751	17,627	49,985	19.3	11.2	31.3	8.78	4.85	14.7
March 2005	36,257	30,820	42,373	6,336	4,844	8,143	6.32	4.05	9.41	2.56	1.46	4.16
April 2005	34,031	28,418	40,424	6,207	4,579	8,229	4.30	2.66	6.58	2.24	1.16	3.94
May 2005	57,269	40,936	77,982	13,977	7,103	24,835	4.01	2.05	7.10	3.00	1.20	6.25
June 2005	423,092	255,656	660,335	215,078	74,074	494,037	12.7	6.55	22.3	12.5	6.52	21.7
July 2005	33,252	27,429	39,944	6,334	4,578	8,543	2.07	1.21	3.31	2.04	.981	3.77
August 2005	205,523	156,127	265,621	60,590	36,307	95,183	8.51	4.50	14.7	9.77	4.90	17.5
September 2005	55,893	43,684	70,460	11,598	7,156	17,806	4.16	2.27	7.03	3.54	1.71	6.51
October 2005	39,785	32,042	48,832	7,706	5,211	10,990	3.96	2.24	6.50	2.37	1.11	4.46
November 2005	25,426	21,620	29,705	4,614	3,541	5,911	3.71	2.22	5.83	1.22	.674	2.03
December 2005	26,597	22,678	30,995	4,781	3,683	6,103	4.92	2.98	7.66	1.26	.721	2.05
January 2006	23,182	19,750	27,037	4,314	3,321	5,513	4.49	2.72	6.99	0.92	.510	1.53
February 2006	17,119	14,525	20,040	3,371	2,572	4,339	2.91	1.77	4.52	0.47	.274	.77
March 2006	30,866	26,147	36,188	5,457	4,164	7,026	5.10	3.21	7.70	1.63	.903	2.72
April 2006	61,648	46,588	80,038	13,733	7,886	22,291	5.81	3.26	9.59	3.32	1.50	6.41
May 2006	34,355	28,847	40,605	6,120	4,602	7,980	3.32	2.06	5.06	1.92	1.01	3.32
June 2006	41,834	34,196	50,666	7,738	5,457	10,656	2.99	1.77	4.73	2.45	1.21	4.45
July 2006	86,701	60,562	120,370	23,360	11,153	43,393	3.82	1.89	6.91	3.68	1.58	7.37
August 2006	149,284	92,554	228,340	55,654	21,813	117,967	4.94	2.06	10.1	3.97	1.48	8.69
September 2006	28,123	23,355	33,575	5,160	3,795	6,857	2.21	1.25	3.63	1.25	.605	2.29
October 2006	50,344	40,419	61,965	9,738	6,568	13,918	5.28	2.84	9.01	2.82	1.35	5.24
November 2006	31,248	25,414	38,017	5,970	4,255	8,149	4.33	2.27	7.50	1.46	.632	2.89
December 2006	61,299	49,934	74,471	11,413	7,964	15,856	11.0	6.17	18.1	3.62	1.82	6.47
January 2007	37,340	31,201	44,330	6,437	4,794	8,463	7.86	4.68	12.4	1.92	1.01	3.31
February 2007	58,380	47,810	70,587	10,564	7,559	14,372	11.0	6.50	17.5	3.57	1.79	6.41
March 2007	125,968	87,783	175,231	36,151	16,523	69,208	14.1	7.25	24.7	4.91	2.33	9.15
April 2007	124,411	99,937	153,058	26,477	17,458	38,548	12.9	7.76	20.2	6.98	3.60	12.3
May 2007	513,952	307,218	808,923	275,304	100,985	608,433	16.3	7.70	30.4	8.22	3.64	16.1
June 2007	209,798	141,405	300,016	74,965	35,662	139,598	6.88	3.27	12.8	5.19	2.09	10.8
July 2007	96,550	69,965	129,953	24,283	12,318	43,206	4.59	2.37	8.06	3.96	1.81	7.60
August 2007	47,442	34,029	64,412	10,796	5,650	18,781	2.40	1.13	4.48	1.66	.585	3.76
September 2007	34,832	28,171	42,591	6,513	4,582	8,986	2.66	1.41	4.60	1.50	.661	2.95

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toluidamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95 percent confidence interval; --, no data]

Dates	Blue River near Kansas City (site 7)											
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)								
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%						
			Escherichia coliiform (billions of colonies)			Fecal coliform (billions of colonies)						
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%			
October 2004	10.1	4.13	20.8	1,847	539	4,669	579,680	99,626	1,911,403	690,764	80,362	2,670,961
November 2004	27.1	10.0	59.6	6,659	2,379	14,961	1,753,291	385,222	5,151,525	1,831,731	280,978	6,345,036
December 2004	22.5	9.09	46.6	1,787	557	4,354	331,793	63,405	1,042,468	323,138	42,998	1,186,473
January 2005	70.1	24.2	161	13,377	3,455	36,170	2,106,759	370,108	6,878,954	2,254,916	262,516	8,716,771
February 2005	84.7	28.7	197	13,263	2,750	40,087	1,469,718	236,386	4,989,014	1,742,480	179,188	7,046,532
March 2005	35.8	16.4	68.6	886	367	1,811	51,639	14,489	133,512	59,881	12,483	180,533
April 2005	28.8	13.2	55.1	1,324	371	3,425	113,937	21,796	357,807	148,942	19,828	546,776
May 2005	28.8	9.54	67.8	8,627	1,136	31,804	1,342,049	148,551	5,285,574	2,253,803	164,743	10,189,962
June 2005	103	18.2	335	140,779	20,138	502,038	18,483,114	2,299,268	69,675,245	39,466,725	2,785,593	180,314,858
July 2005	8.73	3.79	17.3	1,619	375	4,636	380,185	60,134	1,299,875	563,716	60,261	2,248,370
August 2005	24.8	8.23	58.4	35,804	10,116	92,219	15,528,814	3,164,975	47,327,725	23,047,245	3,230,403	82,875,273
September 2005	8.35	3.05	18.5	3,542	639	11,426	1,558,716	189,018	5,933,510	1,805,558	145,318	7,924,552
October 2005	7.58	3.03	15.9	1,486	266	4,812	596,552	67,710	2,327,925	623,000	46,489	2,799,168
November 2005	7.99	3.43	16.0	217	82	470	28,765	6,425	83,829	24,774	4,243	81,815
December 2005	12.5	5.45	24.9	200	87	396	15,655	4,900	38,051	12,928	3,248	35,475
January 2006	16.8	7.37	33.1	157	56	355	8,625	1,744	26,386	7,279	1,113	25,249
February 2006	16.8	7.27	33.5	67	32	125	1,387	478	3,186	1,349	366	3,551
March 2006	26.2	12.1	49.8	461	214	872	23,606	8,376	53,253	23,346	6,461	60,820
April 2006	32.8	12.8	69.7	6,322	1,081	20,892	958,333	132,327	3,467,015	1,235,570	112,342	5,212,425
May 2006	17.2	7.64	33.4	925	381	1,896	83,446	24,324	211,220	97,523	21,456	286,352
June 2006	12.2	4.97	25.3	2,093	534	5,695	406,091	72,042	1,320,138	513,102	62,771	1,946,668
July 2006	13.4	3.79	34.6	12,686	1,765	45,751	4,361,201	497,443	16,987,815	6,312,005	469,613	28,385,656
August 2006	13.8	2.77	42.3	24,471	3,079	91,848	10,503,159	995,873	43,687,196	13,801,568	811,696	66,405,321
September 2006	4.08	1.53	8.89	432	102	1,226	143,787	17,965	541,119	129,610	11,437	552,230
October 2006	7.29	2.55	16.6	1,615	361	4,705	645,982	93,010	2,297,512	505,030	49,760	2,073,128
November 2006	7.26	2.66	16.1	558	139	1,542	146,338	25,686	478,003	98,635	12,475	369,450
December 2006	17.6	6.50	38.8	1,685	474	4,352	363,808	69,724	1,141,515	244,681	33,571	887,468
January 2007	17.5	6.99	36.6	415	175	838	38,489	11,832	94,528	25,779	6,249	72,070
February 2007	30.1	11.8	63.8	1,882	711	4,084	220,540	65,723	551,327	162,716	36,868	470,816
March 2007	54.8	15.1	143	12,384	1,761	44,272	1,562,725	177,207	6,100,320	1,476,093	110,626	6,623,381
April 2007	46.9	17.4	103	10,472	3,223	25,700	1,580,695	401,528	4,312,251	1,565,357	280,541	5,065,383
May 2007	111	18.3	374	120,911	20,229	403,450	14,168,930	1,662,059	54,617,602	20,152,904	1,442,070	91,699,136
June 2007	25.9	6.20	73.0	39,619	7,675	123,694	12,267,435	1,898,747	42,332,375	16,082,648	1,669,150	64,826,179
July 2007	11.3	2.74	31.6	10,886	1,623	38,164	3,794,669	467,686	14,355,795	4,505,550	355,672	19,895,268
August 2007	4.49	1.08	12.6	3,250	374	12,620	1,710,229	151,389	7,279,244	1,733,681	101,040	8,362,005
September 2007	3.32	0.891	8.81	739	182	2,053	343,651	52,892	1,188,699	259,041	27,003	1,042,521

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Brush Creek at Ward Parkway (site 13)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	23,645	10,065	47,491	7,891	2,216	20,390	4.76	1.50	11.5	2.28	.547	6.41
November 1998	6,617	3,522	11,369	1,158	437	2,514	2.04	.820	4.24	.474	.160	1.10
December 1998	2,344	932	4,923	359	86	1,008	.771	.204	2.06	.137	.037	.361
January 1999	2,412	1,056	4,756	316	96	779	.904	.261	2.30	.129	.040	.315
February 1999	1,061	654	1,630	100	54	170	.430	.204	0.804	.051	.020	.109
March 1999	2,244	1,015	4,327	270	77	691	.872	.273	2.12	.138	.044	.331
April 1999	12,805	7,925	19,613	1,894	921	3,475	4.57	2.22	8.37	1.21	.522	2.41
May 1999	6,582	3,695	10,868	958	377	2,027	2.31	.995	4.60	.730	.302	1.49
June 1999	6,497	3,534	10,986	1,125	419	2,464	1.99	.832	4.05	1.02	.425	2.09
July 1999	388	202	678	47	18	102	.122	.044	.274	.057	.022	.120
August 1999	606	304	1,085	80	29	179	.187	.064	.430	.094	.037	.198
September 1999	3,539	1,878	6,095	605	236	1,285	1.00	.393	2.11	.513	.228	1.00
October 1999	204	126	313	23	12	40	.057	.026	.109	.020	.010	.037
November 1999	536	239	1,043	64	20	156	.174	.051	.437	.046	.017	.101
December 1999	1,210	578	2,249	150	51	346	.399	.132	.938	.099	.039	.207
January 2000	31	21	44	3	2	4	.007	.004	.012	.002	.001	.003
February 2000	533	266	962	51	18	113	.196	.067	.455	.039	.016	.082
March 2000	1,307	717	2,196	132	55	267	.489	.196	1.02	.114	.051	.220
April 2000	172	90	301	16	6	34	.058	.020	.131	.019	.008	.038
May 2000	1,890	940	3,411	245	85	559	.625	.220	1.42	.305	.127	.621
June 2000	4,882	2,559	8,485	786	269	1,814	1.40	.559	2.94	1.01	.451	1.96
July 2000	2,833	1,696	4,452	402	192	746	.825	.374	1.59	.616	.317	1.08
August 2000	2,474	1,077	4,896	439	123	1,136	.632	.189	1.58	.577	.222	1.24
September 2000	2,044	1,159	3,350	295	127	587	.557	.241	1.11	.378	.192	.671
October 2000	3,476	1,976	5,688	531	233	1,047	.923	.400	1.83	.558	.285	.988
November 2000	1,506	729	2,770	204	66	487	.418	.145	.956	.197	.084	.395
December 2000	35	25	49	3	2	5	.007	.004	.011	.003	.002	.004
January 2001	1,614	636	3,409	198	48	550	.501	.129	1.36	.155	.053	.358
February 2001	5,405	3,063	8,861	647	274	1,305	1.73	.756	3.43	.547	.268	1.00
March 2001	4,002	2,146	6,839	473	177	1,033	1.29	.519	2.68	.463	.214	.880
April 2001	7,889	4,182	13,594	1,133	400	2,565	2.31	.942	4.77	1.15	.534	2.16
May 2001	6,391	3,866	9,967	874	409	1,645	1.88	.878	3.54	1.24	.647	2.17
June 2001	14,975	8,814	23,853	2,789	1,197	5,572	3.59	1.67	6.79	3.74	1.95	6.54
July 2001	1,620	855	2,800	223	85	481	.426	.161	.925	.425	.193	.819
August 2001	1,552	714	2,958	242	75	593	.374	.120	.899	.404	.163	.840
September 2001	1,736	924	2,981	251	98	534	.424	.166	.899	.393	.184	.738

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued

[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Dates	Brush Creek at Ward Parkway (site 13)											
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	53.5	8.71	181	27,085	2,706	110,646	--	--	--	--	--	--
November 1998	6.57	1.79	17.3	1,766	299	5,862	--	--	--	--	--	--
December 1998	2.06	.339	6.92	596	56	2,490	--	--	--	--	--	--
January 1999	1.75	.378	5.19	573	77	2,095	--	--	--	--	--	--
February 1999	0.660	.288	1.31	127	32	347	--	--	--	--	--	--
March 1999	1.55	.324	4.67	461	51	1,811	--	--	--	--	--	--
April 1999	10.24	3.82	22.4	3,145	800	8,575	--	--	--	--	--	--
May 1999	5.24	1.50	13.4	1,334	216	4,512	--	--	--	--	--	--
June 1999	6.08	1.61	16.3	1,205	202	4,012	--	--	--	--	--	--
July 1999	.317	.102	.757	26	5	79	--	--	--	--	--	--
August 1999	.486	.140	1.24	43	8	138	--	--	--	--	--	--
September 1999	3.15	.897	8.09	458	93	1,397	--	--	--	--	--	--
October 1999	.184	.084	.355	14	5	34	--	--	--	--	--	--
November 1999	.374	.090	1.05	49	8	168	--	--	--	--	--	--
December 1999	.810	.204	2.22	135	22	453	--	--	--	--	--	--
January 2000	.0442	.023	.0779	5	2	11	--	--	--	--	--	--
February 2000	.315	.096	.780	50	9	160	--	--	--	--	--	--
March 2000	.737	.244	1.74	127	27	380	--	--	--	--	--	--
April 2000	.123	.044	.274	13	3	35	--	--	--	--	--	--
May 2000	1.24	.312	3.41	182	32	596	--	--	--	--	--	--
June 2000	3.98	.949	11.2	619	88	2,212	--	--	--	--	--	--
July 2000	2.02	.738	4.47	193	51	515	--	--	--	--	--	--
August 2000	2.18	.414	6.88	266	33	997	--	--	--	--	--	--
September 2000	1.47	.474	3.50	134	30	395	--	--	--	--	--	--
October 2000	2.59	.854	6.10	303	73	850	--	--	--	--	--	--
November 2000	1.03	.246	2.92	123	18	439	--	--	--	--	--	--
December 2000	.0468	.026	.0788	4	2	8	--	--	--	--	--	--
January 2001	.977	.168	3.22	201	21	812	--	--	--	--	--	--
February 2001	3.12	.987	7.54	671	132	2,084	--	--	--	--	--	--
March 2001	2.31	.640	6.00	465	77	1,555	--	--	--	--	--	--
April 2001	5.48	1.35	15.2	1,334	192	4,746	--	--	--	--	--	--
May 2001	4.06	1.43	9.18	611	153	1,682	--	--	--	--	--	--
June 2001	13.5	4.24	32.8	2,479	554	7,222	--	--	--	--	--	--
July 2001	1.07	.304	2.73	85	15	273	--	--	--	--	--	--
August 2001	1.11	.239	3.31	93	13	336	--	--	--	--	--	--
September 2001	1.17	.336	2.98	91	18	287	--	--	--	--	--	--

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Brush Creek at Ward Parkway (site 13)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	2,082	1,060	3,694	310	114	687	0.500	0.184	1.10	.410	0.185	.791
November 2001	783	336	1,563	96	27	247	.204	.058	.525	.105	.04	.229
December 2001	372	141	809	41	10	115	.101	.023	.292	.043	.014	.103
January 2002	1,197	510	2,403	135	40	335	.356	.101	.919	.132	.049	.289
February 2002	1,023	449	2,013	107	31	271	.305	.089	.772	.113	.042	.249
March 2002	579	279	1,067	54	18	126	.175	.057	.416	.069	.028	.142
April 2002	5,860	3,103	10,107	817	304	1,788	1.56	.616	3.29	1.08	.487	2.08
May 2002	5,657	3,648	8,386	693	376	1,173	1.57	.789	2.81	1.20	.630	2.08
June 2002	897	520	1,444	100	47	186	.237	.100	.481	.220	.103	.415
July 2002	709	411	1,144	83	39	155	.173	.072	.352	.192	.090	.360
August 2002	836	361	1,661	117	33	303	.188	.054	.482	.238	.086	.532
September 2002	299	112	650	38	9	108	.067	.015	.193	.070	.022	.168
October 2002	1,397	860	2,149	168	87	295	.325	.156	.602	.266	.137	.468
November 2002	197	123	301	20	10	34	.042	.020	.080	.027	.015	.047
December 2002	80	58	108	7	5	10	.015	.009	.023	.008	.005	.012
January 2003	172	95	288	15	6	29	.041	.015	.091	.017	.008	.032
February 2003	783	316	1,630	81	21	216	.214	.055	.578	.091	.031	.211
March 2003	875	397	1,681	87	27	212	.242	.074	.597	.114	.043	.248
April 2003	2,378	1,088	4,548	291	85	736	.603	.194	1.44	.431	.163	.934
May 2003	1,099	634	1,778	112	52	211	.289	.122	.584	.217	.099	.416
June 2003	3,365	1,825	5,701	463	183	976	.765	.303	1.61	.907	.400	1.78
July 2003	110	47	219	12	4	29	.024	.006	.063	.029	.010	.065
August 2003	8,021	3,458	15,977	1,872	500	4,970	1.22	.382	2.98	2.47	.914	5.43
September 2003	1,668	870	2,907	234	88	509	.335	.127	.724	.422	.182	.840
October 2003	269	121	521	31	9	76	.054	.015	.138	.050	.019	.108
November 2003	407	182	790	44	14	108	.088	.026	.222	.056	.022	.121
December 2003	1,513	752	2,731	174	60	398	.337	.121	.754	.191	.079	.390
January 2004	218	113	382	19	8	39	.051	.018	.114	.022	.010	.043
February 2004	398	245	611	32	18	55	.097	.046	.180	.041	.021	.071
March 2004	5,814	2,228	12,502	907	204	2,635	1.16	.306	3.11	.793	.261	1.87
April 2004	745	304	1,538	78	20	211	.177	.046	.478	.124	.042	.290
May 2004	5,969	2,913	10,917	909	272	2,267	1.19	.436	2.62	1.35	.549	2.81
June 2004	2,820	1,614	4,588	356	160	691	.593	.247	1.21	.708	.324	1.35
July 2004	5,757	2,954	10,158	1,004	363	2,238	.987	.366	2.17	1.71	.740	3.38
August 2004	7,067	2,978	14,292	1,579	399	4,322	1.00	.305	2.46	2.02	.729	4.50
September 2004	495	234	928	61	21	140	.091	.029	.222	.110	.043	.232

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toluidamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Dates	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			<i>Escherichia coli</i> (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
	Brush Creek at Ward Parkway (site 13)											
October 2001	1.43	.381	3.79	134	25	431	--	--	--	--	--	--
November 2001	.468	.099	1.40	48	6	179	--	--	--	--	--	--
December 2001	.215	.042	.672	22	3	85	--	--	--	--	--	--
January 2002	.596	.122	1.81	97	14	343	--	--	--	--	--	--
February 2002	.512	.112	1.51	75	10	280	--	--	--	--	--	--
March 2002	.288	.082	.740	33	6	110	--	--	--	--	--	--
April 2002	3.59	.949	9.59	644	113	2,103	--	--	--	--	--	--
May 2002	3.00	1.26	6.09	345	107	844	--	--	--	--	--	--
June 2002	.481	.177	1.06	32	8	86	--	--	--	--	--	--
July 2002	.409	.152	.896	22	6	60	--	--	--	--	--	--
August 2002	.527	.107	1.61	34	4	129	--	--	--	--	--	--
September 2002	.183	.033	.591	10	1	41	--	--	--	--	--	--
October 2002	.761	.301	1.60	49	14	127	6,915	86	44,141	10,039	143	63,088
November 2002	.130	.060	.247	7	3	17	312	6	1,886	323	7	1,909
December 2002	.0674	.039	.108	4	2	8	67	4	318	45	3	207
January 2003	.102	.043	.204	8	2	22	179	4	1,069	120	3	692
February 2003	.355	.068	1.11	49	6	186	3,452	43	21,996	2,421	45	14,685
March 2003	.386	.090	1.10	49	7	172	4,184	63	26,131	3,536	82	20,783
April 2003	1.20	.243	3.69	173	21	657	50,752	710	319,627	55,879	1,432	322,785
May 2003	.494	.176	1.11	41	11	112	8,533	253	48,008	13,177	519	69,958
June 2003	1.86	.527	4.77	182	34	578	158,503	3,517	937,704	281,747	11,035	1,497,677
July 2003	.068	.018	.179	3	1	10	1,101	16	6,880	2,458	63	14,181
August 2003	8.09	1.36	26.9	1,139	122	4,539	4,562,783	60,756	28,895,666	5,899,556	165,471	33,537,677
September 2003	.939	.255	2.47	63	11	208	82,237	1,331	508,884	128,163	3,975	714,918
October 2003	.154	.041	.411	8	1	28	3,685	45	23,575	4,450	100	26,268
November 2003	.203	.051	.558	15	2	53	4,225	55	26,837	3,412	82	19,910
December 2003	.707	.181	1.92	77	12	264	25,579	342	161,935	17,132	430	99,308
January 2004	.104	.036	.235	9	2	25	770	18	4,535	473	18	2,531
February 2004	.170	.074	.334	15	5	36	1,305	59	6,722	878	59	4,072
March 2004	3.69	.523	13.2	1,011	91	4,278	638,241	7,474	4,096,299	360,071	8,676	2,101,889
April 2004	.321	.062	1.00	35	4	133	17,702	242	111,787	19,516	547	110,966
May 2004	3.53	.697	10.9	561	66	2,165	1,237,346	17,513	7,782,410	1,456,201	45,055	8,126,994
June 2004	1.33	.438	3.15	113	26	327	204,380	6,760	1,125,749	348,184	22,510	1,631,827
July 2004	3.80	.964	10.4	412	73	1,342	2,024,781	53,083	11,650,330	3,252,770	176,333	15,993,190
August 2004	6.33	.995	21.7	884	87	3,626	6,936,437	84,829	44,325,457	8,375,467	222,858	48,065,567
September 2004	.249	.064	.673	14	2	44	22,120	393	135,217	33,626	1,200	182,359

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-touluamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Brush Creek at Ward Parkway (site 13)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	789	328	1,610	103	27	277	0.143	0.039	0.375	.146	0.050	.34
November 2004	1,043	630	1,629	109	57	190	.209	.097	.395	.135	.069	.24
December 2004	357	153	715	36	10	93	.070	.019	.186	.039	.014	.09
January 2005	2,488	1,275	4,396	281	106	611	.516	.193	1.13	.256	.113	.50
February 2005	2,299	1,124	4,202	244	81	574	.502	.177	1.14	.231	.096	.47
March 2005	425	244	690	35	17	65	.095	.040	.193	.043	.021	.08
April 2005	833	378	1,602	82	25	202	.183	.055	.456	.111	.042	.24
May 2005	1,527	600	3,231	191	45	537	.298	.075	.817	.275	.091	.65
June 2005	5,607	3,040	9,505	795	288	1,770	1.02	.414	2.10	1.21	.552	2.31
July 2005	769	366	1,432	93	31	218	.137	.043	.330	.174	.068	.37
August 2005	8,777	4,848	14,671	1,620	650	3,380	1.26	.524	2.56	2.13	1.02	3.92
September 2005	2,697	1,230	5,172	427	125	1,080	.408	.131	.975	.518	.206	1.09
October 2005	1,155	562	2,119	148	50	342	.191	.065	.443	.184	.076	.38
November 2005	504	272	856	50	21	102	.088	.034	.190	.051	.024	.10
December 2005	457	209	875	43	14	105	.085	.025	.212	.038	.015	.08
January 2006	360	143	754	33	9	87	.070	.017	.197	.027	.009	.06
February 2006	56	39	79	4	3	7	.008	.005	.013	.004	.002	.01
March 2006	539	305	883	44	21	83	.111	.046	.227	.045	.022	.08
April 2006	1,974	1,105	3,268	201	89	393	.390	.158	.809	.238	.113	.44
May 2006	738	393	1,269	72	29	149	.138	.051	.306	.099	.043	.19
June 2006	2,027	1,074	3,495	243	94	519	.347	.129	.761	.340	.151	.66
July 2006	1,230	588	2,281	151	50	357	.199	.063	.478	.219	.089	.46
August 2006	4,277	1,965	8,160	744	214	1,896	.563	.186	1.33	.766	.310	1.59
September 2006	657	332	1,172	77	30	165	.100	.034	.229	.089	.039	.18
October 2006	2,270	1,209	3,899	292	119	605	.340	.132	.727	.248	.116	.47
November 2006	702	370	1,212	70	29	142	.115	.043	.251	.052	.024	.10
December 2006	1,461	672	2,782	158	49	385	.242	.077	.584	.095	.038	.20
January 2007	404	266	588	31	19	48	.068	.036	.116	.021	.012	.03
February 2007	3,118	1,415	5,998	350	101	889	.539	.173	1.29	.198	.078	.42
March 2007	3,219	1,428	6,290	368	101	966	.548	.171	1.33	.216	.085	.46
April 2007	3,935	2,075	6,807	441	156	995	.673	.263	1.43	.336	.148	.66
May 2007	9,693	4,868	17,369	1,504	505	3,510	1.37	.502	3.02	1.02	.448	2.01
June 2007	1,708	885	2,994	198	78	418	.267	.093	.606	.202	.087	.40
July 2007	455	221	835	48	17	108	.067	.021	.164	.054	.021	.11
August 2007	2,175	742	5,024	378	76	1,160	.256	.054	.769	.291	.084	.74
September 2007	1,736	847	3,176	234	83	526	.229	.077	.535	.172	.070	.36

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95 percent confidence interval; --, no data]

Dates	Cholesterol plus coprostanol (kg)				Suspended sediment (kg)				<i>Escherichia coli</i> (billions of colonies)				Fecal coliform (billions of colonies)			
	Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%		Load	Lower 95%	Upper 95%	
October 2004	.400	0.076	1.26		30		4		49,438	532	319,865		55,456	1,236	327,859	
November 2004	.436	.170	.929		33		10		16,069	400	93,287		13,261	637	67,213	
December 2004	.163	.039	.455		14		2		4,704	51	30,416		3,217	70	19,087	
January 2005	1.03	.281	2.70		150		28		65,331	1,147	399,960		36,839	1,296	200,386	
February 2005	.898	.213	2.54		148		21		57,880	833	363,354		33,667	1,007	189,116	
March 2005	.162	.062	.349		16		5		2,627	97	14,146		2,009	135	9,308	
April 2005	.316	.072	.909		37		5		18,935	292	117,892		18,648	605	103,105	
May 2005	.686	.111	2.32		88		9		139,259	1,793	885,123		173,895	4,835	990,116	
June 2005	2.80	.696	7.74		363		52		1,134,975	18,885	6,998,440		1,573,182	60,214	8,404,800	
July 2005	.346	.085	.960		22		4		54,250	935	332,980		103,557	3,748	559,931	
August 2005	5.70	1.62	14.6		665		133		4,450,456	121,471	25,424,952		6,295,910	362,420	30,468,102	
September 2005	1.48	.292	4.59		151		18		560,362	7,663	3,538,230		661,654	19,997	3,709,314	
October 2005	.523	.128	1.45		41		7		73,495	1,123	458,072		86,769	2,755	481,816	
November 2005	.207	.070	.484		16		4		6,415	133	38,339		5,146	212	27,044	
December 2005	.176	.045	.477		18		3		4,560	62	28,817		2,926	82	16,640	
January 2006	.134	.030	.392		16		2		2,884	36	18,395		1,800	46	10,420	
February 2006	.0346	.018	.060		3		1		115	11	484		63	10	219	
March 2006	.179	.064	.401		20		6		3,019	122	15,940		2,524	198	11,170	
April 2006	.669	.212	1.61		85		21		45,609	1,711	244,714		58,041	4,293	261,474	
May 2006	.265	.081	.651		24		6		13,257	332	76,866		21,941	1,038	111,641	
June 2006	.800	.220	2.09		79		15		117,560	2,645	693,970		219,861	10,300	1,121,381	
July 2006	.506	.118	1.44		43		6		74,094	1,217	457,667		149,479	5,353	810,025	
August 2006	2.44	.458	7.72		313		37		1,166,999	16,933	7,318,772		1,746,547	56,528	9,661,854	
September 2006	.265	.074	.688		19		4		17,510	433	101,756		27,566	1,404	137,721	
October 2006	.925	.266	2.36		101		21		86,255	2,373	492,048		95,241	5,333	464,316	
November 2006	.248	.077	.605		26		6		5,498	164	30,910		4,684	277	22,505	
December 2006	.517	.115	1.50		83		12		18,772	289	116,891		13,089	427	72,297	
January 2007	.142	.066	.270		15		6		623	51	2,720		433	59	1,579	
February 2007	1.09	.213	3.41		279		33		52,283	744	328,644		39,274	1,206	219,511	
March 2007	1.16	.213	3.72		303		33		61,027	821	386,051		46,867	1,430	262,250	
April 2007	1.36	.332	3.79		272		41		78,980	1,258	489,751		104,626	3,583	572,243	
May 2007	4.78	1.08	13.9		1,328		208		764,680	17,509	4,501,208		1,028,558	50,785	5,178,883	
June 2007	.601	.165	1.57		70		14		27,805	744	159,397		66,298	3,592	326,028	
July 2007	.168	.046	.443		13		2		3,798	62	23,453		10,540	361	57,661	
August 2007	1.16	.147	4.33		176		15		200,656	2,293	1,290,891		432,210	10,545	2,517,748	
September 2007	.684	.166	1.91		77		13		33,224	711	197,672		64,111	2,899	329,788	

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Brush Creek at Rockhill Road (site 16)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	37,672	18,479	68,657	12,812	4,277	29,986	10.5	3.69	24.0	34.6	6.13	112
November 1998	9,052	5,251	14,581	1,424	669	2,675	4.42	2.04	8.41	3.83	.896	10.9
December 1998	2,341	1,187	4,165	265	100	573	1.36	0.544	2.83	.590	.095	2.01
January 1999	2,873	1,497	5,014	281	117	570	1.77	.712	3.70	.667	.124	2.13
February 1999	1,282	895	1,781	94	63	134	0.993	.586	1.58	.197	.071	.44
March 1999	4,400	2,879	6,445	375	211	619	3.31	1.87	5.43	1.20	.371	2.95
April 1999	17,916	12,303	25,230	2,084	1,222	3,330	11.6	7.05	18.2	9.25	3.17	21.3
May 1999	6,193	3,809	9,533	718	349	1,317	4.25	2.26	7.29	3.63	1.00	9.48
June 1999	7,754	4,627	12,219	1,206	549	2,317	4.50	2.33	7.88	6.95	1.76	19.0
July 1999	406	299	540	43	30	61	.292	.179	0.452	.164	.073	.318
August 1999	966	664	1,360	112	67	175	.644	.362	1.06	.489	.173	1.1
September 1999	2,845	1,697	4,485	413	206	743	1.41	.689	2.59	1.52	.429	3.9
October 1999	458	348	590	48	34	65	.256	.171	.369	.095	.044	.18
November 1999	807	511	1,214	80	45	132	.428	.221	.751	.154	.043	.398
December 1999	1,365	816	2,148	132	67	236	.707	.344	1.29	.258	.061	.728
January 2000	517	373	699	41	29	55	.293	.183	.445	.055	.022	.117
February 2000	1,824	1,141	2,770	147	80	249	1.09	.566	1.90	.336	.091	.887
March 2000	1,593	1,071	2,281	124	75	194	1.03	.589	1.68	.335	.112	.785
April 2000	441	324	586	36	25	49	.289	.186	.428	.091	.039	.181
May 2000	2,482	1,430	4,020	278	122	545	1.45	.687	2.71	1.35	.301	3.93
June 2000	5,667	3,253	9,202	840	355	1,696	2.80	1.38	5.09	4.47	1.02	12.9
July 2000	2,948	2,018	4,162	369	217	588	1.62	.910	2.67	1.88	.69	4.16
August 2000	1,938	911	3,638	310	104	721	.849	.310	1.88	1.42	.22	4.91
September 2000	1,861	1,177	2,802	242	124	427	.847	.447	1.46	.790	.229	2.01
October 2000	3,127	1,927	4,807	431	228	746	1.23	.612	2.23	1.22	.367	3.04
November 2000	844	440	1,473	97	40	200	.350	.138	.738	.210	.039	.668
December 2000	103	76	136	11	8	14	.037	.0227	.058	.008	.003	.017
January 2001	1,687	865	2,977	158	64	327	.734	.283	1.57	.315	.058	1.01
February 2001	4,275	2,494	6,855	416	202	762	1.87	.859	3.56	.962	.234	2.68
March 2001	2,580	1,432	4,296	242	106	475	1.23	.535	2.44	.666	.146	1.96
April 2001	8,311	4,313	14,546	1,108	432	2,359	3.20	1.32	6.58	3.68	.763	11.1
May 2001	4,396	2,871	6,450	495	273	828	2.15	1.11	3.79	2.25	.757	5.23
June 2001	17,656	11,031	26,844	3,174	1,612	5,643	6.20	3.18	10.95	15.0	4.64	36.6
July 2001	1,877	984	3,262	269	107	564	.798	.315	1.68	1.30	.263	3.96
August 2001	1,990	989	3,594	322	120	703	.713	.265	1.57	1.26	.240	3.97
September 2001	1,838	1,074	2,943	259	122	486	.682	.308	1.32	.830	.215	2.24

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued

[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Brush Creek at Rockhill Road (site 16)												
Dates	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	299	30.8	1,206	9,146	746	39,977	--	--	--	--	--	--
November 1998	36.9	6.81	118	455	66	1,615	--	--	--	--	--	--
December 1998	6.70	.782	25.8	63	5	270	--	--	--	--	--	--
January 1999	7.05	1.01	25.2	76	8	301	--	--	--	--	--	--
February 1999	2.17	.884	4.49	13	3	35	--	--	--	--	--	--
March 1999	9.25	2.43	24.8	90	16	296	--	--	--	--	--	--
April 1999	52.0	15.3	131	823	178	2,432	--	--	--	--	--	--
May 1999	17.7	3.44	55.1	247	35	881	--	--	--	--	--	--
June 1999	29.4	5.08	96.6	503	70	1,813	--	--	--	--	--	--
July 1999	.906	.389	1.81	5	2	12	--	--	--	--	--	--
August 1999	2.52	.765	6.24	18	4	51	--	--	--	--	--	--
September 1999	9.85	2.02	29.9	122	24	380	--	--	--	--	--	--
October 1999	.97	.465	1.81	6	2	12	--	--	--	--	--	--
November 1999	1.73	.433	4.74	15	3	45	--	--	--	--	--	--
December 1999	2.95	.600	9.02	31	5	107	--	--	--	--	--	--
January 2000	.789	.378	1.46	6	2	14	--	--	--	--	--	--
February 2000	3.22	.768	9.06	39	7	127	--	--	--	--	--	--
March 2000	2.65	.801	6.57	30	7	86	--	--	--	--	--	--
April 2000	.679	.302	1.33	6	2	13	--	--	--	--	--	--
May 2000	6.11	.956	21.0	107	14	398	--	--	--	--	--	--
June 2000	18.5	2.75	65.2	441	51	1,707	--	--	--	--	--	--
July 2000	7.99	2.32	20.3	113	28	314	--	--	--	--	--	--
August 2000	6.70	.642	27.8	136	12	583	--	--	--	--	--	--
September 2000	5.09	1.08	15.2	72	12	244	--	--	--	--	--	--
October 2000	9.27	2.14	26.6	163	35	483	--	--	--	--	--	--
November 2000	1.99	.263	7.32	29	3	115	--	--	--	--	--	--
December 2000	.160	.075	.300	2	1	3	--	--	--	--	--	--
January 2001	3.23	.431	11.8	65	7	258	--	--	--	--	--	--
February 2001	8.58	1.66	26.8	207	32	709	--	--	--	--	--	--
March 2001	4.91	.764	16.9	114	15	423	--	--	--	--	--	--
April 2001	22.6	2.91	84.2	901	100	3,539	--	--	--	--	--	--
May 2001	10.0	2.53	27.4	235	54	680	--	--	--	--	--	--
June 2001	63.5	13.7	188	2,738	558	8,343	--	--	--	--	--	--
July 2001	5.33	.691	19.7	124	14	488	--	--	--	--	--	--
August 2001	6.35	.745	24.5	159	17	638	--	--	--	--	--	--
September 2001	5.02	.903	16.2	102	16	353	--	--	--	--	--	--

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Brush Creek at Rockhill Road (site 16)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	3,012	1,845	4,650	418	210	750	1.05	0.508	1.92	1.09	0.302	2.85
November 2001	1,003	682	1,424	99	60	155	3.90	.210	.663	.162	.054	.379
December 2001	678	444	991	62	36	98	2.64	.135	.466	.086	.025	.218
January 2002	1,140	589	2,001	103	44	205	4.50	.164	1.00	.192	.040	.583
February 2002	1,102	608	1,844	93	42	181	4.65	.190	.959	.177	.035	.547
March 2002	765	514	1,097	60	36	93	3.60	.187	.631	.117	.040	.271
April 2002	7,507	4,452	11,888	934	447	1,734	2.82	1.28	5.43	3.31	.909	8.65
May 2002	6,963	4,941	9,538	775	480	1,187	3.05	1.64	5.18	3.20	1.33	6.54
June 2002	1,106	722	1,623	119	67	198	5.17	.244	.966	.498	.171	1.15
July 2002	633	430	899	72	43	114	2.80	.14	.506	.257	.094	.570
August 2002	865	422	1,583	123	45	271	3.15	.108	.726	.457	.078	1.51
September 2002	242	132	409	30	14	58	.086	.033	.187	.067	.013	.207
October 2002	1,231	858	1,713	140	86	217	4.39	.232	.76	.296	.109	.654
November 2002	431	314	577	43	30	61	1.51	.086	.246	.057	.024	.115
December 2002	184	137	242	18	13	24	.058	.035	.091	.014	.006	.028
January 2003	338	242	459	28	20	39	1.23	.069	.204	.028	.011	.060
February 2003	723	353	1,321	63	25	134	2.75	.092	.644	.112	.020	.366
March 2003	1,046	582	1,741	90	41	174	4.31	.173	.902	.195	.044	.567
April 2003	3,237	1,660	5,715	374	140	814	1.21	.464	2.59	1.18	.225	3.73
May 2003	1,539	1,031	2,212	147	84	240	.694	.338	1.27	.496	.176	1.12
June 2003	3,733	2,262	5,812	497	242	908	1.40	.626	2.73	2.09	.605	5.30
July 2003	124	80	184	15	9	23	.049	.023	.094	.036	.011	.085
August 2003	9,732	4,508	18,463	2,568	858	6,007	1.97	.687	4.48	7.34	1.28	24.0
September 2003	951	505	1,638	132	55	270	.313	.118	.678	.373	.083	1.09
October 2003	222	95	443	27	9	64	.072	.02	.189	.053	.008	.188
November 2003	518	259	929	56	23	117	.165	.057	.377	.086	.016	.271
December 2003	1,640	861	2,845	182	75	376	.500	.194	1.07	.278	.055	.860
January 2004	110	57	193	10	4	18	.039	.014	.089	.010	.002	.030
February 2004	209	127	323	17	9	28	.082	.037	.161	.021	.006	.054
March 2004	8,806	3,887	17,263	1,322	411	3,226	2.28	.765	5.31	2.54	.381	8.86
April 2004	1,174	578	2,135	120	44	264	.468	.163	1.07	.342	.06	1.12
May 2004	9,731	5,009	17,132	1,668	596	3,745	2.89	1.20	5.89	5.62	1.08	17.6
June 2004	4,212	2,720	6,236	560	305	946	1.57	.742	2.93	2.21	.772	5.04
July 2004	8,335	4,705	13,707	1,649	753	3,161	2.28	.973	4.56	6.10	1.61	16.3
August 2004	9,569	4,608	17,666	2,426	835	5,577	2.04	.779	4.41	6.62	1.21	21.3
September 2004	586	306	1,021	79	33	160	.197	.071	.44	.203	.046	.587

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% percent confidence interval; --, no data]

Dates	Brush Creek at Rockhill Road (site 16)											
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	8.07	1.65	24.5	180	31	594	--	--	--	--	--	--
November 2001	1.76	.530	4.37	26	6	75	--	--	--	--	--	--
December 2001	1.06	.292	2.77	16	3	47	--	--	--	--	--	--
January 2002	1.89	.283	6.62	43	6	156	--	--	--	--	--	--
February 2002	1.66	.257	5.72	36	4	136	--	--	--	--	--	--
March 2002	1.00	.302	2.48	17	4	47	--	--	--	--	--	--
April 2002	17.3	3.27	54.7	686	114	2,290	--	--	--	--	--	--
May 2002	14.2	4.63	33.7	398	113	1,026	--	--	--	--	--	--
June 2002	2.07	.532	5.61	39	9	114	--	--	--	--	--	--
July 2002	1.19	.346	3.00	18	4	52	--	--	--	--	--	--
August 2002	2.14	.235	8.46	48	5	202	--	--	--	--	--	--
September 2002	0.472	.072	1.64	7	1	27	--	--	--	--	--	--
October 2002	2.33	.729	5.66	40	10	109	19,655	412	117,297	18,116	766	94,649
November 2002	.653	.267	1.35	9	3	21	1,635	64	8,703	1,323	97	5,984
December 2002	.238	.117	.433	3	1	7	182	12	842	138	15	541
January 2003	.394	.171	.783	6	2	14	299	15	1,497	208	18	888
February 2003	1.02	.124	3.87	25	3	99	4,600	73	28,530	2,929	100	16,035
March 2003	1.44	.230	4.92	36	5	131	5,915	107	36,070	4,304	169	22,871
April 2003	6.20	.727	23.9	242	24	990	115,556	1,850	716,086	101,132	3,661	546,783
May 2003	2.33	.624	6.17	52	12	151	11,388	362	63,239	12,628	803	59,468
June 2003	8.15	1.59	25.4	264	43	890	240,955	6,112	1,394,364	294,698	16,402	1,438,988
July 2003	.195	.054	.508	3	1	8	526	15	2,983	838	53	3,954
August 2003	40.3	4.04	164	2,590	234	10,953	26,275,116	417,155	162,991,204	28,850,391	1,092,527	154,491,866
September 2003	2.08	.295	7.46	48	6	181	123,090	2,273	748,402	137,669	6,053	712,843
October 2003	.40	.036	1.69	8	1	32	11,789	162	74,382	11,293	376	62,135
November 2003	.84	.108	3.11	18	2	68	21,769	369	133,924	16,239	665	85,486
December 2003	2.80	.382	10.2	77	8	304	122,419	1,903	761,386	82,351	3,059	442,826
January 2004	.125	.020	.428	2	3	7	441	12	2,541	317	19	1,515
February 2004	.218	.053	.613	4	1	11	489	20	2,570	389	34	1,657
March 2004	19.9	1.73	84.9	1,318	103	5,840	2,004,897	27,749	12,642,271	1,432,827	46,229	7,931,277
April 2004	1.75	.193	6.89	52	5	212	30,878	494	191,336	31,267	1,214	166,514
May 2004	24.6	2.74	96.6	1,498	139	6,271	4,138,670	67,227	25,598,964	4,695,003	185,318	24,914,620
June 2004	8.30	2.05	23.0	251	55	737	414,063	19,384	2,112,235	565,524	57,486	2,296,308
July 2004	24.3	4.21	79.7	1,127	182	3,822	6,565,359	224,833	35,908,798	8,953,991	707,823	39,521,108
August 2004	34.5	3.64	138	2,057	187	8,674	31,305,803	484,040	194,838,490	38,332,603	1,442,802	205,538,170
September 2004	1.10	.160	3.92	22	3	80	70,050	1,714	407,881	87,541	5,028	423,888

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-touluamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Brush Creek at Rockhill Road (site 16)											
	Total nitrogen (kg)			Total phosphorus (kg)			Caffeine (kg)			DEET (kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	1,125	580	1,978	154	60	329	0.340	0.130	0.732	0.303	0.054	0.982
November 2004	1,027	691	1,472	108	65	169	.344	.176	.606	.151	.055	.336
December 2004	349	177	622	35	15	72	.114	.040	.256	.042	.007	.137
January 2005	3,336	1,877	5,497	368	173	691	1.01	.431	2.03	.515	.125	1.44
February 2005	3,195	1,734	5,412	327	139	657	1.08	.449	2.19	.524	.112	1.56
March 2005	564	363	836	46	26	74	.236	.116	.428	.067	.022	.162
April 2005	841	417	1,521	80	30	174	.351	.124	.795	.191	.035	.615
May 2005	2,261	1,098	4,150	285	100	647	.851	.310	1.89	.884	.151	2.92
June 2005	8,519	4,962	13,680	1,362	580	2,735	2.87	1.37	5.32	4.65	1.15	12.9
July 2005	928	514	1,548	122	53	242	.364	.145	.763	.403	.097	1.13
August 2005	10,365	6,239	16,226	2,152	1,067	3,893	2.75	1.34	5.05	6.16	1.82	15.5
September 2005	3,019	1,547	5,334	527	202	1,133	.856	.345	1.78	1.16	.233	3.58
October 2005	1,628	979	2,549	218	105	402	.529	.25	.992	.403	.102	1.10
November 2005	752	462	1,158	80	42	137	.259	.123	.482	.098	.028	.249
December 2005	2,056	1,391	2,932	197	120	307	.739	.405	1.24	.231	.081	.525
January 2006	1,056	676	1,575	92	52	152	.404	.206	.718	.102	.031	.256
February 2006	134	92	188	12	8	17	.049	.028	.080	.008	.003	.019
March 2006	339	199	542	28	14	50	.152	.067	.296	.039	.010	.102
April 2006	2,365	1,525	3,504	237	126	407	1.08	.539	1.93	.605	.199	1.43
May 2006	1,524	1,066	2,113	151	90	238	.741	.395	1.27	.400	.159	.838
June 2006	2,960	1,804	4,589	391	186	726	1.24	.587	2.33	1.25	.344	3.26
July 2006	1,870	1,120	2,938	251	118	471	.785	.357	1.51	.761	.193	2.07
August 2006	4,825	2,430	8,628	978	357	2,166	1.43	.583	2.95	2.42	.468	7.56
September 2006	761	399	1,321	106	44	217	.277	.106	.595	.208	.045	.620
October 2006	2,611	1,569	4,091	364	182	655	.874	.418	1.62	.574	.160	1.49
November 2006	889	559	1,345	94	51	158	.335	.166	.605	.101	.030	.253
December 2006	2,019	1,174	3,247	214	101	400	.743	.349	1.40	.233	.054	.669
January 2007	702	490	974	59	38	88	.300	.173	.487	.050	.019	.111
February 2007	3,746	1,807	6,906	434	153	981	1.40	.529	3.05	.640	.106	2.14
March 2007	5,107	2,638	8,971	602	227	1,308	1.99	.858	3.97	.951	.190	2.92
April 2007	5,300	3,274	8,131	599	284	1,119	2.43	1.22	4.37	1.35	.361	3.58
May 2007	15,164	8,533	24,998	2,643	1,142	5,258	5.26	2.43	10.0	6.44	1.60	17.7
June 2007	2,801	1,718	4,321	367	183	660	1.32	.594	2.54	1.07	.321	2.68
July 2007	770	456	1,220	96	46	177	.378	.156	.774	.245	.062	.671
August 2007	2,512	1,070	5,042	493	149	1,220	.867	.264	2.14	1.24	.173	4.46
September 2007	2,528	1,438	4,132	402	185	764	.944	.396	1.91	.762	.195	2.07

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Dates	Brush Creek at Rockhill Road (site 16)											
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	2.15	0.259	8.18	51	5	209	244,358	3,582	1,530,652	250,188	8,908	1,357,422
November 2004	1.43	.435	3.53	25	7	66	34,718	1,594	177,931	30,293	3,055	123,351
December 2004	.450	.058	1.67	8	1	33	9,244	136	57,887	7,263	262	39,294
January 2005	5.12	.924	16.5	155	24	532	252,732	5,966	1,480,325	177,793	9,905	867,937
February 2005	4.47	.657	15.8	145	17	555	144,854	2,525	887,716	107,585	4,510	563,231
March 2005	.557	.145	1.50	10	2	29	2,194	78	11,892	1,993	167	8,639
April 2005	1.05	.121	4.05	26	3	104	13,975	232	86,206	14,756	600	77,796
May 2005	3.78	.389	15.3	126	12	532	182,189	2,877	1,130,919	226,935	8,828	1,208,111
June 2005	18.1	2.74	63.2	774	88	3,015	2,537,067	45,575	15,484,646	3,456,014	154,273	17,831,463
July 2005	1.57	.240	5.43	32	4	114	72,078	1,376	436,186	115,282	5,335	589,727
August 2005	28.2	5.77	85.8	1,091	200	3,498	10,911,118	375,855	59,605,860	15,179,583	1,203,260	66,942,099
September 2005	6.80	.834	25.8	201	21	808	1,736,628	28,812	10,712,364	2,050,459	83,456	10,806,862
October 2005	2.72	.505	8.68	54	8	186	231,055	4,724	1,384,239	262,344	12,727	1,326,695
November 2005	.944	.214	2.73	15	3	45	20,099	659	110,900	18,026	1,368	80,577
December 2005	2.36	.732	5.77	40	11	106	37,267	1,604	193,934	30,273	2,943	124,840
January 2006	1.06	.275	2.88	18	4	51	7,871	275	42,868	6,398	519	28,003
February 2006	.113	.041	.251	1	1	3	107	7	503	104	14	377
March 2006	.305	.060	.948	5	1	15	839	22	4,827	831	55	3,870
April 2006	2.81	.654	8.01	58	13	167	28,377	1,188	148,607	36,730	3,493	152,627
May 2006	1.71	.509	4.29	27	8	69	10,132	509	50,791	15,732	1,698	62,526
June 2006	4.61	.851	14.7	100	16	342	152,481	3,434	899,938	248,987	13,467	1,224,934
July 2006	2.88	.503	9.45	52	7	192	85,510	1,639	517,172	145,977	6,896	743,025
August 2006	11.4	1.31	44.5	344	34	1,413	2,535,265	41,898	15,646,651	3,659,521	148,607	19,297,247
September 2006	1.19	.165	4.30	18	2	66	46,143	965	275,485	62,104	3,134	310,991
October 2006	4.14	.841	12.6	73	14	232	218,708	7,282	1,203,049	238,410	18,212	1,063,533
November 2006	.988	.238	2.77	12	3	36	9,417	375	49,886	8,817	808	37,105
December 2006	2.33	.410	7.59	38	5	137	34,870	689	209,962	29,070	1,405	147,157
January 2007	.577	.206	1.29	6	2	14	756	56	3,405	704	108	2,437
February 2007	4.80	.508	19.2	123	11	517	67,367	1,079	417,408	61,779	2,410	328,681
March 2007	6.62	.782	25.5	177	17	728	102,139	1,622	633,562	94,811	3,735	503,354
April 2007	6.49	1.19	20.8	135	20	474	55,841	1,167	333,419	73,768	3,703	369,913
May 2007	28.6	4.47	98.1	1,018	147	3,611	969,147	27,599	5,494,042	1,358,692	91,767	6,288,238
June 2007	3.88	.789	11.9	60	11	191	31,141	992	172,795	57,373	4,228	258,754
July 2007	.954	.172	3.08	10	1	36	3,897	70	23,775	7,949	350	41,148
August 2007	5.20	.428	22.7	108	8	475	207,741	2,963	1,305,467	366,832	12,751	2,000,224
September 2007	4.16	.723	13.7	57	9	196	66,321	1,791	379,624	99,025	6,383	464,496

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Blue River at Stadium Drive (site 22)											
	Total nitrogen			Total phosphorus			Caffeine			DEET		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	--	--	--	--	--	--	--	--	--	--	--	--
November 1998	--	--	--	--	--	--	--	--	--	--	--	--
December 1998	--	--	--	--	--	--	--	--	--	--	--	--
January 1999	--	--	--	--	--	--	--	--	--	--	--	--
February 1999	--	--	--	--	--	--	--	--	--	--	--	--
March 1999	--	--	--	--	--	--	--	--	--	--	--	--
April 1999	--	--	--	--	--	--	--	--	--	--	--	--
May 1999	--	--	--	--	--	--	--	--	--	--	--	--
June 1999	--	--	--	--	--	--	--	--	--	--	--	--
July 1999	--	--	--	--	--	--	--	--	--	--	--	--
August 1999	--	--	--	--	--	--	--	--	--	--	--	--
September 1999	--	--	--	--	--	--	--	--	--	--	--	--
October 1999	22,422	18,346	27,131	4,106	2,855	5,724	2.60	1.80	3.64	1.74	0.950	2.93
November 1999	23,818	17,749	31,299	4,971	2,762	8,272	3.29	1.83	5.46	1.25	.489	2.66
December 1999	50,548	39,575	63,623	11,127	6,988	16,847	9.61	6.27	14.1	3.11	1.50	5.71
January 2000	16,801	13,131	21,180	3,093	2,012	4,553	2.62	1.70	3.86	.449	.221	.816
February 2000	53,826	37,778	74,430	13,077	6,284	24,181	11.1	6.43	17.8	2.63	1.18	5.11
March 2000	59,544	47,196	74,131	12,222	7,934	18,022	14.2	9.53	20.5	4.35	2.36	7.35
April 2000	20,519	16,436	25,308	3,541	2,400	5,039	3.51	2.37	5.01	1.17	.666	1.90
May 2000	47,377	36,005	61,209	9,903	5,827	15,779	6.98	4.39	10.6	4.74	2.40	8.44
June 2000	110,810	82,100	146,344	28,200	15,644	46,986	11.3	7.23	16.8	10.7	5.93	17.9
July 2000	66,324	52,075	83,270	14,246	9,040	21,391	7.54	4.99	10.9	9.08	5.07	15.1
August 2000	24,447	18,773	31,301	4,786	2,853	7,550	2.29	1.38	3.58	2.57	1.17	4.90
September 2000	39,923	30,251	51,711	9,005	5,151	14,660	4.13	2.57	6.31	3.78	1.91	6.75
October 2000	77,086	57,504	101,210	20,394	11,367	33,860	8.40	5.32	12.6	5.77	2.95	10.2
November 2000	50,298	39,198	63,569	11,873	7,260	18,359	7.16	4.69	10.5	3.33	1.68	5.96
December 2000	24,427	20,035	29,493	4,920	3,447	6,812	3.80	2.66	5.27	.925	.515	1.54
January 2001	61,956	47,136	79,967	15,182	8,682	24,722	12.6	7.96	19.0	2.89	1.41	5.30
February 2001	171,985	125,445	230,205	51,977	27,688	89,252	29.6	19.0	44.1	6.84	3.47	12.2
March 2001	123,085	93,432	159,181	32,417	18,232	53,455	23.7	15.8	34.1	6.72	3.77	11.1
April 2001	162,071	121,347	212,113	45,446	25,161	75,834	24.5	16.3	35.4	9.29	5.39	15.0
May 2001	111,455	89,411	137,280	25,942	16,914	38,115	16.9	11.7	23.6	10.9	6.55	17.0
June 2001	538,454	347,740	797,236	200,382	84,432	405,213	28.4	17.7	43.1	20.6	10.7	35.8
July 2001	56,955	43,497	73,268	12,822	7,300	20,950	5.75	3.77	8.40	6.37	3.54	10.6
August 2001	56,655	40,719	76,790	14,392	7,133	26,036	4.67	2.86	7.19	5.02	2.60	8.81
September 2001	60,396	46,435	77,241	14,826	8,740	23,587	5.80	3.75	8.57	5.45	2.96	9.21

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toluamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued

[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Blue River at Stadium Drive (site 22)												
Dates	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 1998	--	--	--	--	--	--	--	--	--	--	--	--
November 1998	--	--	--	--	--	--	--	--	--	--	--	--
December 1998	--	--	--	--	--	--	--	--	--	--	--	--
January 1999	--	--	--	--	--	--	--	--	--	--	--	--
February 1999	--	--	--	--	--	--	--	--	--	--	--	--
March 1999	--	--	--	--	--	--	--	--	--	--	--	--
April 1999	--	--	--	--	--	--	--	--	--	--	--	--
May 1999	--	--	--	--	--	--	--	--	--	--	--	--
June 1999	--	--	--	--	--	--	--	--	--	--	--	--
July 1999	--	--	--	--	--	--	--	--	--	--	--	--
August 1999	--	--	--	--	--	--	--	--	--	--	--	--
September 1999	--	--	--	--	--	--	--	--	--	--	--	--
October 1999	5.52	2.21	11.6	817	424	1,431	--	--	--	--	--	--
November 1999	9.32	2.21	26.3	1,189	286	3,338	--	--	--	--	--	--
December 1999	25.2	8.29	59.5	2,798	1,061	6,056	--	--	--	--	--	--
January 2000	8.56	2.97	19.6	180	97	306	--	--	--	--	--	--
February 2000	33.5	6.30	106	5,482	1,283	15,605	--	--	--	--	--	--
March 2000	29.7	10.6	66.4	3,915	1,788	7,499	--	--	--	--	--	--
April 2000	7.28	2.79	15.6	552	295	944	--	--	--	--	--	--
May 2000	14.0	4.01	35.8	7,609	2,689	17,206	--	--	--	--	--	--
June 2000	30.2	7.50	83.3	38,941	14,366	85,754	--	--	--	--	--	--
July 2000	15.0	4.92	35.6	12,758	5,488	25,447	--	--	--	--	--	--
August 2000	5.25	1.50	13.4	2,494	730	6,297	--	--	--	--	--	--
September 2000	11.9	3.07	32.0	4,492	1,379	11,045	--	--	--	--	--	--
October 2000	31.8	7.97	87.3	11,239	3,765	26,247	--	--	--	--	--	--
November 2000	25.2	7.87	61.3	3,371	1,199	7,593	--	--	--	--	--	--
December 2000	14.7	5.86	30.7	343	201	548	--	--	--	--	--	--
January 2001	49.1	12.6	133	3,690	1,197	8,783	--	--	--	--	--	--
February 2001	150	33.6	436	24,600	8,977	54,543	--	--	--	--	--	--
March 2001	88.7	22.6	242	15,082	5,186	34,679	--	--	--	--	--	--
April 2001	100	24.1	281	31,536	11,873	68,573	--	--	--	--	--	--
May 2001	45.5	15.7	104	17,803	8,473	33,143	--	--	--	--	--	--
June 2001	225	39.8	730	338,682	135,932	707,004	--	--	--	--	--	--
July 2001	16.0	4.18	43.0	9,758	2,891	24,475	--	--	--	--	--	--
August 2001	17.9	3.50	55.8	10,829	2,733	29,641	--	--	--	--	--	--
September 2001	21.9	6.00	57.4	7,490	2,787	16,405	--	--	--	--	--	--

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Blue River at Stadium Drive (site 22)											
	Total nitrogen			Total phosphorus			Caffeine			DEET		
	(kg)			(kg)			(kg)			(kg)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	46,403	35,986	58,898	11,101	6,647	17,450	5.02	3.23	7.47	3.39	1.73	6.02
November 2001	21,420	17,533	25,909	4,444	3,032	6,292	2.57	1.74	3.66	.862	.467	1.46
December 2001	25,623	20,845	31,167	5,423	3,613	7,829	3.83	2.59	5.46	.934	.492	1.62
January 2002	35,718	25,991	47,904	8,620	4,343	15,413	5.98	3.40	9.79	1.20	.494	2.45
February 2002	55,514	43,519	69,795	12,979	7,760	20,425	11.8	7.75	17.2	2.66	1.41	4.59
March 2002	32,690	26,564	39,802	6,549	4,293	9,580	6.33	4.36	8.90	1.52	.890	2.44
April 2002	129,615	92,601	176,571	37,727	18,515	68,731	16.0	10.3	23.6	6.55	3.64	10.9
May 2002	322,657	235,243	432,039	103,753	53,696	181,957	29.1	20.1	40.8	16.3	9.99	25.3
June 2002	50,845	39,365	64,630	11,078	6,460	17,771	5.87	3.87	8.55	4.87	2.71	8.09
July 2002	27,518	21,652	34,483	5,507	3,416	8,420	2.53	1.60	3.80	2.63	1.32	4.72
August 2002	31,214	22,988	41,437	6,972	3,632	12,167	2.48	1.46	3.95	2.57	1.19	4.90
September 2002	20,553	16,620	25,135	4,116	2,709	6,003	1.72	1.12	2.53	1.35	.701	2.35
October 2002	36,191	29,841	43,489	7,720	5,233	10,988	4.08	2.84	5.68	2.43	1.42	3.88
November 2002	18,952	15,643	22,752	3,845	2,659	5,383	1.93	1.35	2.68	.636	.371	1.02
December 2002	15,985	12,811	19,707	3,217	2,130	4,669	1.71	1.14	2.46	.323	.172	.554
January 2003	16,415	13,027	20,414	3,266	2,114	4,827	2.07	1.36	3.02	.314	.165	.545
February 2003	30,618	23,324	39,476	6,839	3,865	11,238	5.39	3.23	8.48	1.09	.499	2.10
March 2003	31,657	24,870	39,726	6,602	3,974	10,335	5.43	3.46	8.12	1.31	.674	2.31
April 2003	71,159	52,896	93,711	17,791	9,543	30,395	9.62	6.06	14.5	3.77	2.01	6.48
May 2003	45,544	35,714	57,245	9,527	5,680	15,025	6.15	4.06	8.93	3.21	1.81	5.29
June 2003	80,270	62,543	101,465	18,908	11,397	29,566	8.12	5.34	11.8	6.72	3.81	11.0
July 2003	16,301	13,116	20,025	2,920	1,933	4,238	1.24	.782	1.86	1.04	.506	1.92
August 2003	243,547	105,431	483,729	114,058	22,785	350,958	4.87	2.12	9.64	3.33	1.02	8.20
September 2003	117,344	73,593	177,858	38,253	14,004	84,641	6.40	3.94	9.83	5.43	2.92	9.25
October 2003	24,484	20,249	29,341	4,859	3,357	6,809	2.21	1.53	3.10	1.22	.700	1.97
November 2003	22,912	18,772	27,693	4,647	3,142	6,629	2.48	1.67	3.54	.800	.448	1.32
December 2003	86,467	69,086	106,887	20,846	13,026	31,688	13.8	9.22	19.8	3.83	2.08	6.47
January 2004	51,036	41,499	62,104	10,862	7,034	16,048	9.32	6.39	13.1	1.96	1.11	3.20
February 2004	61,671	49,480	75,952	13,372	8,419	20,205	12.0	8.14	17.1	2.58	1.47	4.23
March 2004	373,728	207,082	623,245	152,239	44,010	387,146	27.3	16.9	41.9	5.91	3.12	10.2
April 2004	51,468	41,853	62,626	10,035	6,632	14,583	8.32	5.76	11.6	3.07	1.83	4.83
May 2004	290,139	166,862	470,428	105,203	31,478	262,394	16.2	10.6	23.6	8.35	4.84	13.5
June 2004	97,560	76,634	122,438	22,316	13,820	34,165	9.06	6.03	13.1	7.44	4.27	12.1
July 2004	192,415	135,471	265,371	57,974	29,135	103,848	9.68	6.08	14.6	8.76	4.66	15.0
August 2004	224,337	134,294	352,690	80,376	28,402	181,768	7.95	4.61	12.8	6.63	3.21	12.2
September 2004	59,337	44,933	76,900	13,484	7,580	22,245	4.60	2.92	6.92	3.91	2.11	6.64

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued
[kg, kilogram; lower 95% confidence interval; Upper 95% confidence interval; Upper 95%, upper 95 percent confidence interval; --, no data]

Dates	Blue River at Stadium Drive (site 22)											
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli (billions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2001	20.7	6.04	52.6	3,629	1,296	8,154	--	--	--	--	--	--
November 2001	12.2	4.41	27.3	344	163	643	--	--	--	--	--	--
December 2001	18.6	6.40	42.7	397	183	756	--	--	--	--	--	--
January 2002	32.1	6.23	100	1,548	333	4,595	--	--	--	--	--	--
February 2002	49.0	13.6	128	2,373	921	5,064	--	--	--	--	--	--
March 2002	23.1	7.96	53.2	749	378	1,339	--	--	--	--	--	--
April 2002	83.7	16.1	262	26,379	7,995	65,315	--	--	--	--	--	--
May 2002	177	40.3	513	104,367	40,328	223,235	--	--	--	--	--	--
June 2002	18.2	4.89	48.1	6,099	1,934	14,714	--	--	--	--	--	--
July 2002	8.02	2.44	19.8	2,079	763	4,596	--	--	--	--	--	--
August 2002	9.93	2.13	29.5	3,363	787	9,575	--	--	--	--	--	--
September 2002	7.28	2.47	16.9	668	256	1,436	--	--	--	--	--	--
October 2002	17.6	6.40	39.0	1,079	617	1,757	332,399	22,458	1,538,253	800,727	28,215	4,353,838
November 2002	11.3	4.13	25.2	206	123	326	28,656	2,521	122,221	54,513	2,528	278,720
December 2002	12.1	3.90	28.8	104	62	164	7,247	772	28,941	10,100	555	49,478
January 2003	14.0	4.31	34.4	107	60	178	5,451	470	23,397	6,245	263	32,670
February 2003	28.3	6.71	80.2	902	296	2,132	125,451	2,834	740,053	144,085	1,609	929,019
March 2003	24.5	6.79	63.9	937	337	2,094	120,146	2,912	700,669	153,253	1,865	979,826
April 2003	46.6	10.2	137	7,901	2,611	18,601	2,603,674	61,565	15,246,245	4,435,526	53,375	28,390,560
May 2003	22.0	6.07	57.3	3,182	1,069	7,422	918,131	17,928	5,538,028	1,860,006	18,267	12,130,251
June 2003	32.3	8.73	85.3	11,412	4,808	23,079	6,476,289	267,057	34,032,628	17,339,753	372,036	103,122,797
July 2003	4.72	1.58	11.0	527	192	1,169	165,680	3,539	985,989	511,168	5,448	3,309,985
August 2003	117	5.73	587	133,381	23,817	432,329	360,107,304	3,442,443	2,353,707,960	1,077,469,763	5,261,045	7,307,624,388
September 2003	52.8	6.51	200	29,930	5,960	92,234	53,200,896	599,766	342,706,626	161,075,707	933,257	1,085,721,165
October 2003	11.4	4.26	25.0	448	233	784	120,882	6,152	604,062	294,332	7,324	1,708,854
November 2003	14.8	5.00	34.3	278	147	481	42,768	2,756	200,621	71,961	2,565	390,333
December 2003	78.3	22.2	201	2,833	1,424	5,072	620,708	30,770	3,122,213	836,498	21,342	4,835,891
January 2004	48.2	15.2	117	844	487	1,364	82,820	8,530	334,731	94,475	5,241	461,722
February 2004	58.0	17.4	144	1,594	813	2,825	179,180	10,998	852,077	199,820	6,254	1,112,706
March 2004	419	35.2	1,813	78,962	19,427	219,055	42,556,368	638,441	265,833,775	50,254,713	387,115	333,659,514
April 2004	30.6	10.8	69.5	1,826	1,011	3,046	248,056	19,117	1,103,550	396,884	15,560	2,109,261
May 2004	168	17.0	684	103,259	22,911	301,924	114,346,197	1,601,623	720,053,801	242,123,130	1,744,222	1,614,167,797
June 2004	38.3	11.0	97.6	12,486	5,453	24,654	7,065,487	315,652	36,447,734	18,167,672	424,192	106,604,167
July 2004	76.0	15.6	231	52,287	19,327	115,006	71,658,360	2,525,084	389,628,308	216,782,796	3,923,606	1,321,734,665
August 2004	98.7	11.8	378	70,117	18,076	189,793	136,855,232	2,227,768	846,261,012	396,899,499	3,335,764	2,619,722,728
September 2004	23.5	5.70	65.7	4,438	1,398	10,747	3,566,257	71,716	21,418,360	9,585,725	100,892	62,141,261

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, n,n-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued

[kg, kilogram; lower 95%, lower 95 percent confidence interval; upper 95%, upper 95 percent confidence interval; --, no data]

Date	Blue River at Stadium Drive (site 22)											
	Total nitrogen			Total phosphorus			Caffeine			DEET		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	58,819	46,050	74,035	13,003	7,999	20,012	5.58	3.63	8.22	3.37	1.83	5.70
November 2004	136,344	106,949	171,326	34,685	21,659	52,752	15.2	9.91	22.2	5.99	3.28	10.1
December 2004	79,578	62,800	99,460	18,077	11,285	27,499	11.2	7.40	16.3	3.17	1.71	5.41
January 2005	195,511	146,661	255,462	54,963	30,584	91,368	25.5	16.6	37.6	5.42	2.82	9.45
February 2005	168,278	126,087	220,096	44,944	24,722	75,359	24.3	15.9	35.5	4.96	2.72	8.33
March 2005	50,965	41,161	62,396	9,625	6,395	13,927	8.80	5.98	12.5	2.09	1.23	3.33
April 2005	48,702	38,733	60,451	9,174	5,903	13,624	7.06	4.68	10.2	2.38	1.36	3.89
May 2005	61,354	43,286	84,470	13,769	6,581	25,556	5.68	3.40	8.94	2.76	1.38	4.94
June 2005	374,463	218,686	600,066	127,442	38,303	317,057	16.1	10.4	23.8	10.6	5.90	17.6
July 2005	41,241	32,081	52,205	7,508	4,626	11,540	3.29	2.07	4.98	3.06	1.57	5.40
August 2005	248,526	178,093	337,696	71,039	37,244	123,417	11.0	6.84	16.7	9.84	5.11	17.2
September 2005	81,130	61,188	105,512	17,793	10,046	29,256	5.94	3.76	8.94	4.76	2.61	8.02
October 2005	53,180	40,920	67,964	10,773	6,498	16,837	4.51	2.84	6.81	2.63	1.37	4.61
November 2005	33,828	27,077	41,749	6,203	4,179	8,875	3.58	2.31	5.30	1.20	.650	2.04
December 2005	37,029	29,689	45,632	6,745	4,567	9,608	4.78	3.12	7.03	1.09	.592	1.83
January 2006	29,480	23,502	36,514	5,164	3,455	7,429	4.04	2.60	6.00	.693	.368	1.19
February 2006	18,881	15,071	23,360	3,060	2,074	4,357	2.35	1.54	3.44	.345	.192	.572
March 2006	40,943	32,846	50,428	6,861	4,648	9,771	6.33	4.20	9.16	1.44	.820	2.34
April 2006	74,444	54,158	99,865	15,368	8,031	26,760	7.84	4.87	12.0	2.82	1.44	4.99
May 2006	41,308	32,748	51,421	6,697	4,384	9,807	4.74	3.04	7.07	2.17	1.17	3.69
June 2006	56,538	43,837	71,774	9,740	5,995	14,983	5.02	3.16	7.58	3.65	1.90	6.39
July 2006	82,263	55,516	117,518	17,996	7,718	35,968	4.48	2.62	7.17	3.84	1.87	7.03
August 2006	158,724	92,353	255,072	45,066	14,424	108,125	5.24	2.87	8.81	4.13	1.85	8.01
September 2006	34,499	26,243	44,533	5,767	3,347	9,287	2.37	1.41	3.73	1.73	.848	3.16
October 2006	73,001	54,374	95,973	14,471	8,153	23,832	5.80	3.46	9.16	2.98	1.49	5.36
November 2006	41,067	30,215	54,562	7,655	4,263	12,718	3.86	2.12	6.48	1.19	.519	2.35
December 2006	87,374	66,307	113,023	16,950	10,114	26,714	10.5	6.39	16.2	2.50	1.25	4.48
January 2007	45,546	35,875	57,021	7,367	4,816	10,801	6.49	4.13	9.72	1.20	.636	2.07
February 2007	80,978	62,402	103,357	14,392	8,936	21,990	12.1	7.58	18.4	2.41	1.25	4.21
March 2007	173,347	113,953	253,005	41,010	15,767	88,000	16.8	10.5	25.5	3.57	1.94	6.05
April 2007	163,260	127,763	205,570	30,090	18,452	46,423	18.1	11.9	26.3	6.04	3.42	9.91
May 2007	510,172	261,278	901,527	153,206	31,759	463,142	18.5	11.5	28.3	7.42	3.85	13.0
June 2007	138,373	95,073	194,766	28,559	12,513	56,268	7.04	4.22	11.0	4.70	2.24	8.74
July 2007	106,152	71,109	152,568	20,831	8,202	44,026	5.40	3.20	8.55	4.44	2.20	8.04
August 2007	50,878	32,748	75,533	9,142	3,401	20,027	2.35	1.23	4.08	1.91	.781	3.92
September 2007	43,347	32,038	57,367	6,685	3,521	11,575	2.77	1.57	4.55	2.01	.913	3.85

Table 20. Monthly loads of total nitrogen, total phosphorus, caffeine, *n,n*-diethyl-meta-toulamide (DEET), triclocan, and cholesterol plus coprostanol, nutrients, suspended sediment, and fecal-indicator bacteria at sites in the Blue River Basin, October 1998 through September 2007.—Continued

[kg, kilogram; lower 95% confidence interval; upper 95% confidence interval; upper 95% confidence interval; --, no data]

Dates	Blue River at Stadium Drive (site 22)											
	Cholesterol plus coprostanol (kg)			Suspended sediment (kg)			Escherichia coli ibillions of colonies)			Fecal coliform (billions of colonies)		
	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%	Load	Lower 95%	Upper 95%
October 2004	29.2	8.68	73.1	2,655	1,007	5,748	1,421,449	35,137	8,262,095	3,222,964	40,085	20,559,801
November 2004	100	28.1	260	7,018	3,373	12,976	2,800,298	137,795	14,111,632	4,549,009	121,929	26,072,334
December 2004	65.5	19.2	165	2,264	991	4,462	553,103	18,513	3,039,251	755,931	13,022	4,639,945
January 2005	208	47.9	596	11,566	4,334	25,223	3,564,600	90,814	20,612,542	4,023,802	52,963	25,514,543
February 2005	175	40.2	502	10,330	3,645	23,383	2,576,951	63,384	14,990,952	2,741,615	34,514	17,467,135
March 2005	37.6	13.2	85.4	1,044	573	1,753	93,275	7,898	402,800	108,346	4,953	555,859
April 2005	27.9	9.10	66.3	1,681	758	3,248	249,599	11,101	1,288,934	358,346	8,194	2,109,853
May 2005	29.2	5.21	94.7	6,409	1,576	17,784	2,860,076	45,675	17,728,690	5,421,316	43,855	35,878,193
June 2005	172	18.9	677	127,851	30,719	359,053	165,087,921	2,522,355	1,028,960,550	373,084,705	2,934,715	2,473,687,023
July 2005	11.6	3.38	29.4	2,483	897	5,541	1,188,538	31,236	6,835,733	3,258,533	43,916	20,608,554
August 2005	91.7	21.2	263	49,697	19,622	104,846	67,453,056	2,552,595	361,260,453	188,251,796	3,696,166	1,134,594,865
September 2005	30.1	7.38	83.7	5,672	1,828	13,553	4,365,783	87,502	26,233,119	10,573,189	110,334	68,595,045
October 2005	22.7	6.62	57.6	2,094	706	4,871	1,115,825	23,544	6,653,106	2,456,575	25,447	15,947,745
November 2005	18.6	6.40	42.9	439	226	773	74,134	5,227	338,803	113,948	4,422	606,934
December 2005	25.5	8.84	58.2	376	203	638	38,611	3,621	161,202	45,794	2,461	225,661
January 2006	22.0	7.50	50.8	251	119	469	18,181	936	90,589	18,352	496	105,036
February 2006	13.0	4.62	29.4	102	58	167	3,970	553	14,315	3,875	313	16,984
March 2006	25.0	9.21	55.0	626	345	1,049	46,194	4,680	187,790	51,579	2,845	252,456
April 2006	36.8	8.48	106	5,692	1,626	14,574	1,831,993	33,697	11,144,765	2,885,045	26,408	18,922,234
May 2006	15.0	4.94	35.5	1,318	638	2,425	198,873	11,205	967,940	326,289	10,001	1,824,292
June 2006	15.9	4.58	40.4	3,430	1,392	7,109	1,186,601	41,818	6,451,768	2,626,650	48,660	15,963,034
July 2006	22.5	3.44	77.9	11,892	2,733	34,162	11,335,876	165,193	71,056,468	29,258,612	215,468	194,803,119
August 2006	49.7	5.22	200	32,992	6,958	98,907	51,611,497	664,339	328,051,022	129,934,949	846,372	871,042,859
September 2006	9.16	2.30	25.1	1,057	325	2,598	488,396	8,809	2,979,220	1,111,283	10,361	7,278,080
October 2006	28.8	6.85	81.4	2,972	1,051	6,719	1,342,251	33,895	7,773,470	2,350,464	31,773	14,860,549
November 2006	20.6	4.58	60.0	936	326	2,138	227,352	7,012	1,269,625	295,403	4,805	1,826,826
December 2006	54.0	14.5	143	2,125	858	4,418	424,204	15,566	2,286,964	465,854	9,053	2,811,913
January 2007	27.4	8.99	64.9	449	234	785	35,993	2,783	159,961	35,545	1,466	186,772
February 2007	50.0	15.2	124	1,967	940	3,651	223,884	15,484	1,029,036	215,732	8,009	1,160,181
March 2007	113	15.5	408	12,583	2,889	36,170	3,778,383	53,065	23,785,733	3,771,700	27,792	25,110,980
April 2007	68.0	20.8	168	9,694	4,512	18,327	2,148,755	117,185	10,548,460	2,862,366	81,627	16,222,469
May 2007	199	14.5	898	127,980	29,139	369,401	109,946,448	1,634,295	687,555,339	171,415,286	1,303,916	1,138,998,369
June 2007	32.3	5.59	106	20,558	6,136	51,350	16,431,064	366,462	97,127,619	37,152,273	414,141	239,581,282
July 2007	22.2	2.93	81.6	14,269	3,139	41,898	12,084,669	165,107	76,313,253	27,666,681	192,291	184,825,811
August 2007	9.45	1.07	36.9	4,823	895	15,362	4,307,430	50,940	27,618,637	10,513,033	62,789	70,769,056
September 2007	8.65	1.67	27.0	1,568	542	3,595	721,809	19,532	4,129,981	1,536,461	20,980	9,703,162

Table 21. Estimated annual contributions of total nitrogen, total phosphorus, and fecal-indicator bacteria for selected stream reaches in the Blue River Basin, 1999 to 2007.

[CSOs, combined sewer overflows; WWTPs, wastewater treatment plant; AVG., average of years where data available, percents and totals may not equal 100 because of rounding errors and unequal periods of data; --, no data; na, not applicable; KS, Kansas; MO, Missouri; <, less than; >, greater than]

Total nitrogen, in metric tons											
Year	All Sources	CSOs		WWTPs		Non-Point					
	Load	Load ¹	Percent of total	Load	Percentage of total	Load ²	Percent of total	KS Load ²	Percent of total	MO Load	Percent of total
Upper Blue River (site 2)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	57	--	--	--	--	--	--	--
2003	125	0	0	64	51	61	49	50	40	11	9
2004	452	0	0	72	16	380	84	311	69	68	15
2005	394	0	0	82	21	312	79	256	65	56	14
2006	134	0	0	71	53	63	47	52	38	11	8
2007	416	0	0	62	15	354	85	290	70	64	15
AVG.	304	0	0	68	31	234	69	192	56	42	12
Lower Indian Creek (site 6)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	373	--	--	--	--	--	--	--
2003	509	0	0	290	57	219	43	216	42	2.8	1
2004	544	0	0	297	55	247	46	244	45	3.2	1
2005	527	0	0	304	58	223	42	220	42	2.9	1
2006	348	0	0	320	92	28	8	28	8	.37	<1
2007	581	0	0	298	51	282	49	278	48	3.7	1
AVG.	502	0	0	314	63	200	38	197	37	2.6	1
Middle Blue River (site 7)											
1999	1,972	--	--	--	--	--	--	--	--	--	--
2000	412	--	--	--	--	--	--	--	--	--	--
2001	1,265	--	--	--	--	--	--	--	--	--	--
2002	759	--	--	430	57	--	--	--	--	--	--
2003	697	--	--	354	51	343	49	266	38	77	11
2004	1,282	--	--	369	29	913	71	556	43	358	28
2005	1,312	⁴ 1.73	⁴ <1	386	29	924	70	475	36	449	34
2006	565	--	--	391	69	174	31	80	14	94	17
2007	1,392	--	--	360	26	1031	74	569	41	463	33
AVG.	1,050	⁴ 1.73	⁴ <1	382	41	677	59	389	34	288	25
Brush Creek (site 16)											
1999	93.7	--	--	--	--	--	--	--	--	--	--
2000	21.9	--	--	--	--	--	--	--	--	--	--
2001	48.7	--	--	--	--	--	--	--	--	--	--
2002	25.0	--	--	--	--	--	--	--	--	--	--
2003	23.3	--	--	--	--	--	--	--	--	--	--
2004	45.1	--	--	--	--	--	--	--	--	--	--
2005	35.5	13	36	--	--	22.7	64	15.5	44	7.2	20
2006	20.3	--	--	--	--	--	--	--	--	--	--
2007	44.1	--	--	--	--	--	--	--	--	--	--
AVG.	33.7	12.8	36	--	--	22.7	64	16	44	7.2	20
Lower Blue River (near site 22)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	536	--	--	--	--	--	--	--	--	--	--
2001	1,495	--	--	--	--	--	--	--	--	--	--
2002	800	--	--	430	54	--	--	--	--	--	--
2003	724	--	--	354	49	--	--	--	--	--	--
2004	1,536	--	--	369	24	--	--	--	--	--	--
2005	1,545	21.4	1	386	25	1,137	74	475	31	662	43
2006	661	--	--	391	59	--	--	--	--	--	--
2007	1,513	--	--	360	24	--	--	--	--	--	--
AVG.	1,196	21.4	1	382	36	1,137	74	475	31	662	43

Table 21. Estimated annual contributions of total nitrogen, total phosphorus, and fecal-indicator bacteria for selected stream reaches in the Blue River Basin, 1999 to 2007.—Continued

[CSOs, combined sewer overflows; WWTPs, wastewater treatment plant; AVG., average of years where data available, percents and totals may not equal 100 because of rounding errors and unequal periods of data; --, no data; na, not applicable; KS, Kansas; MO, Missouri; <, less than; >, greater than]

Total phosphorus, in metric tons											
Year	All Sources	CSOs		WWTPs		Non-Point					
	Load	Load ¹	Percent of total	Load	Percent of total	Load ²	Percent of total	KS Load ²	Percent of total	MO Load	Percent of total
Upper Blue River (site 2)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	8.4	--	--	--	--	--	--	--
2003	33	0	0	8.8	26	25	74	20	60	4.4	13
2004	120	0	0	8.5	7	111	93	91	76	20	17
2005	99	0	0	8.9	9	90	91	74	75	16	16
2006	24	0	0	9.4	39	15	61	12	50	2.7	11
2007	94	0	0	7.3	8	87	92	71	76	16	17
AVG.	74	0	0	8.5	18	65	82	54	67	12	15
Lower Indian Creek (site 6)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	82	--	--	--	--	--	--	--
2003	119	0	0	71	60	48	40	18	20	.23	<1
2004	119	0	0	69	58	50	42	41	37	.55	1
2005	109	0	0	64	59	45	41	52	44	.69	1
2006	70	0	0	72	103	--	--	--	--	--	--
2007	117	0	0	66	56	51	44	42	38	.55	<1
AVG.	107	0	0	71	67	49	42	38	35	.51	1
Middle Blue River (site 7)											
1999	833	--	--	--	--	--	--	--	--	--	--
2000	91	--	--	--	--	--	--	--	--	--	--
2001	456	--	--	--	--	--	--	--	--	--	--
2002	253	--	--	90	36	--	--	--	--	--	--
2003	287	--	--	80	28	207	72	68	24	139	49
2004	437	--	--	77	18	360	82	141	32	219	50
2005	425	⁴ .24	⁴ <1	73	17	352	83	118	28	233	55
2006	142	--	--	82	58	60	42	10	7	50	35
2007	499	--	--	74	15	425	85	121	24	304	61
AVG.	358	⁴ .24	⁴ <1	79	29	281	73	92	23	189	50
Brush Creek (site 16)											
1999	19.8	--	--	--	--	--	--	--	--	--	--
2000	2.65	--	--	--	--	--	--	--	--	--	--
2001	6.98	--	--	--	--	--	--	--	--	--	--
2002	2.89	--	--	--	--	--	--	--	--	--	--
2003	4.12	--	--	--	--	--	--	--	--	--	--
2004	8.12	--	--	--	--	--	--	--	--	--	--
2005	5.57	1.30	32	--	--	2.71	68	1.85	46	.86	22
2006	2.74	--	--	--	--	--	--	--	--	--	--
2007	6.37	--	--	--	--	--	--	--	--	--	--
AVG.	5.38	1.30	35	--	--	2.71	68	1.85	46	.86	22
Lower Blue River (near site 22)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	118	--	--	--	--	--	--	--	--	--	--
2001	451	--	--	--	--	--	--	--	--	--	--
2002	218	--	--	90	41	--	--	--	--	--	--
2003	233	--	--	80	34	--	--	--	--	--	--
2004	496	--	--	77	16	--	--	--	--	--	--
2005	422	2.43	1	73	17	346	82	118	28	228	54
2006	139	--	--	82	59	--	--	--	--	--	--
2007	350	--	--	74	21	--	--	--	--	--	--
AVG.	328	2.43	1	79	31	346	82	118	28	228	54

Table 21. Estimated annual contributions of total nitrogen, total phosphorus, and fecal-indicator bacteria for selected stream reaches in the Blue River Basin, 1999 to 2007.—Continued

[CSOs, combined sewer overflows; WWTPs, wastewater treatment plant; AVG., average of years where data available, percents and totals may not equal 100 because of rounding errors and unequal periods of data; --, no data; na, not applicable; KS, Kansas; MO, Missouri; <, less than; >, greater than]

<i>Escherichia coli</i> , in billions of colonies											
Year	All Sources	CSOs		WWTPs		Non-Point					
	Load	Load ¹	Percent of total	Load	Percent of total	Load ²	Percent of total	KS Load ²	Percent of total	MO Load	Percent of total
Upper Blue River (site 2)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	--	--	--	--	--	--	--	--
2003	10,200,000	0	0	--	--	--	--	--	--	--	--
2004	24,000,000	0	0	--	--	--	--	--	--	--	--
2005	17,500,000	0	0	--	--	--	--	--	--	--	--
2006	3,530,000	0	0	--	--	--	--	--	--	--	--
2007	18,700,000	0	0	--	--	--	--	--	--	--	--
AVG.	14,786,000	0	0	--	--	--	--	--	--	--	--
Lower Indian Creek (site 6)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	--	--	--	--	--	--	--	--
2003	9,120,000	0	0	--	--	--	--	--	--	--	--
2004	13,800,000	0	0	--	--	--	--	--	--	--	--
2005	15,000,000	0	0	--	--	--	--	--	--	--	--
2006	6,180,000	0	0	--	--	--	--	--	--	--	--
2007	12,600,000	0	0	--	--	--	--	--	--	--	--
AVG.	11,340,000	0	0	--	--	--	--	--	--	--	--
Middle Blue River (site 7)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	--	--	--	--	--	--	--	--	--	--	--
2001	--	--	--	--	--	--	--	--	--	--	--
2002	--	--	--	--	--	--	--	--	--	--	--
2003	30,600,000	--	--	--	--	--	--	--	--	--	--
2004	43,100,000	--	--	--	--	--	--	--	--	--	--
2005	44,700,000	⁴ 521,000	⁴ 1	--	--	--	--	--	--	--	--
2006	17,100,000	--	--	--	--	--	--	--	--	--	--
2007	36,800,000	--	--	--	--	--	--	--	--	--	--
AVG.	34,460,000	⁴ 521,000	⁴ 1	--	--	--	--	--	--	--	--
Brush Creek (site 16)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	--	--	--	--	--	--	--	--	--	--	--
2001	--	--	--	--	--	--	--	--	--	--	--
2002	--	--	--	--	--	--	--	--	--	--	--
2003	26,800,000	--	--	--	--	--	--	--	--	--	--
2004	44,700,000	--	--	--	--	--	--	--	--	--	--
2005	16,100,000	3,860,000	24	--	--	12,300,000	76	8,390,000	52	3,910,000	24
2006	3,160,000	--	--	--	--	--	--	--	--	--	--
2007	1,770,000	--	--	--	--	--	--	--	--	--	--
AVG.	18,506,000	3,860,000	24	--	--	12,300,000	76	8,390,000	52	3,910,000	24
Lower Blue River (near site 22)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	--	--	--	--	--	--	--	--	--	--	--
2001	--	--	--	--	--	--	--	--	--	--	--
2002	--	--	--	--	--	--	--	--	--	--	--
2003	421,000,000	--	--	--	--	--	--	--	--	--	--
2004	366,000,000	--	--	--	--	--	--	--	--	--	--
2005	257,000,000	5,300,000	2	--	--	--	--	--	--	--	--
2006	83,500,000	--	--	--	--	--	--	--	--	--	--
2007	182,000,000	--	--	--	--	--	--	--	--	--	--
AVG.	261,900,000	5,300,000	2	--	--	--	--	--	--	--	--

Table 21. Estimated annual contributions of total nitrogen, total phosphorus, and fecal-indicator bacteria for selected stream reaches in the Blue River Basin, 1999 to 2007.—Continued

[CSOs, combined sewer overflows; WWTPs, wastewater treatment plant; AVG., average of years where data available, percents and totals may not equal 100 because of rounding errors and unequal periods of data; --, no data; na, not applicable; KS, Kansas; MO, Missouri; <, less than; >, greater than]

Fecal coliform, in billions of colonies											
Year	All Sources	CSOs		WWTPs		Non-Point					
	Load	Load ¹	Percent of total	Load	Percent of total	Load ²	Percent of total	KS Load ²	Percent of total	MO Load	Percent of total
Upper Blue River (site 2)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	1,150	--	--	--	--	--	--	--
2003	14,000,000	0	0	2,390	<1	14,000,000	>99	11,500,000	82	2,520,000	18
2004	33,400,000	0	0	2,420	<1	33,400,000	>99	27,400,000	82	6,010,000	18
2005	21,900,000	0	0	³ 12,000	<1	21,900,000	>99	17,900,000	82	3,940,000	18
2006	3,740,000	0	0	² 2,780	<1	3,740,000	>99	3,070,000	82	673,000	18
2007	19,100,000	0	0	880	<1	19,100,000	>99	15,700,000	82	3,450,000	18
AVG.	18,428,000	0	0	1,710	<1	18,428,000	>99	15,114,000	82	3,318,600	18
Lower Indian Creek (site 6)											
1999	--	0	0	--	--	--	--	--	--	--	--
2000	--	0	0	--	--	--	--	--	--	--	--
2001	--	0	0	--	--	--	--	--	--	--	--
2002	--	0	0	14,800	--	--	--	--	--	--	--
2003	15,500,000	0	0	14,100	<1	15,500,000	>99	15,300,000	99	202,000	1
2004	21,200,000	0	0	15,400	<1	21,200,000	>99	20,900,000	99	275,000	1
2005	25,000,000	0	0	130,000	<1	24,800,000	>99	24,500,000	98	323,000	1
2006	12,100,000	0	0	478,000	4	11,600,000	96	11,400,000	95	151,000	4
2007	18,200,000	0	0	8,270	<1	18,200,000	>99	17,900,000	99	236,000	1
AVG.	18,400,000	0	0	110,000	<1	18,260,000	>99	18,000,000	98	237,400	2
Middle Blue River (site 7)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	--	--	--	--	--	--	--	--	--	--	--
2001	--	--	--	--	--	--	--	--	--	--	--
2002	--	--	--	16,000	--	--	--	--	--	--	--
2003	75,200,000	--	--	16,500	<1	75,200,000	>99	26,800,000	36	48,400,000	64
2004	86,500,000	--	--	17,800	<1	86,500,000	>99	48,300,000	56	38,200,000	44
2005	74,200,000	⁴ 1,400,000	²	142,000	<1	72,600,000	98	42,400,000	57	30,200,000	41
2006	22,800,000	--	--	481,000	2	22,300,000	98	14,500,000	64	7,800,000	34
2007	46,800,000	--	--	9,150	<1	46,800,000	>99	33,600,000	72	13,100,000	28
AVG.	61,100,000	⁴ 1,400,000	²	114,000	<1	60,680,000	>99	33,120,000	57	27,540,000	42
Brush Creek (site 16)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	--	--	--	--	--	--	--	--	--	--	--
2001	--	--	--	--	--	--	--	--	--	--	--
2002	--	--	--	--	--	--	--	--	--	--	--
2003	29,400,000	--	--	--	--	--	--	--	--	--	--
2004	54,200,000	--	--	--	--	--	--	--	--	--	--
2005	21,600,000	8,360,000	39	--	--	13,300,000	61	9,040,000	40	4,210,000	20
2006	4,490,000	--	--	--	--	--	--	--	--	--	--
2007	2,400,000	--	--	--	--	--	--	--	--	--	--
AVG.	22,418,000	8,360,000	39	--	--	13,300,000	61	9,040,000	40	4,210,000	20
Lower Blue River (near site 22)											
1999	--	--	--	--	--	--	--	--	--	--	--
2000	--	--	--	--	--	--	--	--	--	--	--
2001	--	--	--	--	--	--	--	--	--	--	--
2002	--	--	--	16,000	--	--	--	--	--	--	--
2003	1,260,000,000	--	--	16,500	<1	--	--	--	--	--	--
2004	936,000,000	--	--	17,800	<1	--	--	--	--	--	--
2005	596,000,000	13,900,000	2	142,000	<1	582,000,000	98	42,400,000	7	540,000,000	91
2006	169,000,000	--	--	481,000	<1	--	--	--	--	--	--
2007	258,000,000	--	--	9,150	<1	--	--	--	--	--	--
AVG.	643,800,000	13,900,000	2	114,000	<1	582,000,000	98	42,400,000	7	540,000,000	91

¹Data from city of Kansas City, Missouri.

²Includes undetermined contribution from wastewater treatment plant bypasses.

³Includes contribution from wastewater treatment plant bypasses.

⁴Refers to contribution in adjacent downstream reach.

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