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

# Water Quality in the Blue River Basin, Kansas City Metropolitan Area, Missouri and Kansas, July 1998 to October 2004

Water quality in the Blue River Basin, Kansas City Metropolitan Area, Missouri and Kansas, July 1998 to October 2004

Scientific Investigations Report 2006–5147

Photographs showing Blue River near site 2, October 2000; Indian Creek near site 6, March 2002; and Brush Creek near site 10, February 2000.

U.S. Department of the Interior
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Prepared in cooperation with the City of Kansas City, Missouri, Water Services Department
Scientific Investigations Report 2006-5147
U.S. Department of the Interior U.S. Geological Survey

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**Cover photographs:**

Top: Blue River near site 2, October 2000.
Bottom left: Indian Creek near site 6, March 2002.
Bottom right: Brush Creek near site 10, February 2000.

# Water Quality in the Blue River Basin, Kansas City Metropolitan Area, Missouri and Kansas, July 1998 to October 2004

By Donald H. Wilkison, Daniel J. Armstrong, Richard D. Norman, Barry C. Poulton, Edward T. Furlong, and Steven D. Zaugg

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**U.S. Department of the Interior**
**U.S. Geological Survey**

**U.S. Department of the Interior**
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# Contents

# Figures

# Tables

# Conversion Factors and Datum

| Multiply | By | To obtain |
|---|---|---|
| **Length** | | |
| centimeter (cm) | 0.3937 | inch (in.) |
| millimeter (mm) | 0.03937 | inch (in.) |
| meter (m) | 3.281 | foot (ft) |
| kilometer (km) | 0.6214 | mile (mi) |
| meter (m) | 1.094 | yard (yd) |
| **Area** | | |
| square meter ($m^2$) | 0.0002471 | acre |
| hectare (ha) | 2.471 | acre |
| square hectometer ($hm^2$) | 2.471 | acre |
| square kilometer ($km^2$) | 247.1 | acre |
| square centimeter ($cm^2$) | 0.001076 | square foot ($ft^2$) |
| square meter ($m^2$) | 10.76 | square foot ($ft^2$) |
| square centimeter ($cm^2$) | 0.1550 | square inch ($in^2$) |
| hectare (ha) | 0.003861 | square mile ($mi^2$) |
| square kilometer ($km^2$) | 0.3861 | square mile ($mi^2$) |
| **Volume** | | |
| liter (L) | 33.82 | ounce, fluid (fl. oz) |
| liter (L) | 2.113 | pint (pt) |
| liter (L) | 1.057 | quart (qt) |
| liter (L) | 0.2642 | gallon (gal) |
| cubic meter ($m^3$) | 264.2 | gallon (gal) |
| cubic decimeter ($dm^3$) | 0.2642 | gallon (gal) |
| cubic meter ($m^3$) | 0.0002642 | million gallons (Mgal) |
| cubic centimeter ($cm^3$) | 0.06102 | cubic inch ($in^3$) |
| cubic decimeter ($dm^3$) | 61.02 | cubic inch ($in^3$) |
| liter (L) | 61.02 | cubic inch ($in^3$) |
| cubic decimeter ($dm^3$) | 0.03531 | cubic foot ($ft^3$) |
| cubic meter ($m^3$) | 35.31 | cubic foot ($ft^3$) |
| cubic meter ($m^3$) | 1.308 | cubic yard ($yd^3$) |
| cubic kilometer ($km^3$) | 0.2399 | cubic mile ($mi^3$) |
| cubic meter ($m^3$) | 0.0008107 | acre-foot (acre-ft) |
| cubic hectometer ($hm^3$) | 810.7 | acre-foot (acre-ft) |
| **Flow rate** | | |
| meter per second (m/s) | 3.281 | foot per second (ft/s) |
| meter per minute (m/min) | 3.281 | foot per minute (ft/min) |
| meter per hour (m/hr) | 3.281 | foot per hour (ft/hr) |
| meter per day (m/d) | 3.281 | foot per day (ft/d) |
| meter per year (m/yr) | 3.281 | foot per year (ft/yr) |
| cubic meter per second ($m^3$/s) | 35.31 | cubic foot per second ($ft^3$/s) |
| cubic meter per second per square kilometer [($m^3$/s)/$km^2$] | 91.49 | cubic foot per second per square mile [($ft^3$/s)/$mi^2$] |

| Multiply | By | To obtain |
|---|---|---|
| cubic meter per day ($m^3/d$) | 35.31 | cubic foot per day ($ft^3/d$) |
| liter per second (L/s) | 15.85 | gallon per minute (gal/min) |
| cubic meter per day ($m^3/d$) | 264.2 | gallon per day (gal/d) |
| cubic meter per day per square kilometer [($m^3/d$)/$km^2$] | 684.28 | gallon per day per square mile [(gal/d)/$mi^2$] |
| cubic meter per second ($m^3/s$) | 22.83 | million gallons per day (Mgal/d) |
| cubic meter per day per square kilometer [($m^3/d$)/$km^2$] | 0.0006844 | million gallons per day per square mile [(Mgal/d)/$mi^2$] |
| cubic meter per hour ($m^3/h$) | 39.37 | inch per hour (in/hr) |
| kilometer per hour (km/h) | 0.6214 | mile per hour (mi/hr) |
| **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:

°F = (1.8 x °C) + 32

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

°C = (°F - 32) / 1.8

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

Horizontal coordinate information is referenced to the "North American Datum of 1983 (NAVD 83)."

Elevation, as used in this report, refers to distance above the vertical datum.

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).

# Water Quality in the Blue River Basin, Kansas City Metropolitan Area, Missouri and Kansas, July 1998 to October 2004

by Donald H. Wilkison, Daniel J. Armstrong, Richard D. Norman, Barry C. Poulton, Edward T. Furlong, and Steven D. Zaugg

## Abstract

Water-quality data were collected from sites in the Blue River Basin from July 1998 to October 2004 in cooperation with City of Kansas City, Missouri, Water Services Department. Data included measurements of stream discharge, physical properties, nutrients, organic wastewater and pharmaceutical compounds, fecal-indicator bacteria densities, and benthic macroinvertebrates to provide an assessment of the chemical, bacteriological, and biological conditions in urban streams that have substantial discharges from wastewater-treatment plants and/or combined sewer overflows. Fourteen sites were sampled during base-flow conditions, 10 sites were sampled during storms, and 5 sites were monitored continuously for temperature, pH, dissolved oxygen, and turbidity. Water column water-quality profiles and bottom-sediment samples were collected in three impounded reaches of Brush Creek. Benthic macroinvertebrate community indicators were described at 10 sites in the basin and 1 outside control site. Total nitrogen and total phosphorus loads and yields were estimated for 28 months at 4 basin sites to allow comparison with loads estimated for 3 wastewater-treatment plants in the basin, and to compare basin yields with those estimated at a control site and to other urban areas of the United States. Sites upstream from wastewater-treatment plants and/or the combined sewer system area had lower concentrations of total nitrogen, total phosphorus, organic wastewater compounds, and pharmaceuticals, and more diverse aquatic communities. Sites downstream from wastewater-treatment plants had the largest concentrations and loads of nutrients, organic wastewater compounds, and pharmaceuticals. Approximately 60 percent of the total nitrogen and total phosphorus in the middle and lower Blue River originated from the Indian Creek tributary, smaller amounts from the upper Blue River (from 28 to 16 percent), and less than 5 percent from Brush Creek. Nutrient yields from the lower Indian Creek and the middle Blue River were significantly greater than yields from the upper Blue River, lower Brush Creek, the outside control site, and other U.S. urban sites. Total nitrogen and total phosphorus yields from the upper Blue River and lower Brush Creek were not significantly different from one another. Large concentrations of nutrients led to eutrophication of impounded Brush Creek reaches, even though biogeochemical activity in bottom sediments reduced and removed nitrogen from the system. This occurred because these same reducing conditions mobilized phosphorus into the overlying water column. Bottom sediment samples collected from impoundments generally had concentrations of organic wastewater and pharmaceutical compounds equivalent to, and sometimes greater than, concentrations observed in streambed sediments downstream from wastewater-treatment plants. Bacteria in streams largely was the result of nonpoint-source contributions during storms. Presumptive sources of *Esherichia coli* bacteria in base-flow stream samples varied temporally and spatially in the basin. Based on genetic source-tracking, average contributions of in-stream *Esherichia coli* bacteria in the basin from dogs ranged from 26 to 32 percent of the total, geese contributed between 8 to 19 percent, human sources ranged from 28 to 42 percent, and 18 to 20 percent were from unknown sources. Macroinvertebrate diversity as measured by total taxa present and the percentage of Ephemeroptera, Plecoptera, and Tricoptera was highest at sites with the largest percentage of upstream land use devoted to forests and grasslands. Declines in macroinvertebrate community metrics were correlated strongly with increases in several, inter-related urbanization factors including percent impervious cover, nutrient enrichment, and the prevalence of organic wastewater compounds and pharmaceuticals.

## Introduction

The Blue River Basin encompasses 725 square kilometers and roughly one-half of the Kansas City metropolitan area south of the Missouri River. The inter-jurisdictional basin extends through two states (Missouri and Kansas), four 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. The quality of stream water in the basin is influenced by a variety of factors, including point and nonpoint-source pollution, physical stream conditions, and complex water-quality processes. Wastewater, both treated and untreated, is an important hydrologic component in the Blue River Basin. Stream segments of Indian Creek, Tomahawk Creek, and the Blue River receive discharge from wastewater treatment plants (WWTPs), and segments in the lower reaches of Brush Creek and the Blue River receive discharges from combined sewer overflows (CSOs). In an effort to better understand the myriad of factors affecting water quality in the basin, the U.S. Geological Survey (USGS) in cooperation with the City of Kansas City, Missouri, Water Services Department initiated studies to characterize water-quality and identify sources of selected constituents in the basin. These studies began in 1998 and continue to present (2006). Previous reports examined data from July 1998 through 2000 (Wilkison and others, 2002), or presented data collected from October 2000 through 2004 (Wilkison and others, 2005).

## Background

Kansas City, Missouri, is one of approximately 750 municipalities in the United States with a combined sewer system (CSS; U.S. Environmental Protection Agency, 2004). Unlike separate sanitary sewer systems, CSSs are designed to carry sanitary wastewater and stormwater runoff and to function differently during dry and wet weather conditions. In dry weather, CSSs convey sewage from homes, businesses, and industry to a WWTP. After treatment, the water is discharged to a receiving stream in accordance with applicable water-quality standards. During wet weather, runoff from streets, rooftops, parking lots, parks, and lawns enters the combined system and is delivered to the WWTP for treatment and discharge. However, if the volume of runoff and sewage exceeds the pipe or treatment plant capacity, then the excess flow (a mixture of stormwater and untreated sewage) is diverted to receiving streams to reduce hydraulic stress on the system. It is the addition of stormwater to CSSs that eventually overwhelms the system and results in diversion and discharge that is termed a CSO. There are approximately 220 diversion structures in the Kansas City, Missouri, CSS area (fig. 1) that drain to approximately 100 stream outfall points (City of Kansas City, Missouri, written commun., 2005). Three-fourths of the diversion structures and outfalls are located within the Blue River Basin.

Communities with CSSs are required under federal and state regulations to develop a plan to control overflows and to monitor their impacts on receiving waters (U.S. Environmental Protection Agency, 1999). Control plans include analysis of current water-quality conditions, characterization of other pollutant sources that might inhibit the attainment of applicable water-quality standards, and a watershed-based perspective (U.S. Environmental Protection Agency, 1994). To support development of a control plan, laboratory and hydrologic analysis of stream samples from the Blue River Basin began in 1998 to characterize water quality in the basin and to better understand the variety of sources, including wastewater, that affect receiving stream water quality. Stream samples are analyzed for a number of constituents including nutrients, selected organic wastewater and pharmaceutical compounds, fecal indicator (*Escherichia coli* [*E. coli*] and fecal coliform) bacteria, and suspended sediment. These data indicate that water quality in the basin is affected by urban stormwater, nonpoint-source pollution, CSOs, leaks from aging or damaged sewer lines, sediments trapped behind impoundments, continuous (or nearly continuous) discharges of treated sewage effluent, storm events that produce flows in excess of the sewer system collection and treatment capabilities that result in the discharge of untreated wastewater into receiving streams, and combinations of these sources (Wilkison and others, 2002, 2005).

## Purpose and Scope

The purpose of this report is to present the results of a detailed assessment of stream water quality in the Blue River Basin from July 1998 to October 2004. This investigation consolidates data from two previous companion water-quality studies conducted in the basin from July 1998 to October 2000, and from October 2000 to October 2004 (Wilkison and others, 2002, 2005). Measurements of nutrients, organic wastewater compounds (OWCs), over-the-counter and prescription drugs, fecal-indicator bacteria, physical properties, and aquatic macroinvertebrate communities are discussed for stream sites on the Blue River, Brush Creek, and Indian Creek. Contaminant loading patterns determined from these measurements are presented for base- and stormflow conditions, and conceptual models were developed to show how various contaminants move through the environment.

## Study Area Description

The study area included 14 surface-water sites in the Blue River Basin and encompassed reaches of the Blue River, Brush Creek, and Indian Creek that received inputs from either CSOs or WWTPs (fig. 1; table 1). Data-collection sites included six sites on the main stem of the Blue River (sites 1, 2, 7, 8, 13, and 14), four sites on the tributary Brush Creek (sites 9 to 12), and three sites on the tributary Indian Creek (sites 3, 4, and 6). Two stream sites, one in the basin (site 5 on Tomahawk Creek) and one outside of the basin (site 19 on the South Grand River) were sampled as controls for aquatic biota measurements. Control sites were chosen because they were either an urban site without expected wastewater sources (site 5) or were a non-urban site within the same ecoregion (site 19). Data from three WWTP discharges (site 15, 16, and 17; fig. 1) were evaluated.

### Climate and Hydrology

Kansas City has a modified continental climate dominated by warm, wet summers and cool, dry winters (Ruffner and Bair, 1979). Mean annual precipitation in the Blue River Basin is 98 centimeters. Sixty percent of the precipitation occurs between May and September of each year and the most intense precipitation events—those with greater than 2.5 centimeters within 24 hours—generally occur then (National Climatic Data Center, 2005). Extended drought conditions can develop when dry

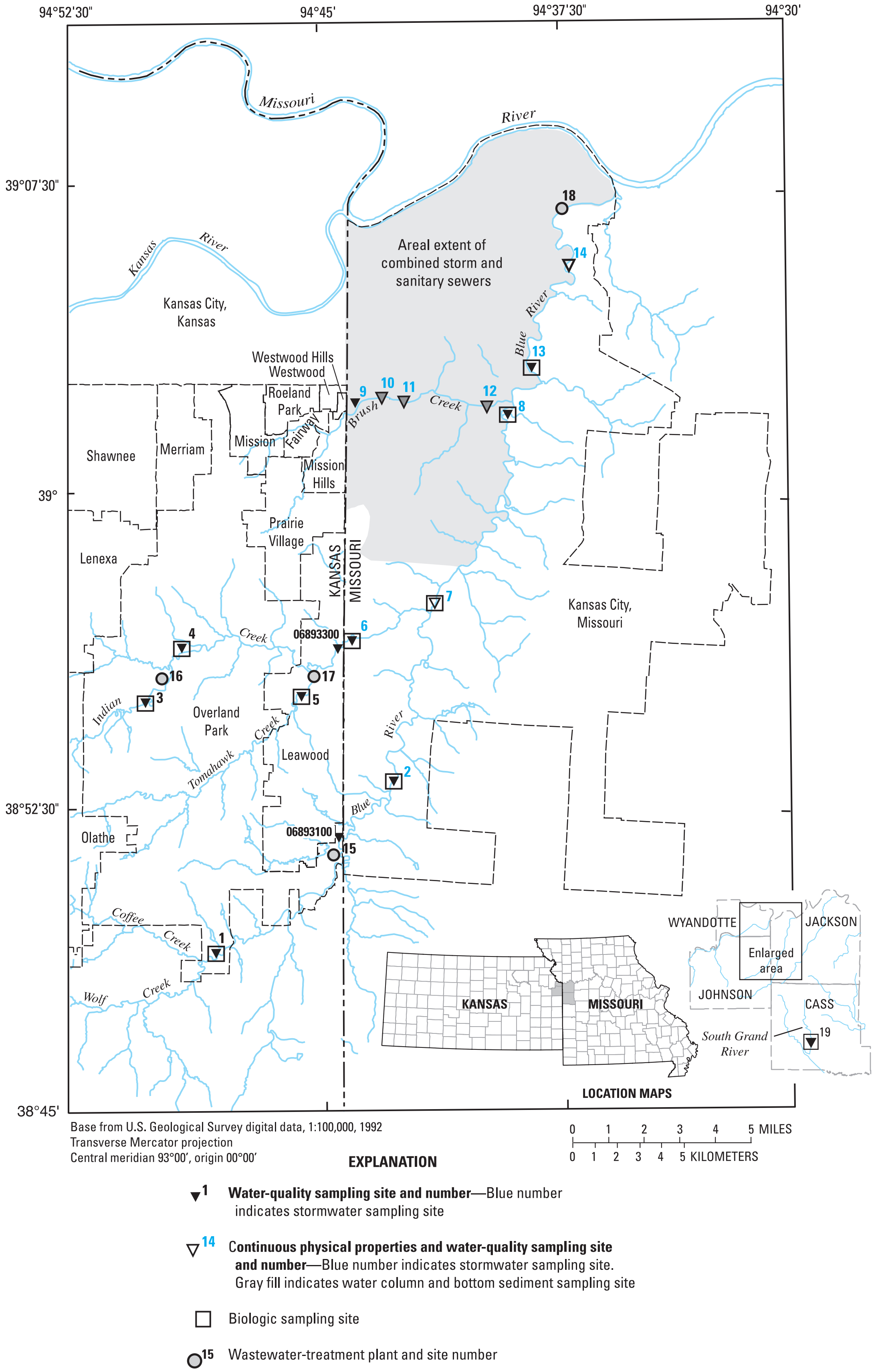



**Figure 1.** Location of study area, sampling sites, wastewater-treatment plants, and area of combined storm and sanitary sewers.

**Table 1.** Locations of sites sampled and type of water-quality and streamflow data collected as part of this study.

[ID, identification number; BQW, base-flow water quality; SQW, stormflow water quality; CQW, continuous water quality; IQW, benthic macroinvertebrates; LQW-SED, vertical water-quality profiles and sediment water quality; $Q_I$, instantaneous discharge; $Q_C$, continuous discharge; KS, Kansas; --, no data or not applicable; KCMO, Kansas City, Missouri; WWTP, wastewater-treatment plant; MO, Missouri]

| Site number (fig. 1) | Station name | Station ID | Latitude / Longitude | Water-quality data | | | | | Streamflow | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | BQW | SQW | CQW | IQW | LQW-SED | $Q_I$ | $Q_C$ |
| 1 | Blue River near Stanley, KS | 06893080 | 384845 / 0944032 | X | -- | -- | X | -- | -- | X |
| 2 | Blue River at Blue Ridge Boulevard Extension, KCMO | 06893150 | 385322 / 0943450 | X | X | -- | X | -- | -- | X[1] |
| 3 | Indian Creek at 69 Hwy., Overland Park, KS | 06893270 | 385513 / 0944216 | X | -- | -- | X | -- | X | -- |
| 4 | Indian Creek at Farley, Overland Park, KS | 06893280 | 385600 / 0944139 | X | -- | -- | X | -- | X | -- |
| 5 | Tomahawk Creek at Tomahawk Creek Park, Overland Park, KS | 385539094372100 | 385539 / 0943721 | X | -- | -- | X | -- | X | -- |
| 6 | Indian Creek at 103rd Street, KCMO | 06893400 | 385631 / 0943616 | X | X | -- | X | -- | -- | X[1] |
| 7 | Blue River near KCMO | 06893500 | 385725 / 0943332 | X | X | X | X | -- | -- | X |
| 8 | Blue River at Blue Parkway, KCMO | 06893552 | 390206 / 0943136 | X | X | -- | X[2] | -- | -- | X[3] |
| 9 | Brush Creek at Ward Parkway, KCMO | 06893557 | 390159 / 0943619 | X | X | -- | -- | -- | -- | X |
| 10 | Brush Creek at KCMO | 06893560 | 390223 / 0943507 | X | X | X[3] | -- | X | -- | X[3] |
| 11 | Brush Creek at Rockhill Road, KCMO | 06893562 | 390221 / 0943443 | X | X | X | -- | X | -- | X |
| 12 | Brush Creek at Elmwood Avenue, KCMO | 06893564 | 390211 / 0943152 | X | X | X[3] | X[4] | X | -- | X[3] |
| 13 | Blue River at Stadium Drive, KCMO | 06893578 | 390330 / 0943042 | X | X | -- | X | -- | -- | X |
| 14 | Blue River at 12th Street, KCMO | 06893590 | 390549 / 0942928 | X | X | X[3] | -- | -- | -- | X[3] |
| 15 | Blue River Main WWTP, Johnson County, KS | -- | 385114 / 0943658 | X[5] | X[5] | -- | -- | -- | X[5] | -- |
| 16 | Indian Creek Middle Basin WWTP, Overland Park, KS | -- | 385514 / 0944208 | X[5] | X[5] | -- | -- | -- | X[5] | -- |
| 17 | Tomahawk Creek WWTP, Overland Park, KS | -- | 385548 / 0943726 | X[5] | X[5] | -- | -- | -- | X[5] | -- |
| 18 | Blue River WWTP, KCMO | 390736094292700 | 390736 / 0942927 | X | -- | -- | -- | -- | -- | -- |
| 19 | South Grand River near Freeman, MO | 06921582 | 383520 / 0942630 | X | -- | -- | X | -- | X | -- |

[1]Continuous data collection began in 2001.

[2]Sampled at 63rd Street

[3]Continuous data collection discontinued in 2001.

[4]Sampled in free-flowing section below dam.

[5]Some data are from U.S. Environmental Protection Agency, Environmental Compliance History Online database (http://www.epa.gov/echo).

winds from the semiarid southwest dominate the air flow pattern. July typically is the warmest month, with a mean daily maximum temperature of 89 $^{o}$F (degrees Fahrenheit) and January is the coldest month, with a mean daily minimum temperature of 18.1 $^{o}$F (National Climatic Data Center, 2005).

The major tributaries of the Blue River—Brush, Indian, and Tomahawk Creeks—originate in Kansas. The remaining basin, approximately 46 percent or 345 square kilometers, drains most of Kansas City, Missouri, which lies south of the Missouri River. Substantial parts of stream segments in the basin have been altered substantially by urbanization, industrial development, and flood-control projects. An estimated 25 percent of the land use and land cover in the basin is impervious (table 2).

During the last 30 years, the Blue River has been channelized from Brush Creek to the mouth as part of flood-control measures (U.S. Army Corps of Engineers, 2004). Additional Blue River flood mitigation projects either have been completed, or are planned, along the reach from Indian Creek to Brush Creek (U. S. Army Corps of Engineers, written commun., 2005). Stream segments have been straightened and the banks armored with rip-rap or concrete in an attempt to increase floodwater conveyance and reduce the area inundated by floods. These projects have resulted in the alteration or removal of most of the native in-stream and adjacent riparian corridor habitat in the lower reaches, although most of the upper stream reaches remain largely unaltered (fig. 2).

Brush Creek is a highly urbanized stream. Large sections of the native streambank and channel have been replaced by concrete and most of the native riparian habitat replaced by landscaping—a process that began in the mid-1920's and continues through the present (2006; fig. 2). The most substantial channel alterations occur along the lower 9-kilometer stretch from the Missouri-Kansas state line to the mouth and followed a devastating loss of life and property flood in 1977. Brush Creek channel modifications were designed to decrease flooding by quickly conveying floodwaters to the Blue River. Additionally, to enhance the aesthetic and recreational potential of

Unaltered Blue River channel downstream from site 2.

Channelized reach of Indian Creek upstream from site 6.

Channelized reach of Blue River upstream from site 13.

Channelized reach of Brush Creek downstream from site 11.

**Figure 2.** Riparian areas adjacent to selected stream sites (fig. 1).

**Table 2.** Land-use/land-cover characteristics for sites and streams sampled.

[Drainage area (upper number), in square kilometers above site or within stream; basin percentage (lower number in bold); $m^3$, cubic meters; --, no data; na, site below wastewater-treatment plant but estimates not available; unless noted, land cover classifications modified from U.S. Geological Survey National Map (2004)]

| Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Drainage area, total** | | | | | | | | | | | | | | |
| 118 | 241 | 477 | 551 | 671 | 749 | 42 | 60 | 168 | 194 | 34 | 41 | 47 | 78 | 78 |
| **Agricultural** | | | | | | | | | | | | | | |
| 30 | 59 | 83 | 83 | 83 | 83 | 6.0 | 8.0 | 23 | 23 | 0.02 | 0.02 | 0.02 | 0.03 | 0.03 |
| 25.2 | 24.6 | 17.3 | 15.0 | 12.4 | 11.1 | 15.3 | 12.8 | 13.7 | 11.9 | 0.0 | 0.0 | 0.1 | 0.0 | 0.0 |
| **Barren** | | | | | | | | | | | | | | |
| 0.28 | 0.85 | 0.92 | 1.39 | 1.54 | 1.68 | 0.01 | 0.03 | 0.05 | 0.05 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 0.2 | 0.4 | 0.2 | 0.3 | 0.2 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Commercial and Industrial** | | | | | | | | | | | | | | |
| 0.83 | 2.97 | 26.8 | 37.4 | 55.7 | 80.3 | 4.22 | 8.37 | 17.9 | 20.9 | 2.59 | 4.50 | 5.20 | 9.97 | 10.2 |
| 0.7 | 1.2 | 5.6 | 6.8 | 8.3 | 10.7 | 10.1 | 14.0 | 10.7 | 10.8 | 7.6 | 11.1 | 11.1 | 12.9 | 13.0 |
| **Forested** | | | | | | | | | | | | | | |
| 11.7 | 33.5 | 56.0 | 73.2 | 82.4 | 86.9 | 2.16 | 2.78 | 10.1 | 11.6 | 2.70 | 2.96 | 3.13 | 4.09 | 4.20 |
| 9.9 | 13.9 | 11.7 | 13.3 | 12.3 | 11.6 | 5.2 | 4.7 | 6.0 | 6.0 | 8.0 | 7.3 | 6.7 | 5.3 | 5.4 |
| **Grassland, including parks** | | | | | | | | | | | | | | |
| 69.8 | 129 | 189 | 203 | 220 | 231 | 10.8 | 13.7 | 44.1 | 47.0 | 4.51 | 4.76 | 5.51 | 8.29 | 8.40 |
| 59.3 | 53.5 | 39.6 | 36.9 | 32.8 | 30.9 | 25.7 | 23.0 | 26.2 | 24.2 | 13.3 | 11.7 | 11.8 | 10.7 | 10.7 |
| **Residential, High Intensity** | | | | | | | | | | | | | | |
| 0.46 | 1.47 | 45.1 | 62.2 | 117 | 144 | 8.23 | 12.0 | 30.3 | 38.9 | 15.9 | 19.7 | 23.6 | 42.9 | 43.0 |
| 0.4 | 0.6 | 9.5 | 11.3 | 17.4 | 19.2 | 19.6 | 20.1 | 18.0 | 20.0 | 46.8 | 48.5 | 50.6 | 55.3 | 55.0 |
| **Residential, Low Intensity** | | | | | | | | | | | | | | |
| 1.31 | 6.20 | 63.2 | 75.3 | 94 | 101 | 9.31 | 14.0 | 39.3 | 48.6 | 8.1 | 8.4 | 8.9 | 11.8 | 11.8 |
| 1.1 | 2.6 | 13.2 | 13.7 | 14.1 | 13.5 | 22.2 | 23.4 | 23.4 | 25.1 | 23.7 | 20.7 | 19.2 | 15.2 | 15.2 |
| **Water** | | | | | | | | | | | | | | |
| 1.51 | 3.40 | 5.67 | 6.39 | 7.18 | 8.23 | 0.22 | 0.39 | 1.42 | 1.57 | 0.09 | 0.15 | 0.18 | 0.29 | 0.30 |
| 1.3 | 1.4 | 1.2 | 1.2 | 1.1 | 1.1 | 0.5 | 0.7 | 0.8 | 0.8 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 |

**Table 2.** Land-use/land-cover characteristics for sites and streams sampled.—Continued

[Drainage area (upper number), in square kilometers above site or within stream; basin percentage (lower number in bold); m³, cubic meters; --, no data; na, site below wastewater-treatment plant but estimates not available; unless noted, land cover classifications modified from U.S. Geological Survey National Map (2004)]

| Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Wetlands** | | | | | | | | | | | | | | |
| 1.92 | 4.20 | 7.41 | 8.82 | 10.0 | 12.1 | 0.55 | 0.75 | 1.98 | 2.30 | 0.09 | 0.10 | 0.10 | 0.18 | 0.22 |
| 1.6 | 1.7 | 1.6 | 1.6 | 1.5 | 1.6 | 1.3 | 1.3 | 1.2 | 1.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 |
| **Impervious area, includes roads, roofs, sidewalks, and parking lots[1]** | | | | | | | | | | | | | | |
| 17.6 | 38.6 | 89.1 | 106 | 146 | 184 | 8.29 | 12.2 | 35.2 | 41.2 | 16.8 | 20.2 | 23.1 | 36.5 | 36.5 |
| 15.0 | 16.0 | 18.7 | 19.2 | 21.8 | 24.6 | 20.0 | 20.6 | 20.9 | 21.2 | 50.0 | 50.0 | 49.2 | 47.1 | 46.8 |
| **Roads** | | | | | | | | | | | | | | |
| 2.19 | 5.46 | 23.2 | 28.5 | 40.7 | 47.4 | 3.42 | 4.45 | 13.5 | 16.0 | 3.59 | 4.49 | 5.20 | 8.91 | 8.94 |
| 1.9 | 2.3 | 4.9 | 5.2 | 6.1 | 6.3 | 8.2 | 7.5 | 8.0 | 8.2 | 10.6 | 11.0 | 11.1 | 11.5 | 11.4 |
| **Storm, sanitary, and combined sewer lines, total length, in meters (upper value) and capacity, in m³ (lower value)[2]** | | | | | | | | | | | | | | |
| -- | na | 464,800 | 1,015,000 | 2,031,000 | | | | | | 78,900 | 158,000 | 272,000 | 741,000 | -- |
| -- | na | 97,400 | 212,000 | 488,000 | -- | -- | na | na | -- | 9,660 | 27,200 | 50,100 | 193,000 | -- |
| **Sewer density, in length (meters) per square kilometer (upper value) and capacity (m³) per square kilometer (lower value)** | | | | | | | | | | | | | | |
| -- | na | 975 | 7,450 | 6,560 | -- | -- | na | na | -- | 2,330 | 11,800 | 29,900 | 69,300 | -- |
| -- | na | 204 | 1,550 | 1,980 | -- | -- | na | na | -- | 284 | 2,610 | 3,770 | 4,630 | -- |
| **Sewer Lines, unit length in meters** | | | | | | | | | | | | | | |
| -- | na | 5,690 | 10,700 | 20,300 | -- | -- | -- | -- | -- | 7,930 | 18,600 | 29,900 | 69,300 | -- |
| **Number of combined sewer overflow diversion structures[2]** | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 34 | 172 | 172 | 0 | 0 | 0 | 0 | 0 | 14 | 19 | 112 | 112 |

[1]Adapted from Mid-America Regional Council, 2005.

[2]City of Kansas City, Missouri, data on file.

the stream corridor, a series of impoundments were created by constructing weirs, or small dams, designed to impound water during base-flow periods and then to allow stormwater to freely move downstream during higher flows (fig. 3). The channel modifications to Brush Creek have resulted in a stream that consists of a series of lotic (flowing) and lentic (standing) reaches during low flows.

**Figure 3.** Flow over weir from Plaza pool (above site 10) into Volker pool below (above site 11) following storm event and storm sewer discharge into Brush Creek (marked with arrow).

Wastewater, both treated and untreated, is an important hydrologic component in the basin. Kansas residents are served by three WWTPs (sites 15 to 17; fig.1) that discharge into the basin above site 7. The largest of these plants, site 16, discharges just upstream from site 4 on Indian Creek; the next-largest plant, site 17, discharges into Tomahawk Creek just upstream from its confluence with Indian Creek and upstream from site 4; the smallest plant, site 15, discharges into the Blue River just upstream from site 2. From July 2001 through August 2004, these plants treated an average of 10.3 million gallons per day (Mgal/d), 4.2 Mgal/d, and 2.9 Mgal/d (U.S. Environmental Protection Agency, 2005). All of these plants have secondary-treatment capacity; sites 15 and 16 utilize activated-sludge treatment, and site 17 uses trickling-filter treatment. Wastewater for Missouri residents in the basin is treated at site 18, but plant effluent is discharged outside of the basin into the Missouri River.

Discharges from WWTPs supplement the natural flow in receiving streams. At sites downstream from either one (site 2), two (site 4), or three (site 7) WWTPs, effluent can comprise greater than 95 percent of base flow during droughts (Wilkison and others, 2005). Other potential sources of wastewater that can contribute contaminants to streams in the basin are faulty septic-systems, line blockages that result in sanitary sewer overflows (SSOs), leaks from aging and disrepaired sewer-lines, and WWTP by-passes; therefore, most sites in the basin potentially are affected by some wastewater source.

## Land Use/Land Cover

The Blue River Basin mostly is urbanized (fig. 4; table 2) and has been for a number of years. However, more than 60 percent of the area upstream from site 2 still remains in grass or forested land. Residential land use constitutes one-third of the total basin area, and more than 70 percent of the area drained by Brush Creek. Since 1970, population has doubled in the Kansas part of the basin, but has remained constant on the Missouri side (U.S. Census Bureau, 2002). Residential development in the basin headwaters area is expected to increase by 30 percent in the next 10 years, with only minimal additional development expected on the Missouri side (Mid-America Regional Council, 2003). Agricultural lands constitute 11 percent of the total basin area, and are confined almost entirely to headwater reaches of the Blue River and Indian Creek. Commercial and industrial development primarily is concentrated along the lower reaches of Brush Creek, Indian Creek, and the Blue River.

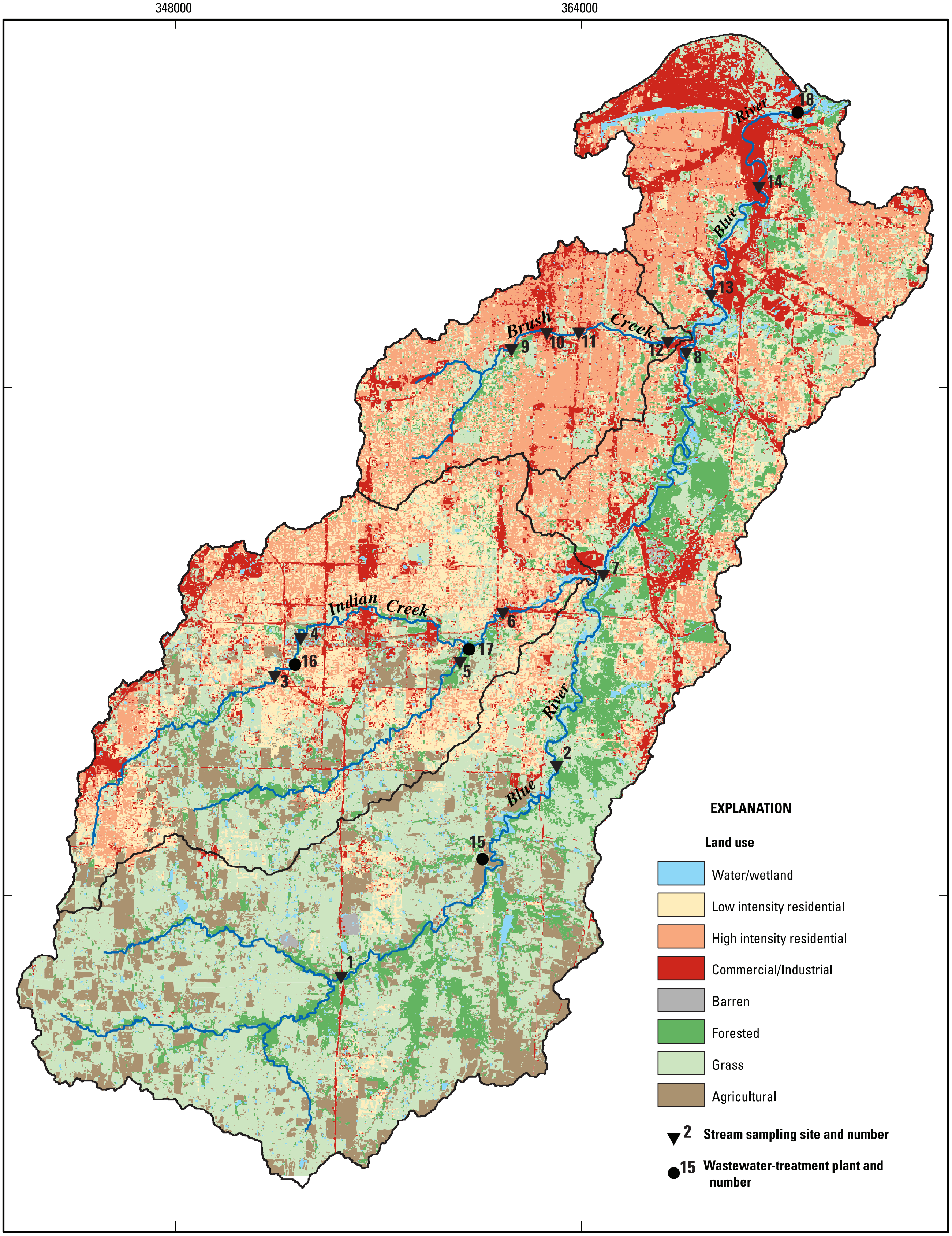
Park lands along streams stretch over approximately 60 linear miles of riparian corridors in the basin. Brush Creek Greenway, which stretches along the lower 6 kilometers of Brush Creek, was acquired in 1917 (City of Kansas City, Missouri Parks Department, written commun., 2005). Numerous other parks have been established along and adjacent to basin streams, and efforts are underway to make these an integral component of an inter-connected, metro-wide, greenways and trails system (Mid-America Regional Council, 2004).

## Water Quality

Water-quality issues have long been a concern in the basin. Principal water-quality concerns have centered around the effects of increasing urbanization in the basin, industrial and wastewater discharges, nonpoint-source pollution, and the effects of CSOs on receiving waters (Mid-America Regional Council, 1983; Blevins, 1986; Wilkison and others, 2002, 2005). Approximately 15 percent of the basin is underlain by a CSS that occasionally allows untreated wastewater to be discharged into Brush Creek and Blue River. The boundaries of the combined system are shaded on figure 1 and are roughly, the Missouri River on the north, the Blue River on the east, 85th Street on the south, and the Kansas state line on the west. Rainfall rates in excess of 0.6 centimeter per hour probably are sufficient to trigger CSOs in some areas of the city (City of Kansas City, Water Services Department, written commun., 2004).

## Previous Studies

Systematic streamflow measurement began in 1939 on the Blue River (site 7, fig. 1) and in 1963 on Indian Creek (approximately 7 kilometers upstream from site 6) and has continued through the present (2006). Various other streamflow gages were established as part of previous studies (Becker, 1990; Blevins, 1986; Wilkison and others, 2002, 2005), some of




Base from U.S. Geological Survey digital data 1:24,000, 2000
Universal Transverse Mercator projection
Zone 15

Land use modified from U.S. Geological Survey National Map (2004)

0 3 6 MILES
0 3 6 KILOMETERS

**Figure 4.** Land use/land cover in the Blue River Basin.

which are still in use today and were part of this study. Streamflow data are published annually in reports by the USGS and made available on the world wide web (URLs: http://waterdata.usgs.gov/mo/nwis/ and URL: http://waterdata.usgs.gov/ks/nwis/).

During 1998, the USGS began conducting surface-water studies in the Blue River Basin in an effort to characterize the effects of wastewater pollutant loadings on selected stream reaches in the Blue River Basin (Wilkison, 2002). This work primarily focused on the Blue River downstream from site 7 and on the Missouri part of Brush Creek (downstream from site 9). Constituent loadings of compounds associated with wastewater were determined for 1998 to 2000 during base-flow and stormflow conditions. DNA fingerprinting of *E.Coli* bacteria also was utilized to estimate relative proportions of bacteria sources at selected sites within the study area. In 2000, data collection efforts were adjusted slightly to better characterize source loadings from wastewater effluent on the upper Blue River (upstream from site 2) and in Indian Creek. Additionally, water-column and bottom-sediment data were collected from lentic reaches of Brush Creek and biological samples were collected at 10 sites throughout the basin. These data were reported in Wilkison and others (2005). Lee and others (2005) sampled selected sites in the upper basin as part of an effort to examine the effects of point and nonpoint sources in Johnson County, Kansas, and their relation to land use.

# Methods

Streamflow and water-quality data analyzed in this study were collected from July 1998 to October 2004 (Wilkison and others, 2002, 2005). Data collected included discrete and continuous streamflow; discrete and continuous water-quality properties; concentrations of nutrients, organic wastewater and pharmaceutical compounds; fecal-indicator bacteria and suspended sediment in base-flow and streamflow samples; and assessments of aquatic macroinvertebrates.

## Sampling Protocol

Sampling sites were selected to provide a comprehensive assessment of the effects of point and nonpoint sources within the basin, to provide support for historical trend analysis of water quality, and to assess the aquatic integrity of selected stream reaches within the Blue River Basin. Locations were based on a variety of factors including accessibility, security, and proximity to tributaries, CSS areas, or WWTPs. Types of water-quality and streamflow data collected at sites are listed in table 1. Sites are shown in figure 1 in relation to streams and tributaries in the basin, to the areal extent of the CSS area in Kansas City, Missouri, and to the proximity of existing WWTPs in the study area. Samples were collected during base-flow (defined as streamflow unaffected by storm runoff) and stormflow events.

Descriptions of the streamflow and water-quality sampling methods employed in this study have been described in detail previously (Wilkison and others 2002; 2005). A brief description follows.

Streamflow was determined by direct discharge measurement at the time of sample collection, or from established stage-discharge relations using USGS procedures outlined by Rantz and others (1982a, 1982b). At continuous streamflow sites (table 1), stage was measured at 5- to 15-minute intervals, and the mean daily discharge published annually (Hauck and Nagel, 2000, 2001, 2002, 2003, 2004, 2005) and are available in the National Water Information System (NWIS) online at URL http://waterdata.usgs.gov/nwis. Mean monthly discharge data for selected sites in the study area (sites 6, 7, and 11) from August 1998 through September 2004 are shown in figure 5.

At continuous water-quality data sites (table 1), multi-parameter probes capable of recording temperature, pH, dissolved oxygen, and turbidity were used in accordance with procedures outlined in Wagner and others (2000). Monitors were installed to allow adequate contact with the sampled stream and to protect the monitor from floods. From 1998 through 2000, monitors at sites 10, 11, and 12 were encased in protective polyvinyl chloride (PVC) pods with holes drilled throughout to allow adequate water exchange, anchored with steel cables to fixed points along the stream bank, and placed in the centroid of flow. Beginning in 2001, the monitor at site 11 was installed adjacent to the stream bank in a protective case designed to hold the instrument six-tenths of the total depth below the static water surface during base flow. Monitors at sites 7 and 14 were installed in protective cases anchored to the stream bottom with steel rods, and designed to hold the monitors at an approximate depth of six-tenths of the total depth below the water surface during base flow.

Mean daily water-quality values were published annually (Hauck and Nagel, 2001, 2002, 2003, 2004, 2005) or in a previous report (Wilkison and others, 2002, 2005) and are available in NWIS (URL http://waterdata.usgs.gov/nwis).

All water-quality samples were collected and processed using protocols designed to prevent contamination; therefore, collection and processing equipment was comprised of inert materials—glass, fluorocarbon polymer, or stainless steel (Lane and Ray, 2003; Wilde, 2004; Wilde, 2005; Wilde and others, 1999; Wilde and others, 2002; Wilde and others, 2004). Base-flow samples were depth- and width-integrated across streams unless depth or width constrictions warranted the collection of grab samples from the centroid of flow. Stormflow samples were collected using automatic samplers programmed to collect flow-weighted samples after minimal stage thresholds were exceeded. Sample programs were based on the shape and duration of a hydrograph from a thunderstorm capable of producing 1.9 to 3.2 centimeters, which targeted events considered to be of sufficient intensity or duration to trigger at least some CSOs in the CSS area. Storms may have triggered events in parts of the basin, but not in other parts, and the duration and magnitude of events likely varied at individual CSO points for any given storm. It was beyond the scope of this project to characterize

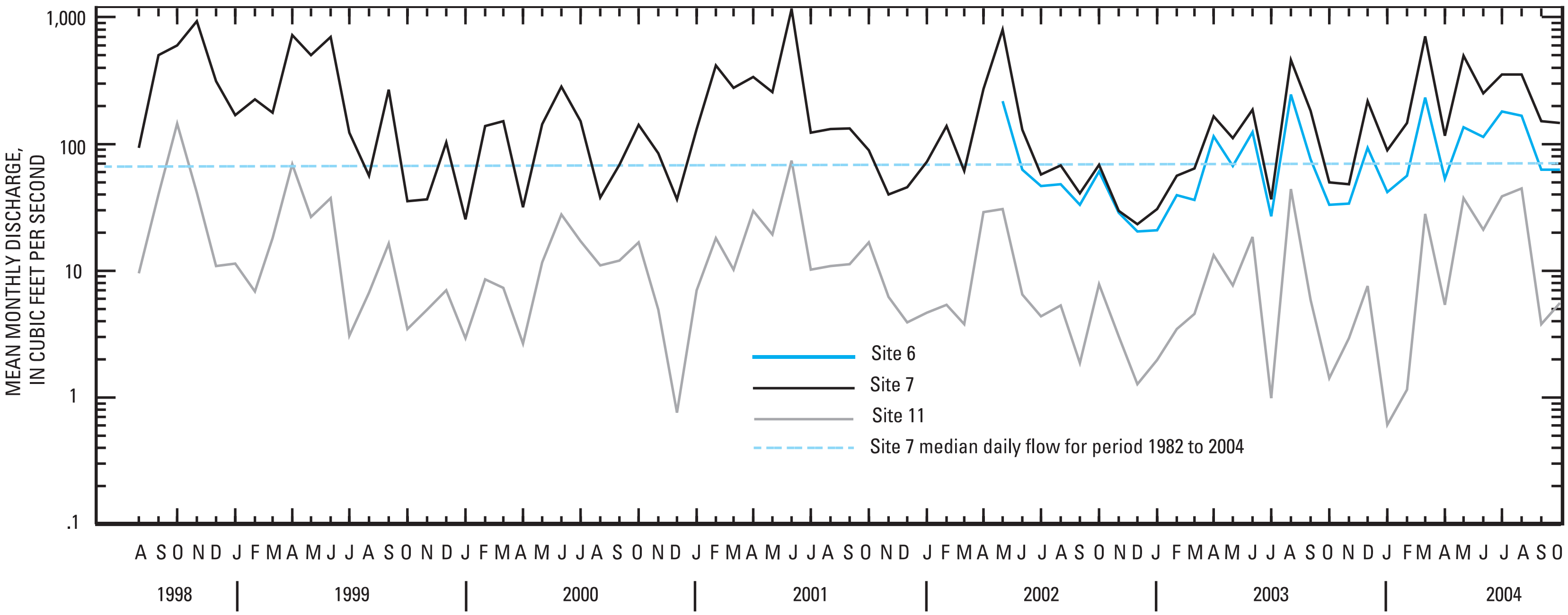



**Figure 5.** Mean monthly discharge at selected sites in the Blue River Basin from August 1998 through October 2004 (no data at site 6 for August 1998 through May 2003).

the frequency, duration, or magnitude of CSO events. 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.

Stream samples were analyzed for physical properties, nutrients, organic wastewater and selected pharmaceutical compounds, fecal indicator bacteria (*E. coli* and fecal coliform), major ions, trace elements, and benthic macroinvertebrates. Major ions and trace elements are not discussed in the report. Nutrients analyzed in this study included total ammonia plus organic nitrogen (N), dissolved ammonia, dissolved nitrate ($NO_3$), dissolved nitrite ($NO_2$), total N (sum of total and dissolved N species), orthophosphate, and dissolved and total phosphorus (P). Organic wastewater compounds refers to concentrations of common household and industrial chemicals, including, but not limited to, detergent surfactants and surfactant metabolites, antimicrobial soaps, personal-care insecticides, plasticizers, musks and fragrance compounds determined from unfiltered samples (Brown and others, 1999; Kolpin and others, 2002). Information about the potential uses, sources, and endocrine-disrupting potential of these compounds has been reported in a related method for OWC determination from filtered samples (Zaugg and others, 2002). Pharmaceutical compounds were determined from filtered samples using the method of Cahill and others (2004). Pharmaceutical analytes included analgesics (acetaminophen and ibuprofen), an anticonvulsant (carbemazepine), antibiotics (sulfamethoxazole and trimethoprim), cardiac and anti-clotting medications (dehydronifedipine, diltiazem, and warfarin), a cholesterol-regulator (gemfibrozil), a narcotic (codeine), and stimulants (caffeine and cotinine, a metabolite of nicotine).

To better characterize Brush Creek impoundment water quality and to more fully understand the controlling processes, vertical water-quality profiles were determined for selected sampling events. Because the intent was to sample water that was in chemical equilibrium with bottom sediment, sampling events were scheduled to follow extended periods (2 weeks or greater) of little or no precipitation. During these sampling events, selected physical properties were measured at 0.25 meter depth intervals concurrent with the collection of depth-integrated water samples.

Benthic macroinvertebrates were sampled in accordance with biological assessment protocols established for the evaluation of the biological condition of wadeable streams (Rabeni and others, 1997; Kansas Department of Health and Environment, 2000). Samples collected in 2002 were obtained from a standard habitat or habitats (usually coarse mineral substrate in riffles, at a minimum) with a D-frame kicknet, preserved in the field, and processed in the laboratory. The sample was split in a gridded tray and organisms sorted from sample debris, enumerated, and identified with microscopy. In 2003 and 2004, two independently obtained 100-organism samples were collected from multiple habitats using a D-frame kicknet, field sorted, and composited into one sample to create a composite of approximately 200 organisms, which were identified and enumerated in the laboratory using microscopy.

With the exception of *E. coli* microbial source-tracking samples, all samples were analyzed at USGS laboratories using established procedures (Faries, 1993; Fishman, 1993; Fishman and Friedman, 1989; Moulton and others, 2000; Kolpin and others, 2002; Zaugg and others, 2002; Cahill and others, 2004). *E. coli* microbial source-tracking samples were analyzed at the University of Missouri Veterinary Pathobiology Laboratory in Columbia, Missouri, using genotypic, geographic-specific, library-based methods (Dombek and others, 2000; Carson and others, 2003).

## Data Analysis

Water-quality data were analyzed by categorical analysis for various factors that may have been expected to affect concentrations and loads observed in stream samples. These factors included hydrologic condition at the time of sample collection, stream reach, and potential wastewater sources.

Stream sampling sites were determined to provide broad areal coverage throughout the basin (fig. 1) with consideration given to site locations that would allow characterization of major tributaries or contributions from major point sources. Due to safety considerations, data collection on the lower Blue River was moved upstream from site 14 to site 13 beginning in early 2002, and data from these sites were combined for the purposes of this report. Sites above and below major point sources were sampled. Because one objective was to determine the relative magnitude of various potential sources of wastewater entering streams, sites were categorized by the expected principal upstream wastewater inputs for stream sites and reaches (table 3). Potential sources included WWTP effluent, CSOs, and mixtures of WWTP effluent and CSOs. Sites categorized as "other" were considered less likely to be affected substantially by wastewater but still could be potentially impacted by faulty septic systems, leaking sanitary sewer lines, and sewer by-pass overflows.

Instantaneous loads of selected contaminants at stream sites were determined by multiplying the measured concentration by the discharge at the time of sample collection, and then by an appropriate conversion factor to normalize units. Estimates of monthly total N and total P loads at selected sites in the basin were determined by minimum variance unbiased procedures (Runkel and others, 2004). These procedures were designed to account for non-normal data distributions, seasonal or annual cycles, censored data, biases associated with logarithmic transformations, and serial correlation of residuals (Cohn and others, 1988; Cohn and others, 1989). Hydrologic and/or seasonal components were included only when model fit improved and warranted their inclusion. Because fewer storm samples were collected at sites 2 and 6, stormflow data from nearby USGS streamflow gaging stations, 06893100 and 06893300, which were sampled in 2003 and 2004 (Lee and others, 2005), were used to provide better resolution to the fitted model at these sites. The models determined instantaneous loads from each observation in the data set. Loads were esti-

**Table 3.** Stream reach and wastewater source categories for sites sampled in the Blue River Basin.

[KS, Kansas; KCMO, Kansas City, Missouri; MO, Missouri; WWTP, wastewater-treatment plant; --, not assigned; CSO, combined sewer overflows]

| Site number (fig. 1) | Station name | Stream reach category | Wastewater source category |
|---|---|---|---|
| 1 | Blue River near Stanley, KS | Upper Blue River | Other[1] |
| 2 | Blue River at Blue Ridge Boulevard Extension, KCMO | Upper Blue River | WWTP |
| 3 | Indian Creek at 69 Hwy., Overland Park, KS | Upper Indian Creek | Other[1] |
| 4 | Indian Creek at Farley, Overland Park, KS | Middle Indian Creek | WWTP |
| 5 | Tomahawk Creek at Tomahawk Creek Park, Overland Park, KS | -- | Other[1] |
| 6 | Indian Creek at 103rd Street, KCMO | Lower Indian Creek | WWTP |
| 7 | Blue River near KCMO | Middle Blue River | WWTP |
| 8 | Blue River at Blue Parkway, KCMO | Middle Blue River | WWTP/CSO |
| 9 | Brush Creek at Ward Parkway, KCMO | Middle Brush Creek | Other[1] |
| 10 | Brush Creek at KCMO | Middle Brush Creek | CSO |
| 11 | Brush Creek at Rockhill Road, KCMO | Lower Brush Creek | CSO |
| 12 | Brush Creek at Elmwood Avenue, KCMO | Lower Brush Creek | CSO |
| 13 | Blue River at Stadium Drive, KCMO | Lower Blue River | WWTP/CSO |
| 14 | Blue River at 12th Street, KCMO | Lower Blue River | WWTP/CSO |

[1]Site upstream from wastewater-treatment plants and combined sewer overflow areas.

mated for each time period, in this case days, which were summed to provide monthly estimates using the S-LOADEST computer program (David Lorenz, U.S. Geological Survey, written commun., 2005). Yield estimates were determined by dividing the constituent load determined at the site by the site's drainage area.

Estimates of the natural background total N and total P loads at selected sites in the basin were done by applying regional regression models developed from minimally affected USGS reference basins (Smith and others, 2003) and atmospheric deposition rates for 1998 through 2004 (National Atmospheric Deposition Program, 2005). Estimates of mean monthly contaminant loads from WWTPs were determined by multiplying the mean monthly concentration of selected contaminants by the mean monthly plant discharge as reported by the plant (U.S. Environmental Protection Agency, 2005) and then by an appropriate conversion factor to normalize units. Estimates of total N and total P loads originating specifically from CSOs were beyond the scope of this report, but such measurements were provided for stream reaches in the CSS area to allow comparison with other potential sources.

Algal productivity of Brush Creek impoundments was determined using the Trophic-State Index (Carlson, 1977) and a slightly different system (Trophic State) developed specifically for Missouri lakes (Jones and Knowlton, 1993). The Trophic-State Index was calculated based on Secchi depths, chlorophyll *a* concentrations, and total P concentrations (Carlson, 1977). Trophic State was determined from measurements of chlorophyll *a*, total N, and total P concentrations (Jones and Knowlton, 1993). Both methods classify the algal productivity of lakes as being oligotrophic (low), mesotrophic (moderate), eutrophic (productive), or hypereutrophic (very productive) based on each parameter measured.

The genetic similarity of *E. coli* isolated from water samples were compared to a library of *E. coli* isolates 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), field observations, and knowledge of potential contaminant sources. Host-source library samples were collected from sites adjacent to stream sites that reasonably could be expected to contribute in-stream bacteria. Genetic fingerprint patterns of samples were determined only after a four-step procedure confirmed that isolates were indeed strains of fecal *E. coli*. Fingerprints of isolates were generated by repetitive extragenic palindromic-PCR (rep-PCR) using BOX1AIR primers consisting of 18 to 30 bands (Carson and others, 2003). The similarity of fingerprint patterns from water-borne *E.coli* were compared to their association with patterns in the host-source library using Bionumerics software, version 3.0 (Applied Maths, Kortrijk, Belgium). Assignment to a host-group was deemed to occur when water sample patterns had a 75 percent or greater similarity to those from a known host. Samples outside of those limits were assumed to be from unknown sources.

The species richness and relative abundance of aquatic macroinvertebrates present at stream sites was determined by applying standard sampling protocols used for biological assessments (Rabeni and others, 1997; Kansas Department of Health and Environment, 2000). The resulting data include community-level attributes referred to as metrics, which are specific indicators of stream impacts that respond to the range in conditions (quality of water, sediments, or habitat) present among stream sites. Relative scores for the sites were determined from several different combinations of indicator metrics, referred to as multi-metric indices. These indices served as the basis for comparison of biological condition among the sites and for the determination of aquatic life status.

Ten indicator metrics determined from individual response patterns, stepwise data analysis, and lack of cross correlations (Barry Poulton, U.S. Geological Survey, written commun., 2005) were used to develop proportional macroinvertebrate metric scores. Each of the 10 macroinvertebrate metric scores at individual sites were scaled proportionally by transforming scores from 1 to 100; the highest score was assigned 100, the lowest assigned 1, and the remaining values calculated as a proportion of the range of scores (Kreis, 1988). Proportional values were then summed with the highest score possible being 1,000 and the lowest possible 10. This process normalized individual metric scores, added robustness to the approach, and allowed relative comparisons of aquatic community integrity between sites. Proportional water-quality scores were determined using a modification of the same approach (Kreis, 1988). The median concentration of nutrients, and OWC and pharmaceutical compounds by use categories (tables 4 and 5) at a site were proportionally transformed based on the range of all observed values for any given constituent; lowest concentrations were assigned 100, largest concentrations assigned 1, and the remaining values calculated as a proportion of the range. Therefore, an increase in a water-quality score corresponded to a decrease in the median concentration of contaminants measured in stream samples.

Nonparametric statistical methods were used to analyze the data when appropriate because water-quality data generally are not normally distributed, and the data often contain values less than the method detection level (Childress and others, 1999). Nonparametric statistical methods are not unduly affected by extreme values (outliers) because ranks of the data are used instead of the actual concentrations of the water-quality constituents (Helsel and Hirsch,1992). A significance level ($\alpha$) of 0.05 was used for all statistical tests in this study. The attained significance level, or probability of error (p-value) from the test, often was much lower and is reported to provide a quantitative indication of the degree of similarity or difference between data sets.

The laboratory method for OWCs in unfiltered samples currently (2006) analyzes for 72 compounds. To simplify data analysis, OWC compounds were categorized into general use categories according to previously established guidelines (Wilkison and others, 2002; Kolpin and others, 2002; Lee and others, 2004). The general use categories of OWCs include detergents, pesticides, polycyclic aromatic hydrocarbons (PAHs), fragrances and flavorings, sterols, plastics, stimulants, and fire retardants. The general use categories of OWCs and the chemicals that make up each category are listed in table 4. Detailed descriptions of the specific uses of these compounds have been reported in several publications (Kolpin and others, 2002; Wilkison and others, 2002; Zaugg and others, 2002; Lee and others, 2004). Some compounds listed have several uses and were assigned to categories that were believed to comprise the bulk of their use.

The laboratory method for pharmaceutical compounds in filtered samples currently (2006) analyzes for 22 compounds. Compounds were sub-divided into 10 categories based on their typical medicinal use (table 5).

### Determination of Impoundment Pool Volumes

Pool volumes of impounded reaches upstream from sites 10 and 12 on Brush Creek were determined 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 bottoms and determine pool volumes.

The impounded reaches occasionally are drained, either to inspect sediment accumulation or to maintain pumps, motors, and lighting contained within the pools. Inspection of continuous hydrograph records during either the draining or filling of the impounded reaches also allowed for the determination of the pool volume by integrating the volume entering and/or exiting a given reach.

## Quality Control and Assurance

Quality control and assurance samples, designed to ensure the integrity of the water-quality data analyzed in this report, represented approximately 10 percent of all field samples collected. Laboratory method performance was evaluated continuously through the use of standard reference materials, logic checks, and internal and external data reviews. Results from, and detailed discussions of, the quality control and assurance samples collected as part of this study were reported in Wilkison and others (2002, 2005). A brief discussion of the quality-assurance methods used in this study follows.

Field equipment blank samples were used to determine the adequacy of field and sample processing cleaning protocols. These samples were collected and processed by passing highly purified water through the same equipment used to collect and process water-quality samples. These blank samples were collected and processed in sequence with environmental samples, and then all samples were stored, shipped, and analyzed by identical methods. Most compounds were not detected in any field blank samples and, if detected, the reported concentrations were less than, or near, the detection limits for the compounds. Benzo[a]pyrene, a combustion by-product, and tri(2-chloroethyl)-phosphate, a plasticizer, frequently were detected in field

**Table 4.** 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 adapted from Wilkison and others, 2002; Zaugg and others, 2002; Lee and others, 2005]

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

| Pesticide | Plastics | Solvent | Sterol or stanol | Stimulant |
|---|---|---|---|---|
| 1,4-Dichlorobenzene | Bis(2-ethylhexyl) adipate | Isophorone | Ethynyl estradiol | Caffeine |
| 3,4-Dichlorophenyl isocyanate | Bis(2-ethylhexyl) phthalate | Isopropylbenzene (cumene) | 17-β–Estradiol | Cotinine |
| Anthraquinone | Bisphenol A | Tetrachloroethylene | 3-β-Coprostanol | |
| Atrazine | Diethylphthalate | | Cholesterol | |
| Benzophenone | Phthalic anhydride | | Equilenin | |
| Bromacil | Triethyl citrate | | Estrone | |
| Carbaryl | Triphenyl phosphate | | Sitosterol | |
| Carbazole | Tris (2-butoxyethyl) phosphate | | Stigmastanol | |
| *cis*-Chlordane | | | | |
| Chlorpyrifos | | | | |
| Diazinon | | | | |
| Dichlorvos | | | | |
| Dieldrin | | | | |
| Lindane | | | | |
| Metalaxyl | | | | |
| Metolachlor | | | | |
| N,N-diethyl-*meta*-toluamide (DEET) | | | | |
| Pentachlorophenol | | | | |
| Prometon | | | | |

**Table 5.** General use categories for pharmaceutical compounds analyzed in this report.

| Analgesic | Antacid | Antibiotic/Antifungal | Anticonvulsant | Antidiabetic |
|---|---|---|---|---|
| Acetaminophen | Ranitidine | Azithromycin | Carbamazapine | Metformin |
| Ibuprofen | Cimetidine | Erythromycin | | |
| | | Miconazole | | |
| | | Sulfamethoxazole | | |
| | | Thiabendazole | | |
| | | Trimethoprim | | |
| **Antidepressant** | **Asthma/Antihistamine** | **Cholesterol/Cardiac** | **Narcotic** | **Stimulant** |
| Fluoxetine | Albuterol (Salbutamol) | Dehydronifedipine | Codeine | 1,7-dimethylxanthine |
| | Diphenhydramine | Diltiazem | | Caffeine |
| | | Gemfibrozil | | Cotinine |
| | | Warfarin | | |

and equipment blanks collected in 1998 and 1999 (Wilkison and others, 2002). Because of that, environmental concentrations above the highest level observed in any blank [0.39 µg/L (micrograms per liter) for benzo[a]pyrene and 0.32 µg/L for tri(2-chloroethyl)-phosphate] for samples collected before October 2000 were removed from analysis in this report. There was one detection each of the pharmaceutical compounds sulfamethoxazole and diphenhydramine at trace levels (0.004 µg/L) in a field equipment blank and environmental concentrations at, or below that level, were censored for analysis in this report.

Equipment blanks also were used to assess the sterility of equipment used in the processing and enumerating bacteria from stream samples, and the potential for sample cross-contamination. Sterile buffered solution was passed through the equipment before sample processing to assess equipment sterility and then again, if multiple sites were processed using the same equipment, to assess the potential for cross-contamination between sites. Equipment blank samples were then processed and enumerated following the same procedures used for stream samples. Results, as determined by the lack of cultural bacteria in these samples, indicated that equipment sterility and cross-contamination were not issues in this study.

Field replicate samples were collected to determine the variability in sample collection and processing procedures, and to examine the affect these variations may have on evaluating the precision of ambient environmental concentrations. The smaller the difference between environmental and replicate concentrations, the higher the confidence level that sampling and processing variability do not unduly affect the precision of results. Quantile-quantile plots of the concentrations of constituents determined in environmental samples, and those determined in replicate samples, were previously reported (Wilkison and others, 2005). The relative percent difference between environmental and replicate samples analyzed for nutrients and pharmaceutical compounds averaged one percent or less and coefficient of determinations of 0.96 and 0.94 respectively (Wilkison and others, 2005). Samples analyzed using the whole-water organic wastewater method had higher percent differences (average of 5.7 percent) and lower coefficients of determination (average $r^2$ of 0.85) than did the nutrient or pharmaceutical samples (Wilkison and others, 2005). Replicate data indicated that a higher degree of uncertainty resulted when compounds were determined from whole-water samples, likely because of slight differences in suspended sediment or organic matter between whole-water samples, or because constituents were mediated by biological activity.

Bacteria samples were enumerated using multiple dilutions to ensure that density counts fell in the range of optimal values as expressed in Myers and Wilde (2003). When enumerated densities fell outside of prescribed limits, densities were estimated based on non-ideal counts using standardized criteria (Myers and Wilde, 2003). Based on these criteria, only 3 percent of the bacteria samples were reported as estimated, indicating that enumeration techniques were sufficient to adequately quantify in-stream bacteria.

A number of quality assurance procedures were utilized by the USGS National Water Quality Laboratory (NWQL). These include the determination and tracking of long-term method detection level, internal and external audits, blind blank and blind spike programs using standard reference materials, method performance evaluations, and data review. Laboratory blanks, reagent-spiked samples, and continuing calibration verification solutions were processed with each sample set (generally 10 to 15 samples) to assess potential sample contamination;

quantify method performance, bias, and variability; and to verify instrument sensitivity and calibration. Data were reviewed by logic algorithms (for example cation/anion balances and historical results); data that fell outside of acceptable limits were reviewed by chemists, verified, and re-analyzed if necessary, before acceptance. During the course of this study, standard reference material nutrient and trace element data indicate that laboratory bias and variability were within acceptable limits, generally less than one standard deviation from the most probable value. Laboratory quality-assurance data and methods are documented on the world wide web (URL http://bqs.usgs.gov), and in Childress and others (1999), Zaugg and others, (2002), and Cahill and others (2004). Data from OWC and pharmaceutical laboratory reagent spike and blank samples analyzed in conjunction with this study previously were reported (Wilkison and others, 2005).

For macroinvertebrate samples collected in 2002, the sorting of every 10th sample was checked by another technician to assure that at least 95 percent of the organisms were removed from the sample debris. For samples collected in 2003 and 2004, 10 percent of laboratory samples were cross-identified by different technicians. Identifications were checked with local experts when available and with catalogued USGS reference collections.

# Water Quality in the Blue River Basin

Water quality in the Blue River Basin was characterized from July 1998 through October 2004 using an interdisciplinary approach. The approach included measurements of nutrients, organic wastewater and pharmaceutical compounds, and fecal indicator bacteria in base flow, stormflow, and impounded stream reaches. Benthic macroinvertebrates were used to assess the biological integrity of basin streams.

## Base Flow Water Quality

Stream samples were collected between August 1998 and October 2004 at surface-water sites in the basin. Summaries of sample analytical results collected during base-flow conditions are given in tables 6 to 8, at the back of this report.

### Nutrients

During base flow, WWTPs constitute the predominant source of nutrient loads to Indian Creek and Blue River. Total N and total P concentrations and instantaneous loads measured in base-flow samples by site, and total N and total P load by stream reach are summarized in figures 6 and 7. The largest concentrations of total N and total P were observed in base-flow samples from sites 4 and 6 on Indian Creek (figs. 6a and 7a). Median total N concentration at site 4 was 15.2 mg/L (milligrams per liter) and 11.4 mg/L at site 6; median total P concentration at site 4 was 3.47 mg/L and 2.58 mg/L at site 6. Both sampling sites are located downstream from WWTP discharges. When sites were grouped by potential wastewater sources (table 3), the median concentration of total N and total P at sites downstream from WWTPs were 9 to 23 times greater than the median concentrations at sites above WWTPs and/or the CSS area. Median total N and P concentrations from base-flow samples collected in the CSS area (1.7 mg/L and 0.176 mg/L) were approximately twice that of sites with no apparent wastewater sources (0.93 mg/L and 0.07 mg/L). When sites were grouped by stream reach (table 6), median total N concentrations were lowest in base-flow samples collected from Brush Creek (1.42 mg/L) and greatest in Indian Creek samples (11.4 mg/L). Samples from the Blue River had median concentrations (5.25 mg/L) intermediate between Brush and Indian Creeks. Median total P concentration in Brush Creek samples was 0.13 mg/L compared to 2.58 mg/L in samples from Indian Creek and 0.88 mg/L in samples from the Blue River. These data indicate substantial nutrient enrichment of Indian Creek and Blue River below WWTPs during base flows. Only samples collected in upper Indian Creek and on Brush Creek ever had concentrations below the U.S. Environmental Protection Agency Level III, ecoregion 40, nutrient criteria of 0.86 mg/L for total N and 0.09 mg/L for total P (U.S. Environmental Protection Agency, 2000). Samples collected at sites downstream from WWTPs had median total N and total P concentrations ranging from 6 to 38 times greater than the criteria. However, more than 90 percent of base-flow samples collected in the basin (including some samples from Brush Creek) had total N and total P concentrations greater than the Level III, ecoregion 40, nutrient criteria, indicating that excess nutrient levels were not confined to reaches affected by WWTP effluent.

Boxplots of instantaneous total N and total P base-flow loads (flow-adjusted concentration) are shown in figures 6b and 7b for stream reaches in the basin. Instantaneous total N and total P loads were significantly greater in lower Indian Creek and in the middle and lower reaches of Blue River than other basin reaches ($p<0.001$). Reaches that received WWTP effluent had significantly greater total N and total P instantaneous base-flow loads than those that did not ($p<0.001$). Instantaneous total N and total P base-flow loads measured in Brush Creek were significantly less than loads measured in lower Indian Creek, and in all reaches of the Blue River ($p<0.001$). Median instantaneous nutrient loads measured in Brush Creek were less than 2 percent of the loads measured in the Lower Blue River, indicating that Brush Creek contributed only a small part of the overall load to the Blue River during base flow.

As water moves downstream in a basin, some part of the dissolved nutrients can be assimilated into aquatic plants and algae, especially during summer months and in lentic stream reaches. It was beyond the scope of this study to completely characterize processes that might have affected in-stream nutrient speciation and downstream N and P losses. However, the relative importance of these processes can be inferred by examining how the percentage of total N and total P in the dissolved fraction at sites changed as it moved downstream. At site 6 on

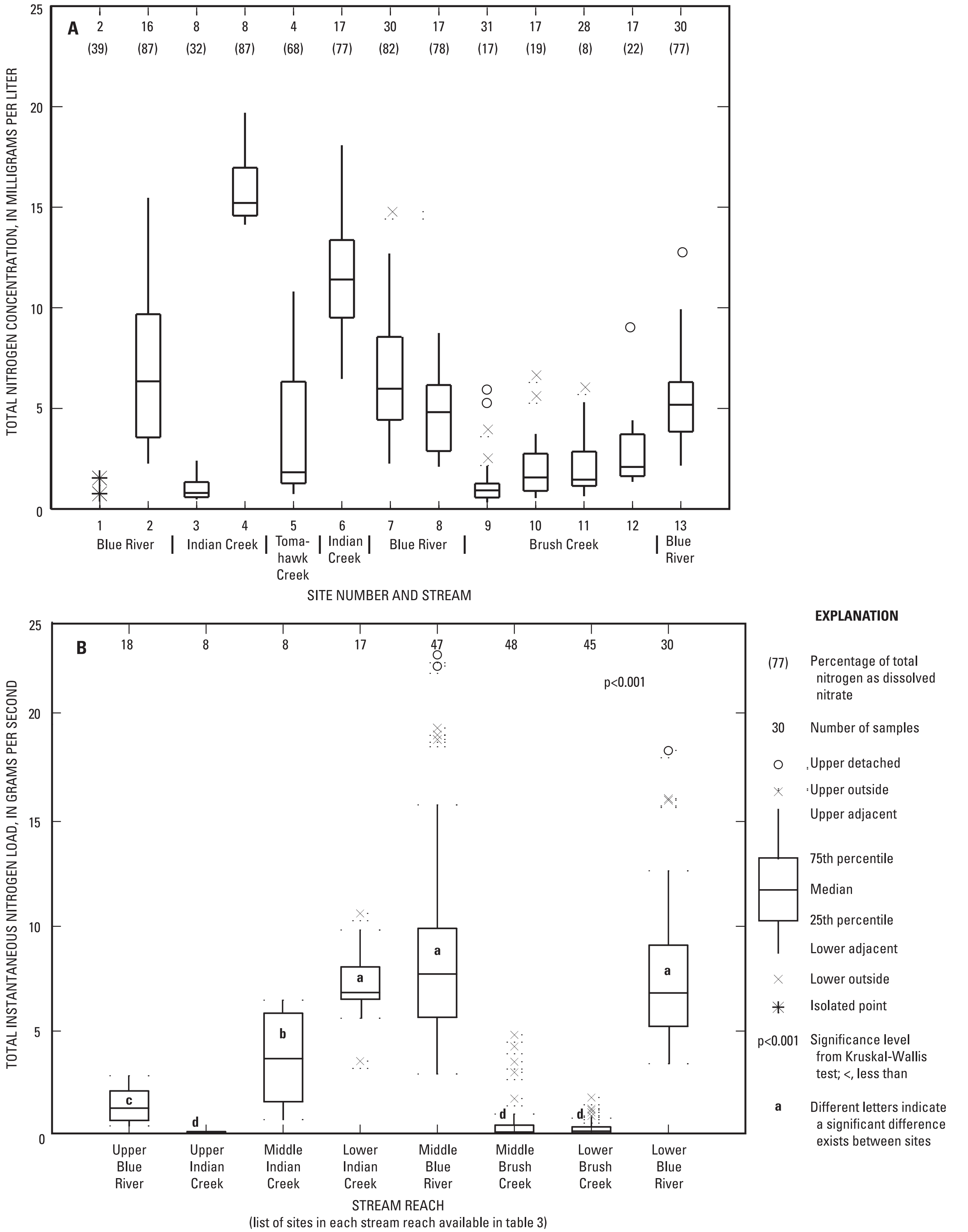



**Figure 6.** Total nitrogen concentration by site (A) and total instantaneous nitrogen load by stream reach (B) in base-flow samples collected between August 1998 and September 2004.

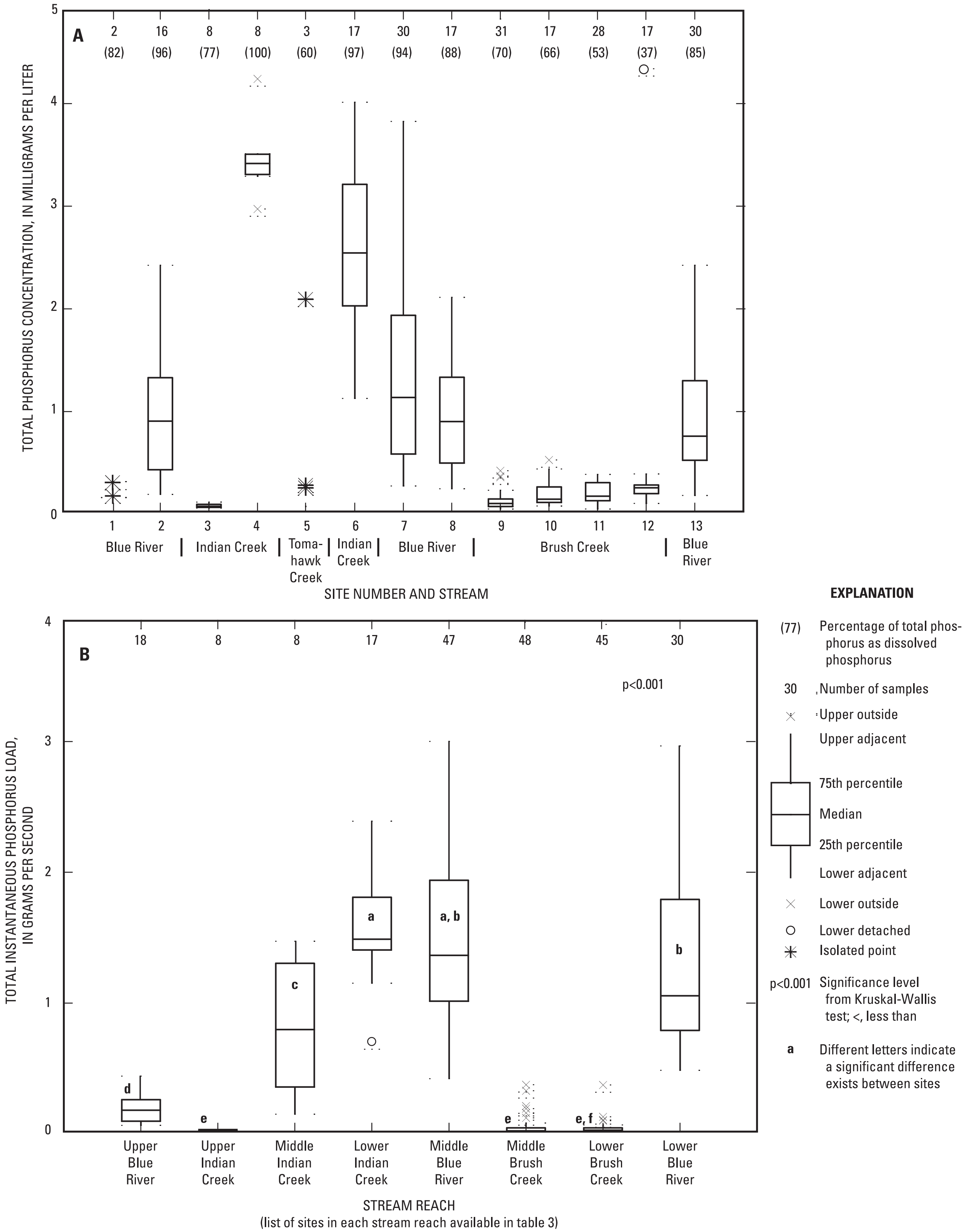



**Figure 7.** Total phosphorus concentration by site (A) and total instantaneous phosphorus load by stream reach (B) in base-flow samples collected between August 1998 and September 2004.

Lower Indian Creek, the percentage of total N that occurred as dissolved $NO_3$ was 77 percent, which is similar to the values at downstream Blue River sites (values ranged from 77 to 82 percent; fig. 6a) indicating that little shift in N speciation, and thus loss, occurred from lower Indian Creek to lower Blue River. Some N assimilation may have occurred in the reach between site 2 and site 7 as evidenced by the decline in the percent of dissolved phase N (from 87 to 82 percent) between these two sites. There was a gradual decline in the percentage of total P that occurred in the dissolved phase as it moved downstream from sites located in the upper Blue River (site 2) or lower Indian Creek (site 6) to sites downstream on the Blue River (sites 7, 8, and 13). The percentage of total P in the dissolved phase declined from 96 percent at site 2, and 97 percent at site 6, to 94 percent at site 7, 88 percent at site 8, and 85 percent at site 13 (fig. 7a). This gradual shift indicated that some P removal (likely the result of algal and plant uptake) occurred as water moved downstream, although this process was insufficient to remove substantial parts of the total P. Discussion of the potential affects of Brush Creek impoundments on nutrient speciation is provided in a later section of this report.

## Organic Wastewater Compounds

Organic wastewater compounds were measured in unfiltered base-flow samples from August 1998 to September 2004 at stream sites in the basin; not every stream site was measured during each base-flow sampling event. The number of OWC samples collected ranged from 1 (sites 1 and 5) to 30 (site 7). Summaries of OWC concentrations grouped by site and by stream are listed in table 7, at the back of this report.

Base-flow concentrations of the sum of detectable (total) OWCs at each site and instantaneous total OWC loads for selected stream reaches are shown in figure 8. Base-flow samples from sites 4 and 6, downstream from WWTPs on Indian Creek, had the largest median concentrations of OWCs in the basin. WWTPs vary in their ability to remove OWCs (Spengler and others, 2001; Glassmeyer and others, 2005). The trickling filter secondary-treatment used at site 17 (upstream from site 6) generally is regarded as being less effective than activated-sludge secondary treatment, which is used at site 15 (upstream from site 2) and site 16 (upstream from site 4) (Lee and others, 2005). Detergents and sterols (primarily cholesterol and 3β-coprostanol) generally comprised at least one-half (values ranged from 37 to 74 percent) of the measured OWCs. Detergents constituted 57 percent of the measured OWCs at site 4 and decreasing amounts at sites downstream (table 9). This is consistent with previously reported findings (Wilkison and others, 2002) where it was shown that, once released into the environment, detergent surfactants degrade by biogeochemical transformations. Adsorption to streambed sediments also likely plays an important role in the observed declines in downstream concentration.

At sites with no apparent wastewater sources the median total OWC concentration was 4.46 μg/L, approximately one-half of the median concentration at sites in the CSS area (8.03 μg/L), and approximately 40 percent of the median concentration at sites immediately downstream from WWTPs (11.5 μg/L). These data indicate that other sources, likely of non-point- source origin, play a role in base-flow OWC concentrations. Atmospheric deposition of PAHs, detergent surfactants originating from car washing, pesticides from irrigation returns, and plant matter in streams could contribute OWCs to streams during base flows. Additionally, SSOs and poorly performing septic systems could contribute OWCs to streams during base flows.

Median instantaneous loads of total OWCs in base-flow samples were largest in the lower Indian Creek [18.4 mg/sec (milligram per second)], followed by those in middle and lower reaches of the Blue River (10.1 and 10.9 mg/sec; fig. 8b). There was some loss of OWCs downstream from site 6, likely either through transformation or sorption onto sediments, but little decrease was observed in loads from the middle to lower Blue River. Instantaneous loads in the upper Blue River and Brush Creek were much smaller by comparison to those from lower Indian Creek, indicating that the predominant source of OWCs to the Blue River resulted from Indian Creek contributions. The median instantaneous base-flow OWC load in upper Blue River and in Brush Creek samples was only 5 percent of the loads measured in downstream Blue River reaches, an indication of the magnitude of base-flow contributions from these reaches when compared to the Indian Creek tributary. There was little difference between OWC loads in the middle reach of Brush Creek (median load of 0.39 mg/sec) compared to those in the lower reach of Brush Creek (median load of 0.53 mg/sec). Median OWC loads at sites without apparent wastewater sources were 23 percent of the median loads at Brush Creek sites in the CSS area. These data indicate that approximately one-quarter of the base-flow OWC load in Brush Creek originated from sources outside of the CSS area.

## Pharmaceutical Compounds

Pharmaceutical compounds were measured in filtered base-flow samples at stream sites from May 1999 to August 2004. Summary statistics for pharmaceutical compounds analyzed in base-flow samples as part of this study are given in table 8, at the back of this report. Concentrations of the sum of pharmaceutical compounds measured in stream samples by site and the instantaneous loads of pharmaceuticals by stream reach are shown in figure 9. Individual pharmaceutical concentrations measured in stream samples were small, generally less than 1 μg/L, and were attributed mostly to over-the-counter medications. Concentrations of pharmaceutical compounds were highest in samples from site 6 on Indian Creek, followed by samples from site 8 on the Blue River, and site 10 on Brush Creek. Median pharmaceutical concentrations at sites with no apparent wastewater source (0.20 μg/L) were 6 times less than the median concentrations at Brush Creek sites in the CSS area (1.21 μg/L). These data indicate that approximately 16 percent

**Table 9**. Percentage of organic wastewater compounds detected in stream samples by wastewater use category.

[--, no data; PAH, polycyclic aromatic hydrocarbon; CSO, combined sewer overflow; WWTP, wastewater-treatment plant; Other, includes no sources, sewer leaks and by-passes]

| | | | Wastewater use category | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stream reach | Sites included | Hydrologic condition | Antiox- idant | Detergent | Disinfec- tant | Fire retardant | Flavor/ fragrance | PAH | Pesticide | Plastic | Sterol | Solvent | Stimulant |
| Upper Blue River | 1,2 | base flow | 1 | 13 | 0.3 | 7 | 6 | 1 | 20 | 23 | 24 | 2 | 2 |
| | | stormflow | 0 | 2 | 0.3 | 6 | 4 | 9 | 26 | 22 | 27 | 2 | 1 |
| Upper Indian Creek | 3 | base flow | 2 | 12 | 0 | 3 | 0.1 | 0.3 | 18 | 36 | 26 | 2 | 1 |
| | | stormflow | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Middle Indian Creek | 4 | base flow | 5 | 57 | 1 | 3 | 4 | 0.3 | 6 | 5 | 17 | 1 | 0.2 |
| | | stormflow | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lower Indian Creek | 6 | base flow | 1 | 34 | 2 | 2 | 1 | 0.3 | 4 | 9 | 40 | 0.3 | 6 |
| | | stormflow | 1 | 17 | 1 | 2 | 2 | 18 | 12 | 8 | 36 | 0.4 | 3 |
| Middle Blue River | 7,8 | base flow | 1 | 30 | 3 | 3 | 2 | 1 | 4 | 16 | 31 | 2 | 6 |
| | | stormflow | 3 | 16 | 2 | 1 | 0.3 | 12 | 4 | 46 | 10 | 1 | 4 |
| Middle Brush Creek | 9,10 | base flow | 1 | 10 | 1 | 1 | 0 | 2 | 2 | 30 | 46 | 1 | 5 |
| | | stormflow | 1 | 16 | 1 | 1 | 1 | 25 | 5 | 24 | 19 | 1 | 5 |
| Lower Brush Creek | 11,12 | base flow | 1 | 16 | 1 | 2 | 1 | 4 | 4 | 23 | 35 | 1 | 10 |
| | | stormflow | 2 | 20 | 1 | 1 | 1 | 10 | 6 | 20 | 31 | 1 | 6 |
| Lower Blue River | 13,14 | base flow | 2 | 24 | 2 | 3 | 2 | 9 | 5 | 18 | 26 | 2 | 7 |
| | | stormflow | 5 | 20 | 2 | 2 | 1 | 10 | 6 | 30 | 16 | 2 | 6 |
| **Potential wastewater source** | | | | | | | | | | | | | |
| CSO | 10,11,12 | base flow | 1 | 13 | 1 | 2 | 1 | 3 | 2 | 18 | 49 | 1 | 8 |
| | | stormflow | 2 | 20 | 1 | 1 | 1 | 11 | 5 | 22 | 30 | 1 | 6 |
| WWTP | 2,4,6,7 | base flow | 2 | 35 | 2 | 3 | 2 | 0 | 5 | 11 | 34 | 1 | 5 |
| | | stormflow | 2 | 14 | 1 | 1 | 1 | 13 | 7 | 42 | 15 | 1 | 2 |
| WWTP/CSO | 8,13,14 | base flow | 2 | 26 | 3 | 3 | 1 | 7 | 4 | 18 | 28 | 2 | 7 |
| | | stormflow | 5 | 20 | 3 | 2 | 0.4 | 11 | 5 | 30 | 15 | 2 | 6 |
| Other | 1,3,5,9 | base flow | 1 | 10 | 0.4 | 2 | 0.5 | 2 | 6 | 50 | 23 | 1 | 4 |
| | | stormflow | 1 | 14 | 0.4 | 1 | 1 | 33 | 6 | 23 | 14 | 1 | 4 |

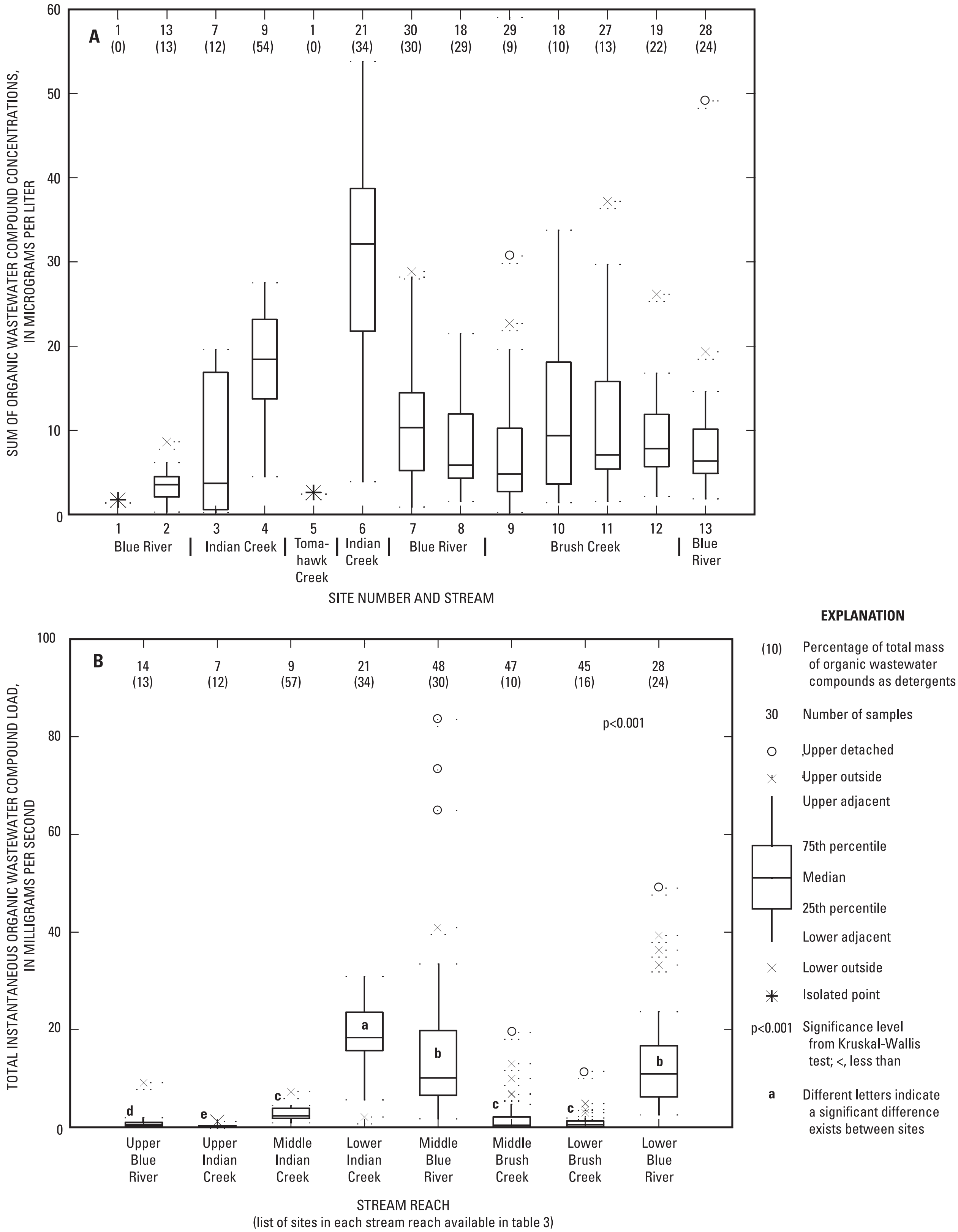



**Figure 8.** Sum of the concentration of organic wastewater compounds by site (A) and total instantaneous organic wastewater compound load by stream reach (B) in base-flow samples collected between August 1998 and September 2004.

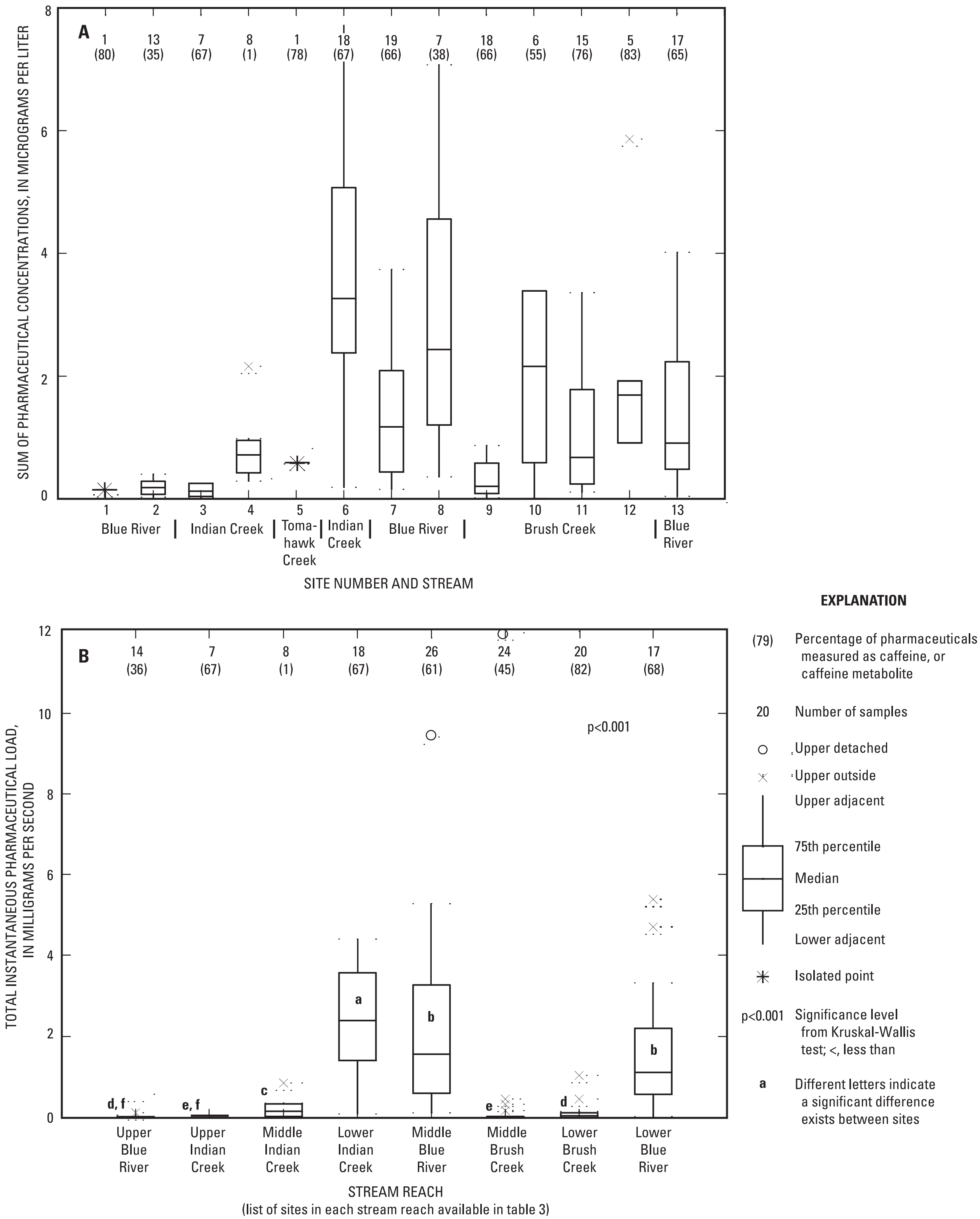



**Figure 9.** Sum of the concentration of pharmaceutical compounds by site (A) and total instantaneous pharmaceutical loads by stream reach (B) in base-flow samples collected between May 1999 and September 2005.

of the pharmaceuticals in Brush Creek originated from sources outside of the CSS area; a percentage slightly less than the 23 percent of OWCs.

Instantaneous base-flow pharmaceutical loads (fig. 8b) followed a similar pattern in stream reaches to base-flow OWC loads (fig. 7b), an indication that sources for each were largely the same during base flows. Median loads measured in lower Indian Creek were greater than those measured in the downstream reach of the Blue River. Some loss of pharmaceuticals may occur through adsorption and sedimentation, biodegradation, or photolysis once released into receiving waters during base flows; although during the winter, cold stream temperatures likely limit biodegradation (Wilkison and others, 2002; Loraine and Pettigrove, 2006). These losses also could result from the mixing of surface water with predominantly contaminant free ground water, resulting in stream dilution. Median loads also declined from the middle to lower reaches of the Blue River. Upper Blue River contributions were less than 4 percent, and Brush Creek contributions were less than 2 percent of downstream Blue River loads. These contributions were much less than those from Indian Creek and the Blue River, and indicate that during base-flow conditions, pharmaceuticals in the Blue River predominantly originate from lower Indian Creek.

The percentage of pharmaceutical compounds determined at each site by pharmaceutical use category are shown in table 10. When viewed as a whole, 87 percent of the pharmaceutical compounds measured in stream samples originated from over-the-counter drugs, primarily from the stimulants caffeine and nicotine, of which caffeine comprises the bulk. Smaller amounts, slightly more than 20 percent, can be attributed to the analgesics acetaminophen and ibuprofen. Many factors could affect these results, including drug metabolism and excretion rates, WWTP removal efficiencies, environmental fate, and the use rate of each drug. The general population use is expected to be much higher for caffeine than for over-the-counter and prescription medications, which likely affects their environmental occurrence. For example, caffeine, either in the form of coffee, tea, or soft drinks, is consumed daily by the majority of the U.S. population. Average adult per capita caffeine use rates are 4 mg/kg (milligrams per kilogram) of body weight per day (Barone and Roberts, 1996). Therefore, a 80 kg (kilogram; 175 pound) adult would consume on average 320 mg (milligram) of caffeine per day, equivalent to approximately four cups of coffee per day (Lelo and others, 1986). This is approximately the midpoint of suggested over-the-counter daily doses for acetaminophen and ibuprofen, but a smaller percentage of the population would be taking these medications on any given day. Cotinine, formed as a by-product of nicotine, would be expected to be consumed on a much smaller basis by the general population. Based on population estimates, smoking rates, and average nicotine content of cigarettes, per capita consumption of nicotine in the Kansas City metropolitan area was estimated to be 6 mg/day (milligrams per day; Federal Trade Commission, 2000; Centers for Disease Control, 2005), which is more than 50 times less than the per capita caffeine consumption.

## Stormflow Water Quality

Storm samples were collected at 10 sites (table 1) in the Missouri part of the basin. The number of samples collected ranged from 7 samples at site 2 to 44 samples at site 11. Storm samples were collected between May 1999 and June 2004. Summaries of the analytical results for selected constituents sampled during storms are given in tables 11 to 13, at the back of this report.

### Nutrients

Boxplots of total N and total P concentrations measured in stormflow samples by site and instantaneous total N and total P loads by stream reaches in the basin are shown in figures 10 and 11. The largest concentrations of total N and total P were present in stormflow samples from site 8 on the Blue River, and site 6 on Indian Creek (figs. 10a and 11a). Median total N concentration at site 8 was 6.64 mg/L and at site 6 was 5.72 mg/L. Median total P concentration at site 8 was 2.03 mg/L and 1.40 mg/L at site 6. When grouped by stream (table 11), median total N and P concentrations in stream samples from Indian Creek were 5.72 mg/L and 1.40 mg/L, which were greater than those observed in samples from the Blue River (4.91 mg/L and 1.24 mg/L) and Brush Creek (2.40 mg/L and 0.37 mg/L). Median concentrations of total N and total P at sites in the CSS area (2.25 and 0.31mg/L) were significantly less ($p<0.001$) than median concentrations at Brush Creek site 9 (3.08 and 0.64 mg/L) with no apparent sources of wastewater. There are three golf courses upstream from site 9, so nonpoint-source runoff upstream from site 9 may contribute greater nutrient loads than in downstream reaches, and some storm nutrients are trapped in impounded reaches. These data indicate that nonpoint sources likely play at least as large a role in the observed concentrations of nutrients in Brush Creek as CSOs.

Boxplots of instantaneous total N and total P stormflow loads are shown in figs. 10b and 11b for stream reaches in the basin. Because storm sampling did not begin at sites 2 and 6 until 2002, a smaller number of storm samples were collected at sites in the upper Blue River and lower Indian Creek (7 to 14 samples) than on sites in the middle and lower reaches of the Blue River and Brush Creek (21 to 44 samples). Because discharge (flow) is a primary component of load calculation, instantaneous load estimations can be skewed by extreme events. As a result, samples from two storm events on Indian Creek (August 28 to 29, 2003, and August 31, 2003) that had discharges in excess of those sampled at downstream Blue River sites were removed from the following analysis. Median instantaneous total N loads measured in lower Indian Creek exceeded those in downstream Blue River reaches, indicating that even without including the two largest events, estimates of total N load from Indian Creek based on instantaneous measurements were still likely biased high. Median instantaneous total N and total P loads in the upper Blue River reaches were 18 and 12 percent of the loads measured in downstream Blue River

**Table 10.** Percentage of pharmaceutical compounds detected in stream samples by pharmaceutical use category

[OTC, over-the-counter drugs includes: acetaminophen, caffeine, ibuprofen, and nicotine; --, no data; CSO, combined sewer overflow; WWTP, wastewater-treatment plant; Other, includes no sources, sewer leaks and by-passes]

| Stream reach | Sites included | Hydrologic condition | Analgesic | Antacid | Antibi-otics | Anti-convul-sants | Anti-diabetics | Anti-depres-sants | Asthma | Choles-terol | Narco-tics | Stimu-lants | Caffeine & caffeine metabolite | OTC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Upper Blue River | 1,2 | base flow | 3 | 5 | 23 | 20 | 0 | 0 | 0 | 1 | 3 | 44 | 36 | 48 |
| | | stormflow | 88 | 0 | 0 | 0.9 | 0 | 4 | 0 | 0 | 0 | 7 | 6 | 95 |
| Upper Indian Creek | 3 | base flow | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.7 | 0 | 98 | 67 | >99 |
| | | stormflow | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Middle Indian Creek | 4 | base flow | 7 | 8 | 42 | 5 | 3 | 0 | 10 | 2 | 18 | 5 | 1 | 12 |
| | | stormflow | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Lower Indian Creek | 6 | base flow | 20 | 0.2 | 7 | 1 | 0.1 | 0 | 0.3 | 0.5 | 1 | 71 | 67 | 90 |
| | | stormflow | 22 | 0.4 | 2 | 0.6 | 0.2 | 0.3 | <0.1 | 0 | 0 | 75 | 59 | 96 |
| Middle Blue River | 7,8 | base flow | 18 | 0.1 | 13 | 1 | 0 | 0 | 0.2 | 1 | 0.7 | 65 | 61 | 84 |
| | | stormflow | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 74 | 63 | 100 |
| Middle Brush Creek | 9,10 | base flow | 53 | <0.1 | 0.1 | <0.1 | 0 | 0 | 0 | 0 | 0 | 47 | 45 | >99 |
| | | stormflow | 58 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 42 | 39 | >99 |
| Lower Brush Creek | 11,12 | base flow | 15 | <0.1 | 0.6 | <0.1 | 0 | 0 | <0.1 | 0 | 0.1 | 85 | 82 | >99 |
| | | stormflow | 41 | 0 | <0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 59 | 51 | 100 |
| Lower Blue River | 13,14 | base flow | 18 | 0.1 | 6 | 1 | 0.1 | 0 | 0.1 | 0.1 | 0.9 | 74 | 68 | 92 |
| | | stormflow | 31 | 0.1 | 0.6 | 0.2 | 0.3 | 0 | <0.1 | 0.1 | 0 | 67 | 64 | 99 |
| **Potential wastewater source** | | | | | | | | | | | | | | |
| CSO | 10,11,12 | base flow | 47 | 0 | 0.2 | 0 | 0 | 0 | <0.1 | 0 | <0.1 | 53 | 51 | >99 |
| | | stormflow | 41 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 59 | 51 | 100 |
| WWTP | 2,4,6,7 | base flow | 17 | 0.4 | 7 | 2 | 0.1 | 0 | 0.5 | 1 | 2 | 70 | 67 | 88 |
| | | stormflow | 44 | 0.3 | 1 | 0.7 | 0.2 | 2 | 0 | 0 | 0 | 52 | 41 | 96 |
| WWTP/CSO | 8,13,14 | base flow | 20 | 0.1 | 14 | 0.7 | 0.1 | 0 | 0.1 | 0.1 | 0.6 | 65 | 59 | 84 |
| | | stormflow | 31 | 0.1 | 0.6 | 0.2 | 0.3 | 0 | 0 | <0.1 | 0 | 67 | 64 | 99 |
| Other | 1,3,5,9 | base flow | 15 | <0.1 | 0.2 | 0.3 | 0 | 0 | 0 | <0.1 | 0 | 84 | 72 | >99 |
| | | stormflow | 58 | 0 | <0.1 | 0 | 0 | 0.1 | 0 | 0 | 0 | 42 | 39 | >99 |

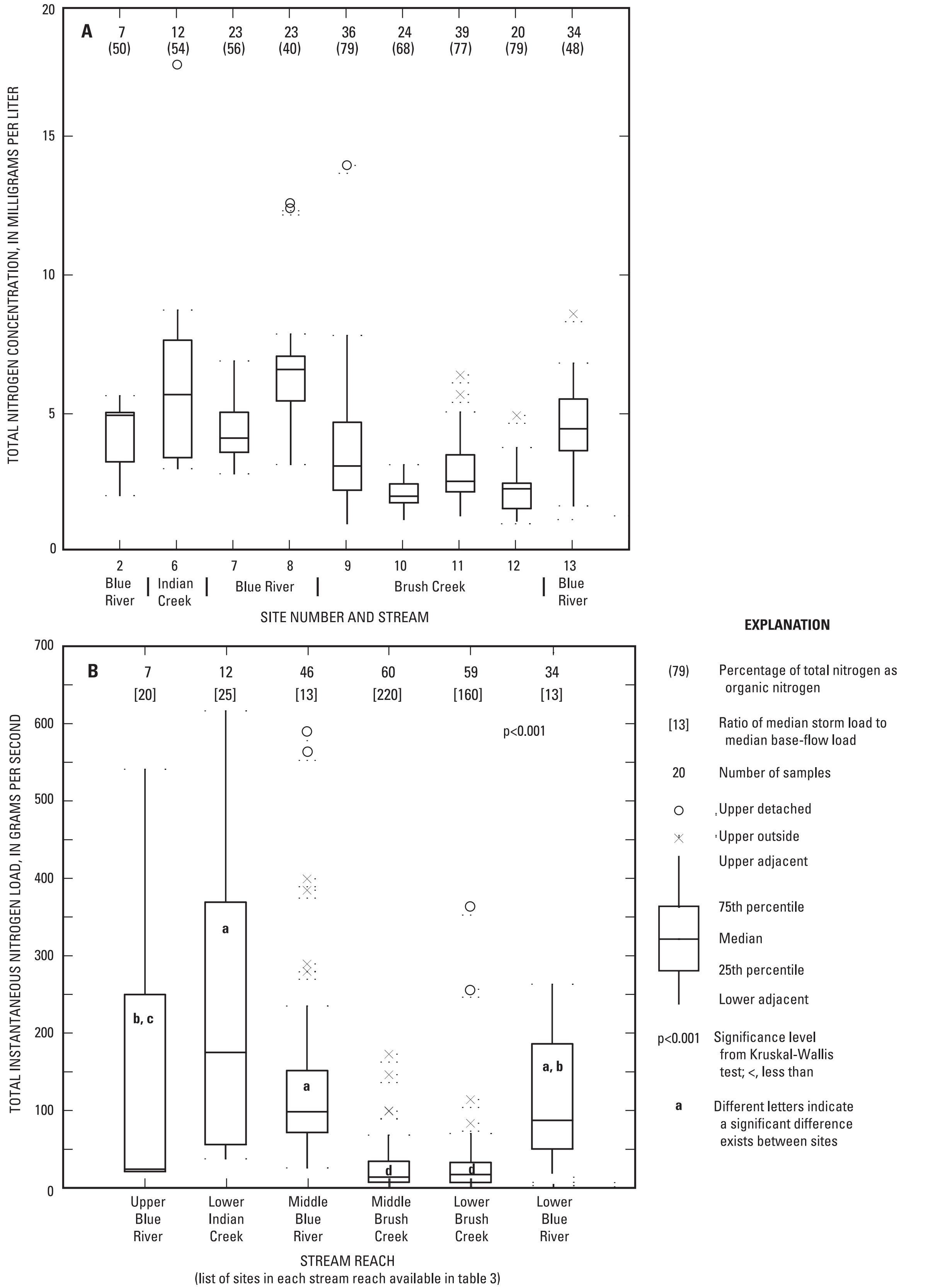



**Figure 10.** Total nitrogen concentration by site (A) and total instantaneous nitrogen load by stream reach (B) in stormflow samples collected between May 1999 and June 2004.

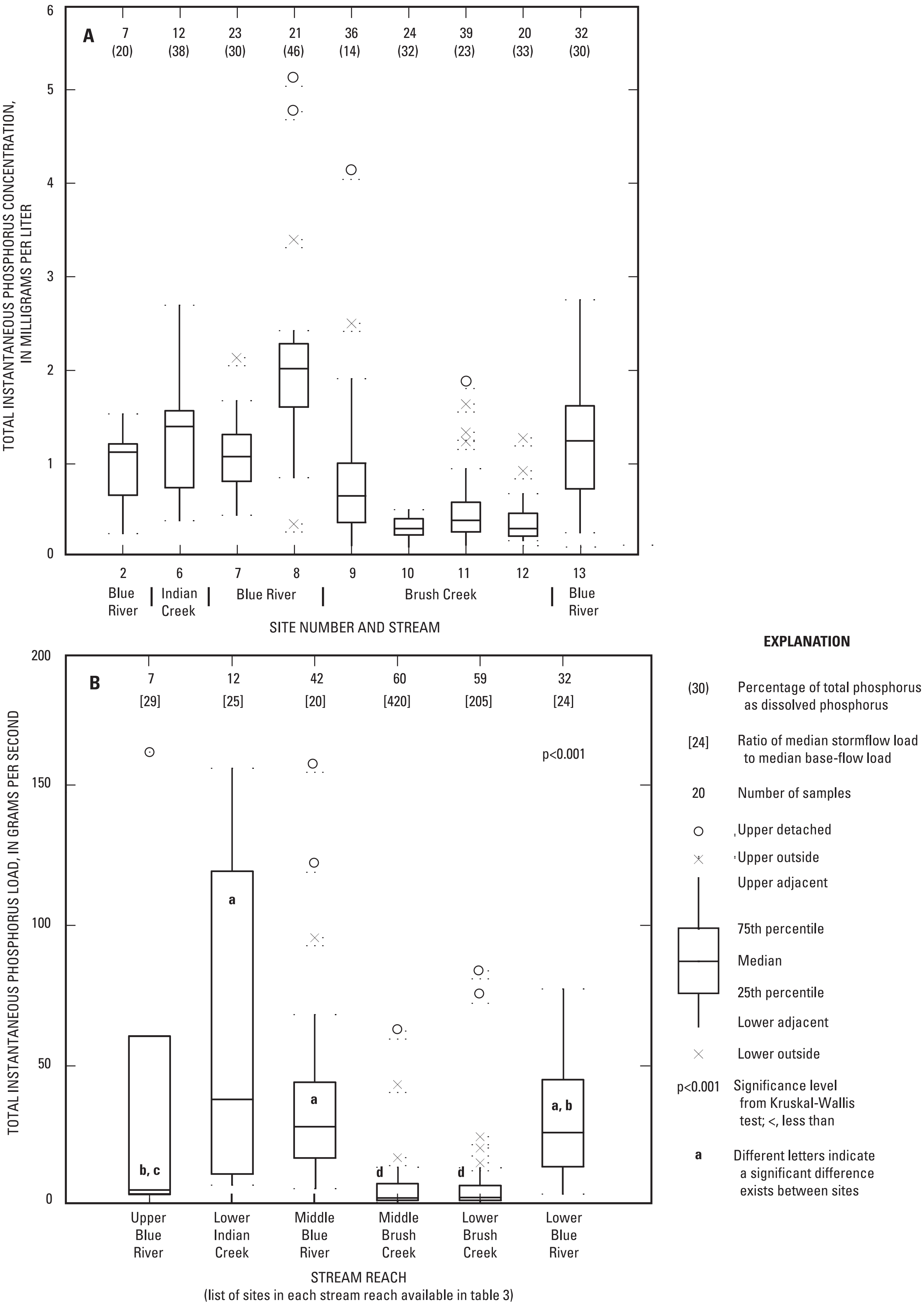



**Figure 11.** Total phosphorus concentration by site (A) and total instantaneous phosphorus load by stream reach (B) in stormflow samples collected between May 1999 and June 2004.

reaches. Instantaneous total N loads measured in Brush Creek were 11 percent of the instantaneous total N load measured in the lower Blue River and 5 percent of the total P load. These data indicate that while the relative contribution of total N and P from Brush Creek to the Blue River increased during storms when compared to base flows, storm loads from Brush Creek comprised a smaller part of the total load when compared to sources from the upper Blue River or lower Indian Creek. Total N and total P yield estimates, developed to integrate base-flow and stormflow loads and which normalize loads based on drainage area for individual reaches, are discussed later in this report.

### Organic Wastewater Compounds

Concentrations of the sum of all (total) OWCs detected in stormflow samples are shown by site in figure 12. Non-detectable concentrations are not summed or plotted in the figures; all samples had at least one detection of an OWC. Summaries of the individual OWC constituents are reported in table 12, at the back of this report. The largest concentrations of OWCs were observed in storm samples from site 9 (median concentration of 19.5 μg/L) and site 11 (median concentration of 22.3 of μg/L) on Brush Creek. Concentrations were less at sites 10 and 12 on Brush Creek probably because suspended sediment and associated particulate contaminants settled out in impoundments because of declines in stream velocities at these sites. The next highest concentration of OWCs were observed in samples from site 6 on Indian Creek (median concentration of 16.7 μg/L). Median OWC concentration at Brush Creek sites in the CSS area (sites 10, 11, and 12; 17.4 μg/L) were similar to the median concentration at site 9, upstream from most CSO influences. These data indicate that factors other than CSOs likely played as great a role in the occurrence of OWCs as did CSOs in Brush Creek. Examples of other factors that could contribute to the observed OWC concentrations are SSOs that result from line blockages, leaks from broken or aging sewer lines that intersect recharge flow paths, WWTP by-passes, and urban nonpoint sources.

The largest instantaneous total OWC loads were measured in samples from lower Indian Creek (median load of 246 mg/sec), followed by those observed in the lower Blue River (196 mg/sec) and the middle Blue River (167 mg/sec). As discussed previously, Indian Creek instantaneous loads may be overestimated because of the sampling of two large storm events. Total instantaneous OWC loads measured in lower Brush Creek (107 mg/sec) were slightly greater than those measured in middle Brush Creek (96 mg/sec). When normalized by drainage area (table 2), median OWC yield from Indian Creek was slightly higher [1.46 mg/sec/km$^2$ (milligrams per second per square kilometer)] than the median OWC yield from Brush Creek (1.29 mg/sec/km$^2$) data, again indicating that sources outside of the CSS area are equally, if not more, important to overall basin storm loads, than are CSOs. Detergents generally comprised a smaller percentage of the total OWCs measured in storm samples than in base-flow samples, except for storm samples from Brush Creek where this percentage tended to be greater than those in base-flow samples (table 9; figs. 8 and 12).

### Pharmaceutical Compounds

Pharmaceutical data from storm samples were collected at six sites. The sum of detectable pharmaceutical concentrations are shown in figure 13 by site and pharmaceutical loads measured in selected stream reaches. Because only a few storms were sampled during this study for pharmaceuticals comparisons between sites were limited and were not performed as part of this study.

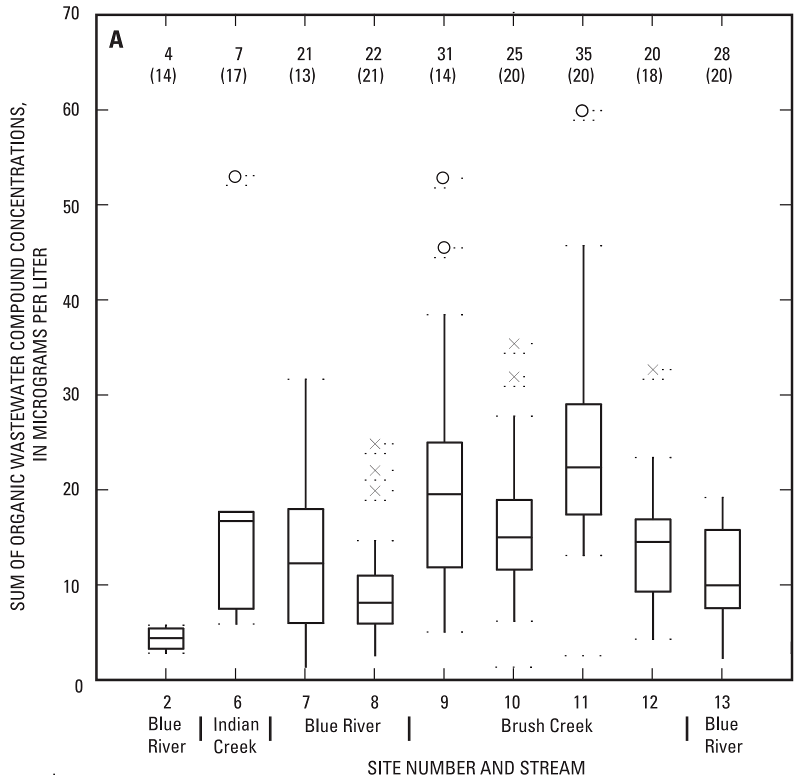
## Hydrologic Effects on Constituent Concentrations

For point-source contributions to contamination that remain nearly constant with time, such as those from WWTPs, constituent concentrations in receiving waters can be expected to be diluted with increasing streamflow. Conversely, as streamflow decreases, concentrations in receiving waters would be expected to increase. When nonpoint sources are the dominant source of contaminant loadings, the reverse is expected. Nonpoint-source contaminants are mobilized into the environment by the same precipitation events that result in increased streamflow. Therefore, as streamflow increases, constituent concentrations also would be expected to increase, or at least decrease less. It also is likely that streams are subjected to a combination of point sources and nonpoint sources, and that the relative magnitude of these sources may shift as hydrologic changes occur.

### Effects of WWTP Effluent on Blue River Streamflow

Wastewater-treatment plant effluent often is an important hydrologic component of a number of streams in the Kansas City metropolitan area. During base flow, the majority of streamflow is often comprised of effluents at sites downstream from WWTP discharges (Wilkison and others, 2002; Lee and others, 2005). Because populations continue to rapidly grow in the upper basin, WWTPs inputs to basin streams also are expected to increase. Increases to the capacity of two WWTPs in the basin (sites 15 and 17) are planned or under consideration (Johnson County Wastewater, written commun., 2005). Therefore, an understanding of the role that WWTPs play in stream hydrology is important, especially in light of the water-quality data presented in this report.

Three WWTPs (sites 15, 16, and 17) located in the upper parts of the Blue River Basin discharge into the Blue River, or its tributaries. These plants are permitted under state and federal statues to process wastewater from residents of Johnson County, Kansas, and discharge effluent into receiving streams. Because the original source of the water is from outside the Blue River Basin (the Kansas River), the net effect is an interbasin transfer of water. Water originates outside the Blue River Basin, is treated and used by businesses and homeowners, trans



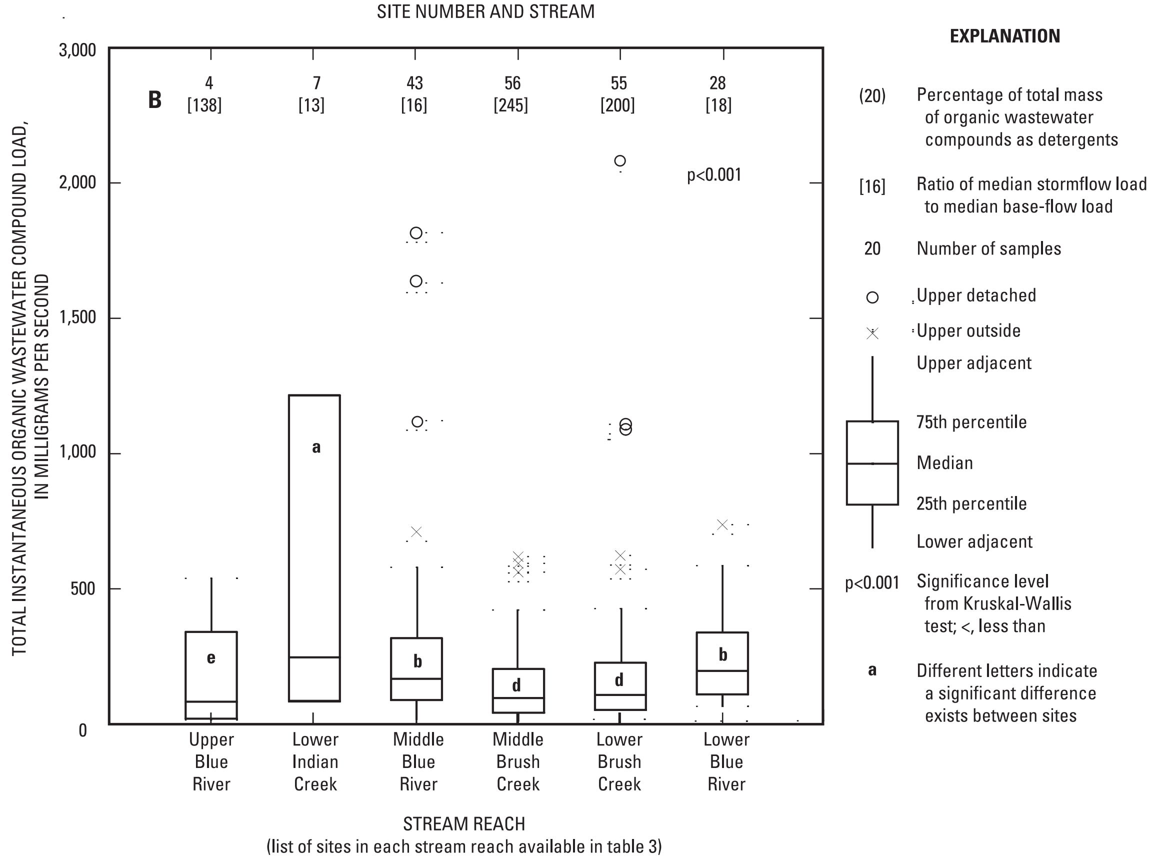




**Figure 12.** Sum of the concentration of organic wastewater compounds by site (A) and total instantaneous organic wastewater compound load by stream reach (B) in stormflow samples collected between May 1999 and June 2005.

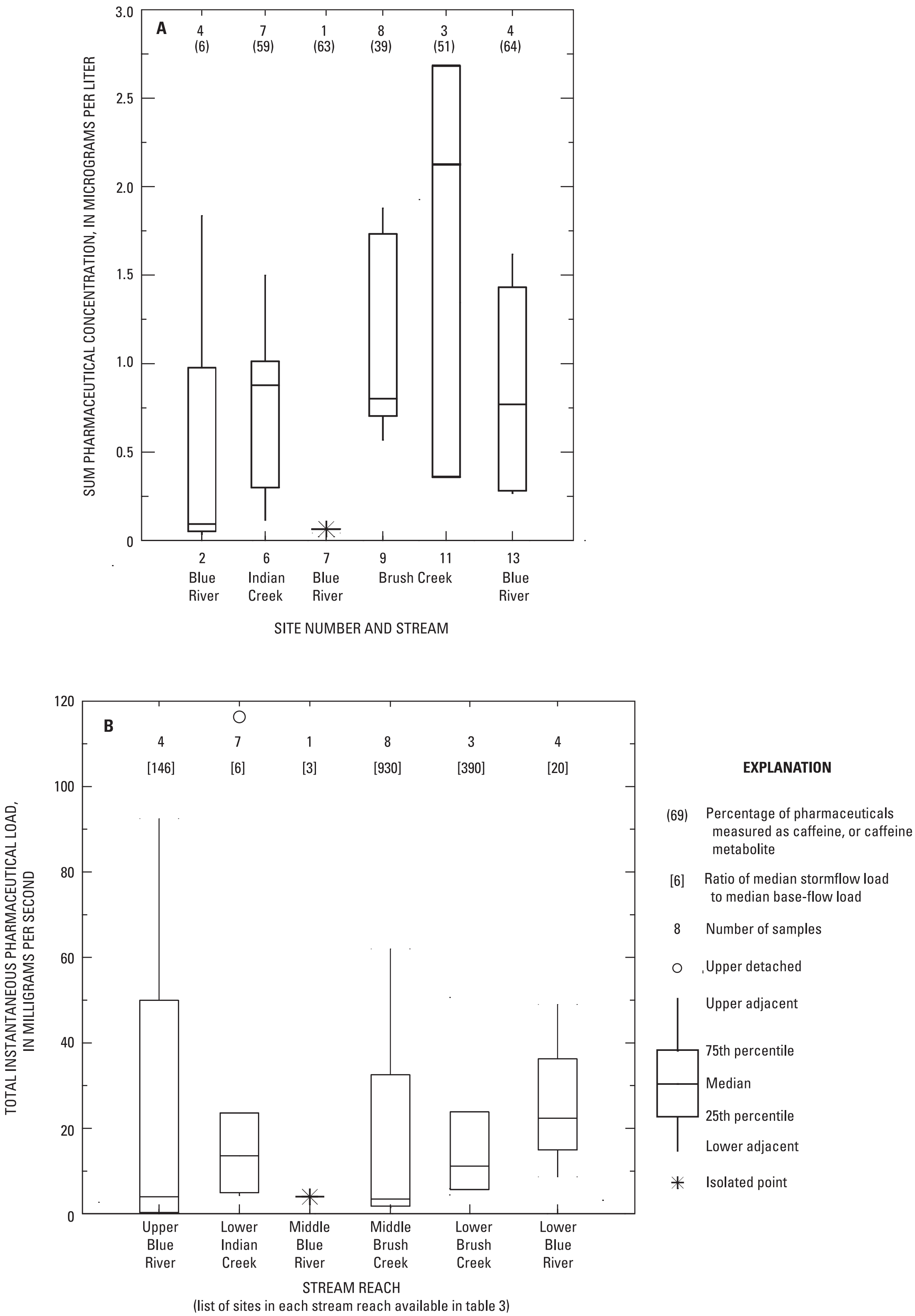



**Figure 13.** Sum of the concentration of pharmaceutical compounds by site (A) and total instantaneous pharmaceutical loads by stream reach (B) in stormflow samples collected between October 2000 and June 2005.

ferred to a wastewater-treatment facility, and ultimately discharged into another basin. This process has altered the hydrologic regime of much of the Blue River. The percent exceedance values of mean daily streamflow for the Blue River at site 7 from 1939 to 1955, 1956 to 1981, and 1982 to 2003 is shown in figure 14. These time periods represent when there was no wastewater effluent discharged into the stream above this site, a time period in which one plant discharged into the stream, and a time period in which three plants discharged into the stream. Since 1955, the median daily streamflow at site 7 increased 29 $ft^3/s$ (cubic feet per second) which is nearly equivalent to the sum of the discharges from these three plants (28.2 $ft^3/s$; fig. 14).

Effluent affects on the discharge to the Blue River (site 7) were more pronounced during drought periods (mid-2002 through mid-2003) because Indian Creek contributed a larger percentage of flow to the overall Blue River flow (fig. 5). More than 40 percent of the time from August 1998 through October 2004, WWTP effluent constituted more than 95 percent of the discharge at site 7.

## Nutrients

When nutrient species are compared by hydrologic event (base flow and stormflow) there are a number of differences that exist. During base flow, the predominant N species occurred as $NO_3$ for sites downstream from WWTPs (sites 2, 4, 6, 7, 8, and 13). On average, $NO_3$ accounted for 81 percent of the total N measured in base-flow samples at these sites (fig. 6a). When WWTPs function properly, most organic N is oxidized into $NO_3$, which is discharged into receiving waters and $NO_3$ constituted the bulk of the total N measured during base flows at downstream sites. In Brush Creek, $NO_3$ constituted a much smaller percentage (17 percent) of the total N observed in base flow stream samples; two-thirds of the N in Brush Creek samples was in the organic N form (table 6), another indication that the source of nutrients in Brush Creek, or the processes acting on them, is different from those observed in Indian Creek and the Blue River. Unlike N from WWTPs, N from nonpoint-source contributions often contains a greater percentage of suspended organic N when compared to the dissolved $NO_3$ phase. Nitrogen species from CSOs also would be expected to occur mostly in the reduced organic particulate phase. Some organic N is trapped in impoundments during storm events, and may remain suspended for extended periods. The algal productivity of Brush Creek may play a more important role in the difference between the N phases of streams. During base flow, dissolved inorganic N can be assimilated into algae, which increases concentrations of organic N when compared to the dissolved phase, a process that can occur in all stream reaches but one that would be expected to be exacerbated in lentic stream reaches, such as those in Brush Creek.

During storms, the percentage of N as $NO_3$ declined, and the percentage of N as organic N increased with increasing flow at all sites (fig. 15); however, the shift was much more pronounced in Indian Creek and the Blue River as compared to Brush Creek, where most N was already in the organic phase. As streamflow increased, there was a marked decline in the percentage of total N that occurred as $NO_3$ for Indian Creek and all reaches of the Blue River (Spearman's rho = -0.69 to -0.87; fig. 15). This decline corresponded with an increase in the percent of the total N that originated from organic N for these same stream reaches (Spearman's rho = 0.82 to 0.87; fig. 15). These data are consistent with a predominantly WWTP source of N during base flows, and an increase in nonpoint and/or WWTP by-passes during storms as the ratio of treated WWTP effluent to streamflow declined in Indian Creek and Blue River reaches. In Brush Creek stream reaches, the trends between flow and the percentage of N occurring as $NO_3$, or as organic N, were much less pronounced (fig. 15); an indication that factors in addition to streamflow were important in determining N speciation.

The concentration of total P and the percentage that occurred as dissolved P in relation to streamflow is shown in figure 16. During base flows, more than 90 percent of the total P in samples from the Blue River and Indian Creek occurred in the dissolved phase (median of 91 and 98 percent, respectively) compared to 60 percent in samples from Brush Creek. The percentage of total P that occurred in the dissolved phase decreased with increasing streamflow for all reaches, although the relation was stronger in reaches of the Blue River and Indian Creek (Spearman's rho -0.77 to -0.88; fig. 16) than for reaches of Brush Creek (Spearman's rho -0.70 to -0.49; fig. 16).

There was a difference in the relation between total P concentration and streamflow for samples collected from Brush Creek compared to those from Indian Creek and the Blue River. For Brush Creek, there was an upward trend in total P concentrations as streamflow increased, but in Indian Creek and the Blue River, the trend was for decreased total P concentrations as streamflow increased (fig. 16). These data are consistent with the pattern expected if sources of P in Brush Creek predominantly were nonpoint and/or from CSOs, and sources in Indian Creek and the Blue River predominantly were WWTP effluent. As streamflow increased in Brush Creek, total P concentrations increased in stream samples; the result of increased nonpoint source and CSO sources. Whereas, on Indian Creek and the Blue River, as streamflow increased, the relative contribution of WWTP effluent to streamflow declined, as did the concentration of P in the receiving stream.

Instantaneous stormflow total N and total P loads were much greater than those observed during base flows. For the Blue River and lower Indian Creek reaches, total N and total P instantaneous storm loads increased by a factor of approximately 25 over those observed during base flow (figs. 10b and 11b); however, on Brush Creek, the difference between instantaneous storm and base-flow loads was much more pronounced. Total N and P storm loads increased, on average, 200 to 300 times more than observed during base flows in Brush Creek. Part of this difference was likely related to the relatively higher base-flow loads in Indian Creek and the Blue River as the result of WWTP inputs. Therefore, storm load increases on these

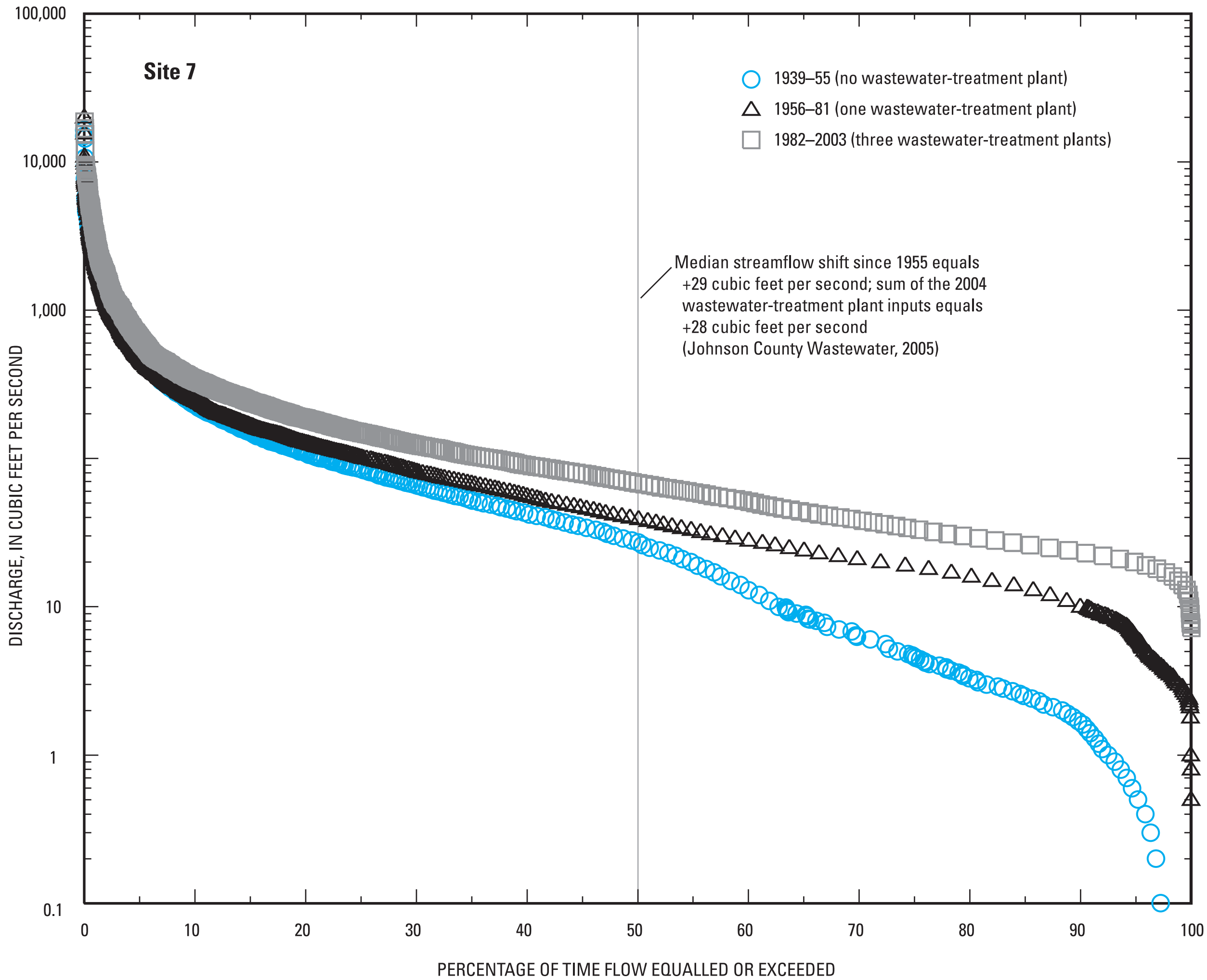



**Figure 14.** Increases in discharge for the Blue River near Kansas City for time periods with no, one, and three wastewater-treatment plant inputs.

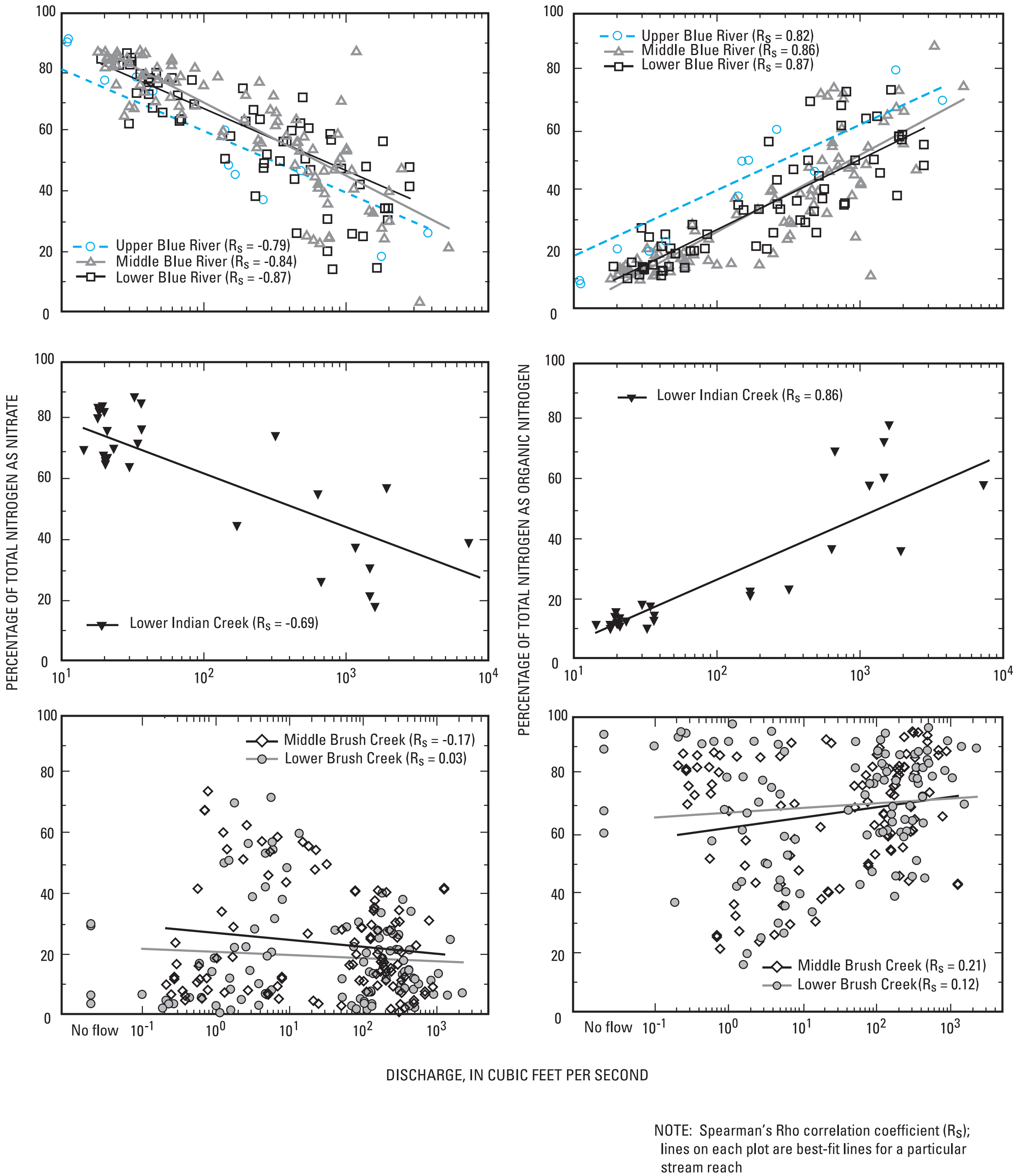



**Figure 15.** Percentage of total nitrogen as nitrate and percent as organic nitrogen in relation to stream discharge for selected stream reaches in the Blue River Basin.

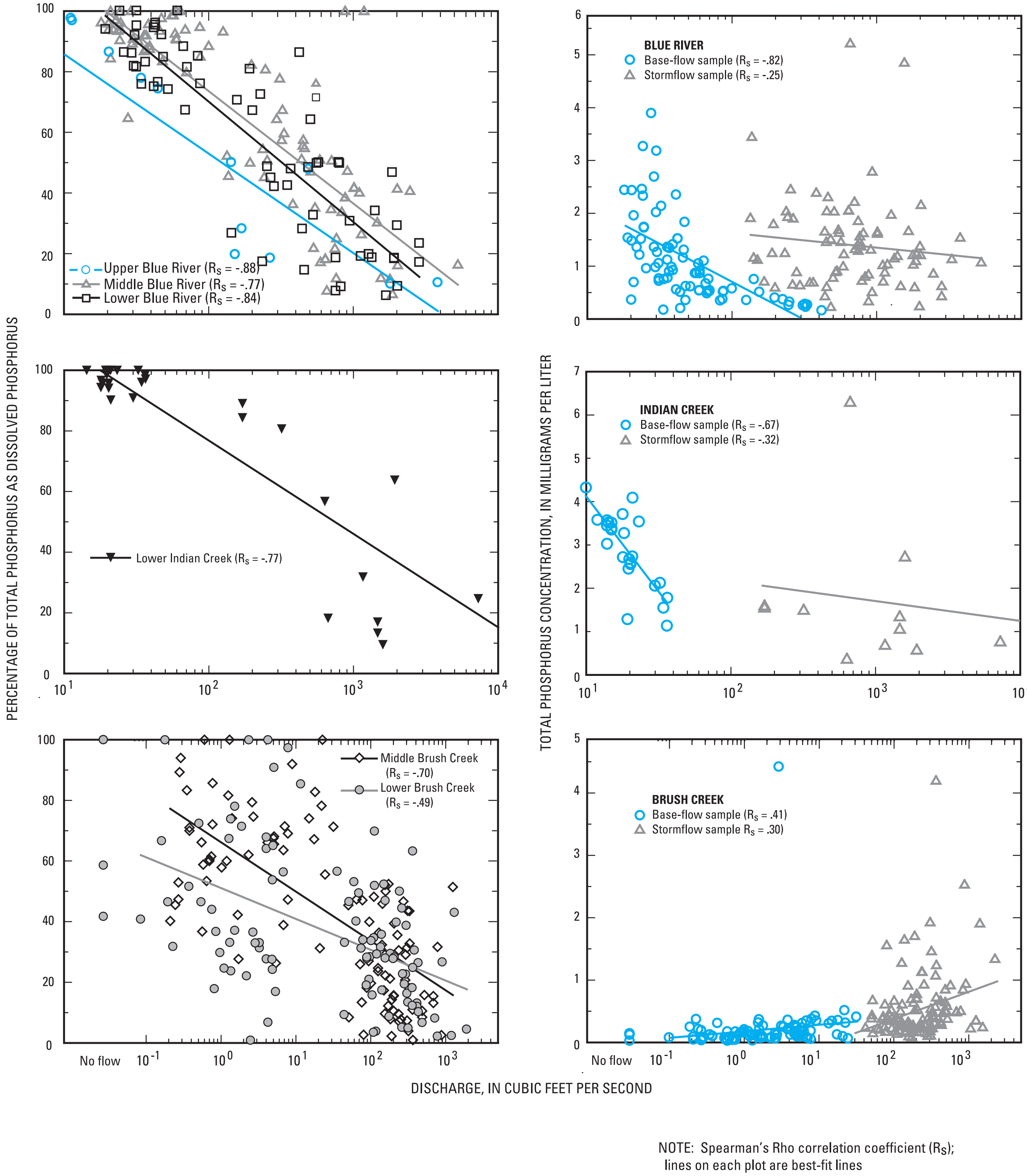



**Figure 16.** Percentage of total phosphorus as dissolved phosphorus in relation to stream discharge for selected stream reaches in the Blue River Basin and total phosphorus concentration in relation to stream discharge by stream.

streams, which include a mixture of nonpoint sources and WWTP inputs, appear masked when compared to Brush Creek. Additionally, Brush Creek has a larger percentage of impervious surface area (47 percent) compared to Indian Creek (21 percent) and the Blue River (25 percent; table 2) which results in greater unit runoff volumes for any given storm on Brush Creek. Brush Creek sites have the highest density of population, storm, sanitary, and combined sewers of sites in the basin, which could have contributed increased runoff and contaminant loads. Consequently, stormflow nutrient contributions from nonpoint sources and CSOs are considered the predominant source of nutrients to Brush Creek.

For stream reaches outside of the CSS area, a variety of nonpoint sources are expected to comprise the bulk of the loadings during storms. Comparison of median loads originating from WWTPs to those measured in stormflow samples indicated that during storms, WWTPs typically accounted for 7 to 8 percent of the total N and total P loads measured in storm samples at sites downstream from WWTPs. This does not account for any by-pass discharges that can occur during storms; if WWTP by-passes do occur, the percentage would be expected to rise. Regardless, these data indicate that sources of nutrients originating from WWTPs are dominant during base flows and become a much smaller component during stormflows. In areas underlain by CSSs, primarily along Brush Creek, the combination of nonpoint source and CSO contributions are expected to constitute the bulk of the nutrient loadings. Some contributions to Brush Creek also could originate from occasional by-pass discharges from the pumping stations located on Brush Creek upstream from site 9.

## Dissolved Compared to Particulate Phase Constituents

Concentration changes as a function of hydrology were very similar at Blue River and Indian Creek sites (fig. 17). However, the relation between concentration and streamflow varied for compounds that primarily occurred in the dissolved phase compared to those primarily occurring in the particulate phase. Dissolved constituents, such as ammonia, $NO_3$, P, and chloride showed a strong downward trend with increased flow because of dilution (sites 2, 6, 7, and 13; fig. 17 [ammonia not plotted]). These data indicate that the predominant source of these compounds were the nearly constant source provided by upstream WWTPs. Nonpoint sources also contributed to these concentrations, especially during storms. Such is the case with the two greatest stormflow concentrations for chloride at site 6; these samples were collected during the winter, and it is likely that stream concentrations were affected by road salt applications. Constituent concentrations that primarily occurred in the particulate phase showed an upward trend with increased streamflow at Blue River and Indian Creek sites. Concentrations of organic N, fecal-indicator bacteria, biochemical- and chemical-oxygen demand, and suspended sediment generally increased with discharge during stormflows as water velocities increased and energy became available for sediment transport. These data indicate that storm runoff and nonpoint-source pollution played a substantial role in the transport of many particulate-phase compounds into Indian Creek and the Blue River. Some compounds, which had point-source and nonpoint- source contributions, such as total P (and to a lesser extent organic N) had concentrations that declined as base flows increased, and increased as stormflow increased (sites 7 and 13; fig. 17). This was because during base flow, much of the total P was in the dissolved phase, and increased flow resulted in more dilution. During storms, however, particulate phases became dominant and total concentrations increased with discharge. This phenomenon was most pronounced at sites where a large percentage of the contaminant load originated from WWTPs.

Sites, such as sites 9 and 11 on Brush Creek, which are not affected by WWTP effluent, showed a different relation between hydrologic condition, streamflow, and concentrations of organic N and total P. During base flow, there is no obvious trend in concentration with discharge, indicating that concentrations were linked to other variables during low-flow periods (fig. 17). During storms, the concentrations of organic N and total P increased with increasing streamflow, indicating that the source of organic N and total P in Brush Creek was largely the result of wet weather events. A combination of nonpoint sources, including runoff from streets, storm sewers, lawns, parks, golf courses, and point sources such as those from CSOs (or WWTP by-passes) would have contributed to the greater concentrations observed in storm samples.

Some constituents, notably fecal indicator bacteria and biochemical oxygen demand, showed similar trends with discharge at all sites. As streamflow increased, concentrations of these compounds increased in large part because of their association with suspended sediment, concentrations of which also increased. Fecal indicator bacteria and suspended sediment concentrations sometimes were one to two orders of magnitude more than those measured in base-flow samples. Consequently, these data indicate that wet weather loads of fecal indicator bacteria and suspended sediment were much greater than base-flow loads throughout the basin. Nonpoint-source contributions would be expected to contribute a substantial part of these loads. Point sources, such as from CSOs and WWTP by-passes, also could have contributed to the loads.

## Organic Wastewater Compounds

Concentrations of total OWCs measured in whole-water stream samples, in relation to discharge, are shown in figure 18 for selected sites that were sampled during base flow and stormflows. These data include one site on Indian Creek (site 6), two sites on the Blue River (sites 11 and 13), and two sites on Brush Creek (sites 9 and 11). Because of the smaller number of stormflow samples collected, only general trends could be determined at site 6. Plots are constructed so as to illustrate the relation between OWC general use categories and streamflow, and help to illustrate the range of concentrations that occur during base flow and stormflow.

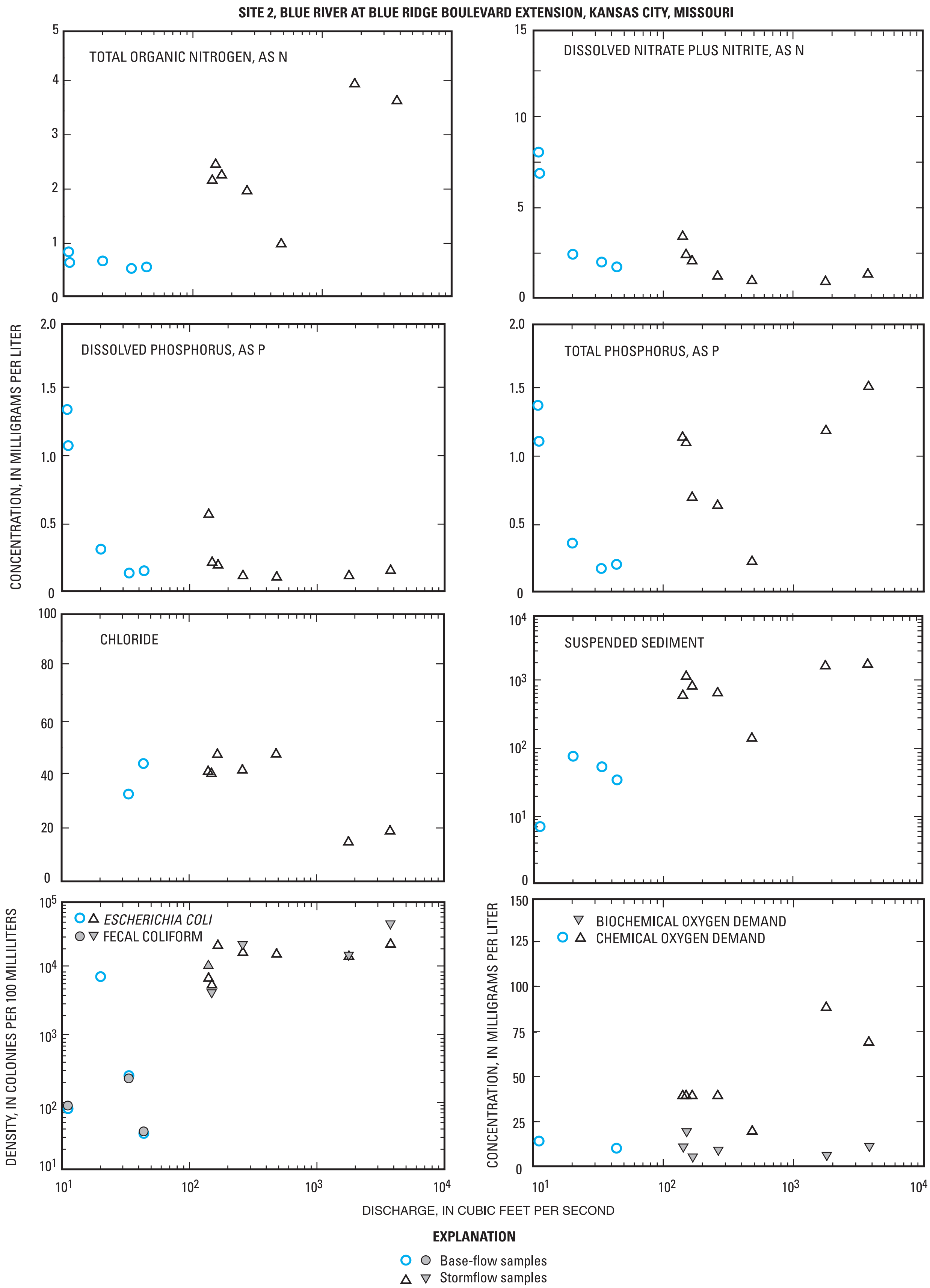



**Figure 17.** Concentrations of selected water-quality constituents in relation to stream discharge by site.

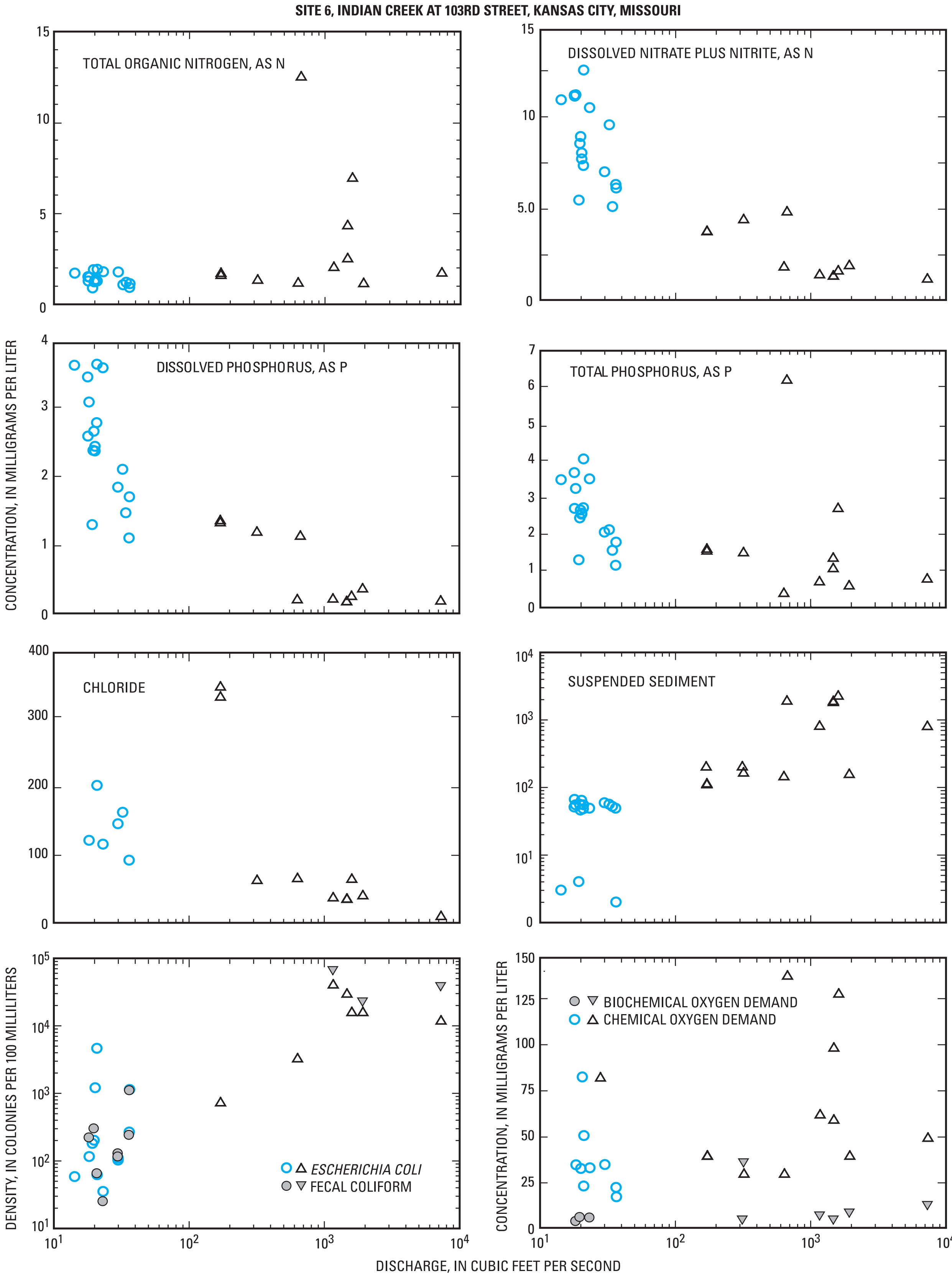



**Figure 17.** Concentrations of selected water-quality constituents in relation to stream discharge by site.—Continued

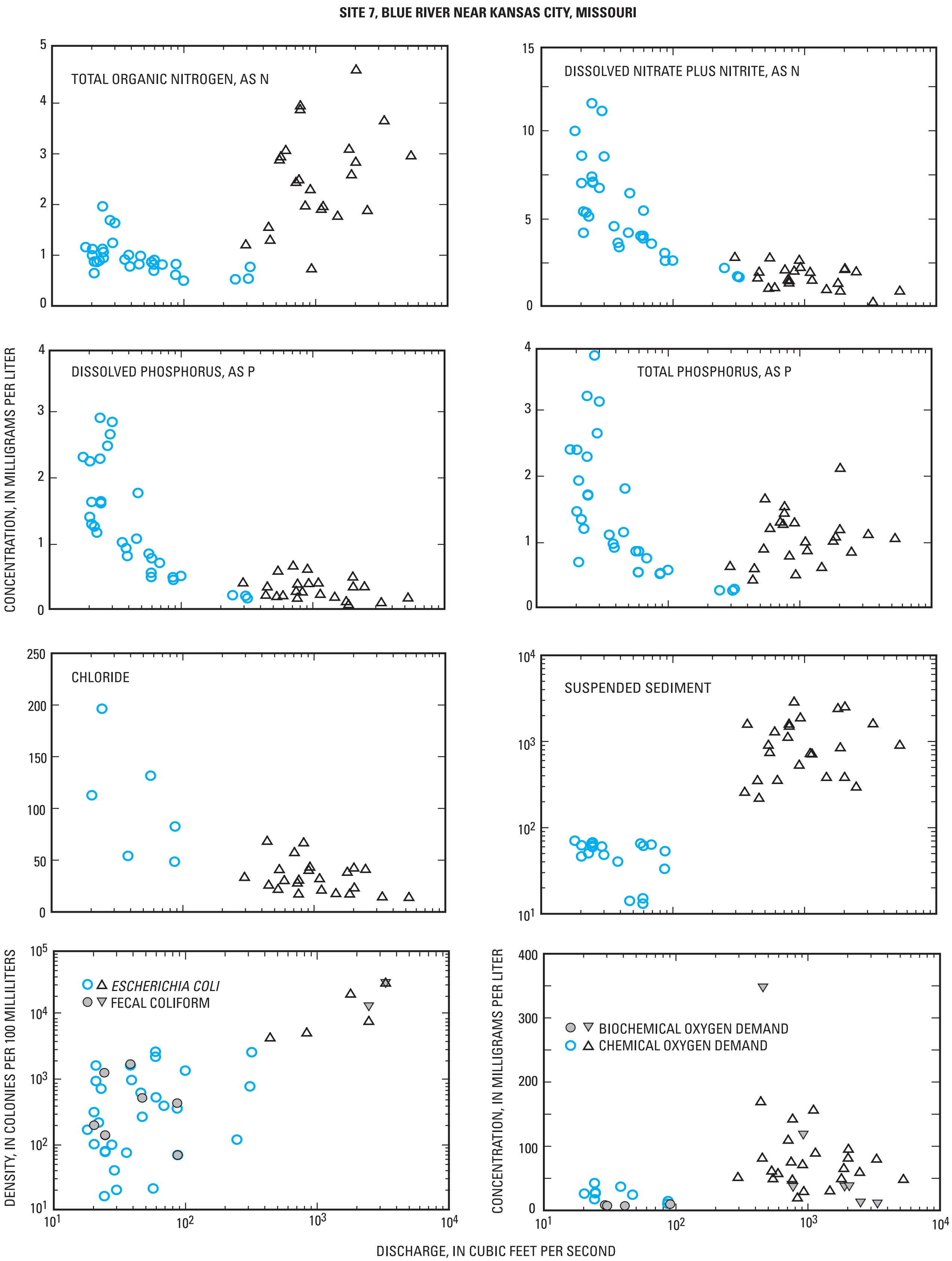



**Figure 17.** Concentrations of selected water-quality constituents in relation to stream discharge by site.—Continued

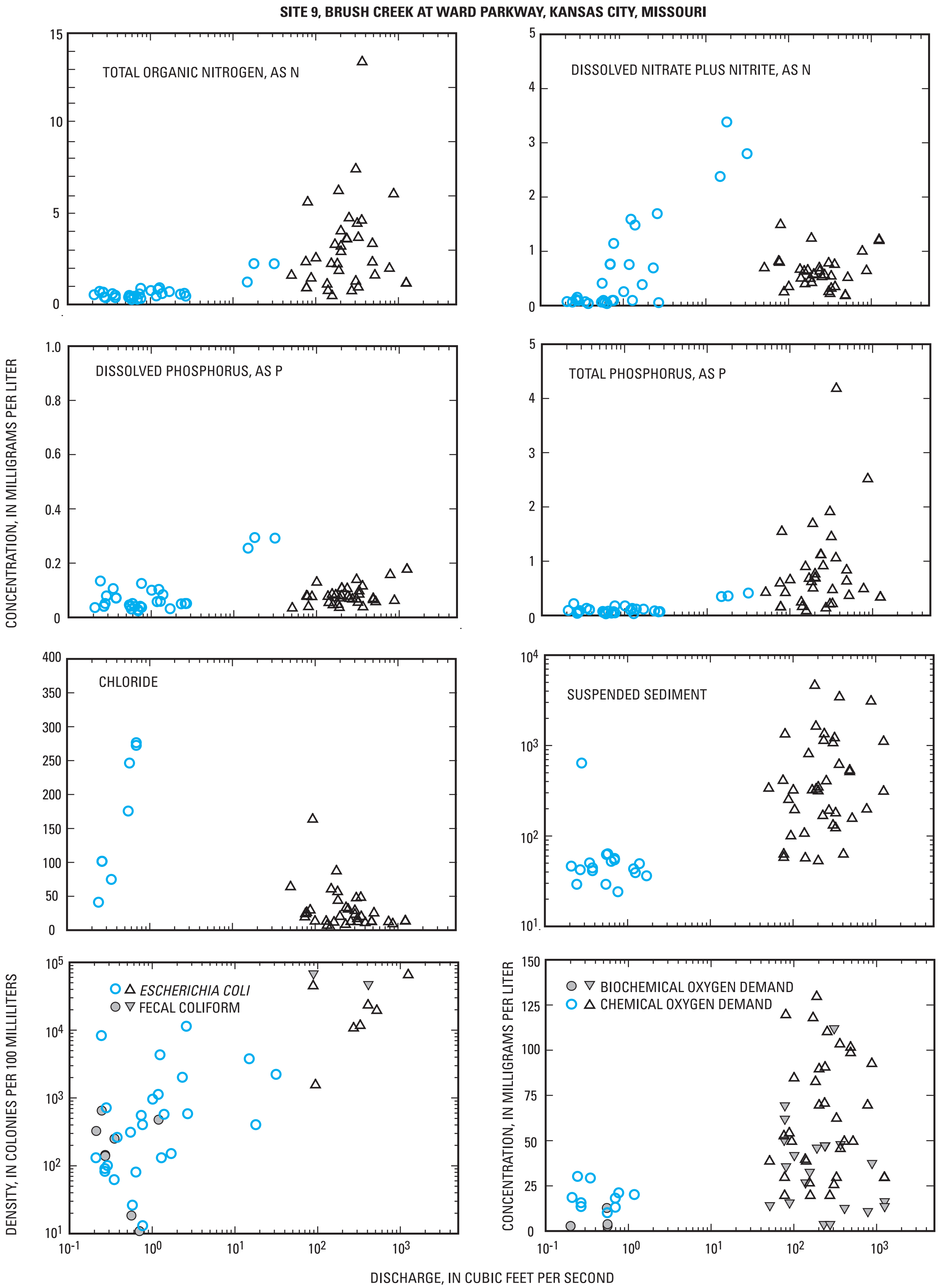



**Figure 17.** Concentrations of selected water-quality constituents in relation to stream discharge by site.—Continued

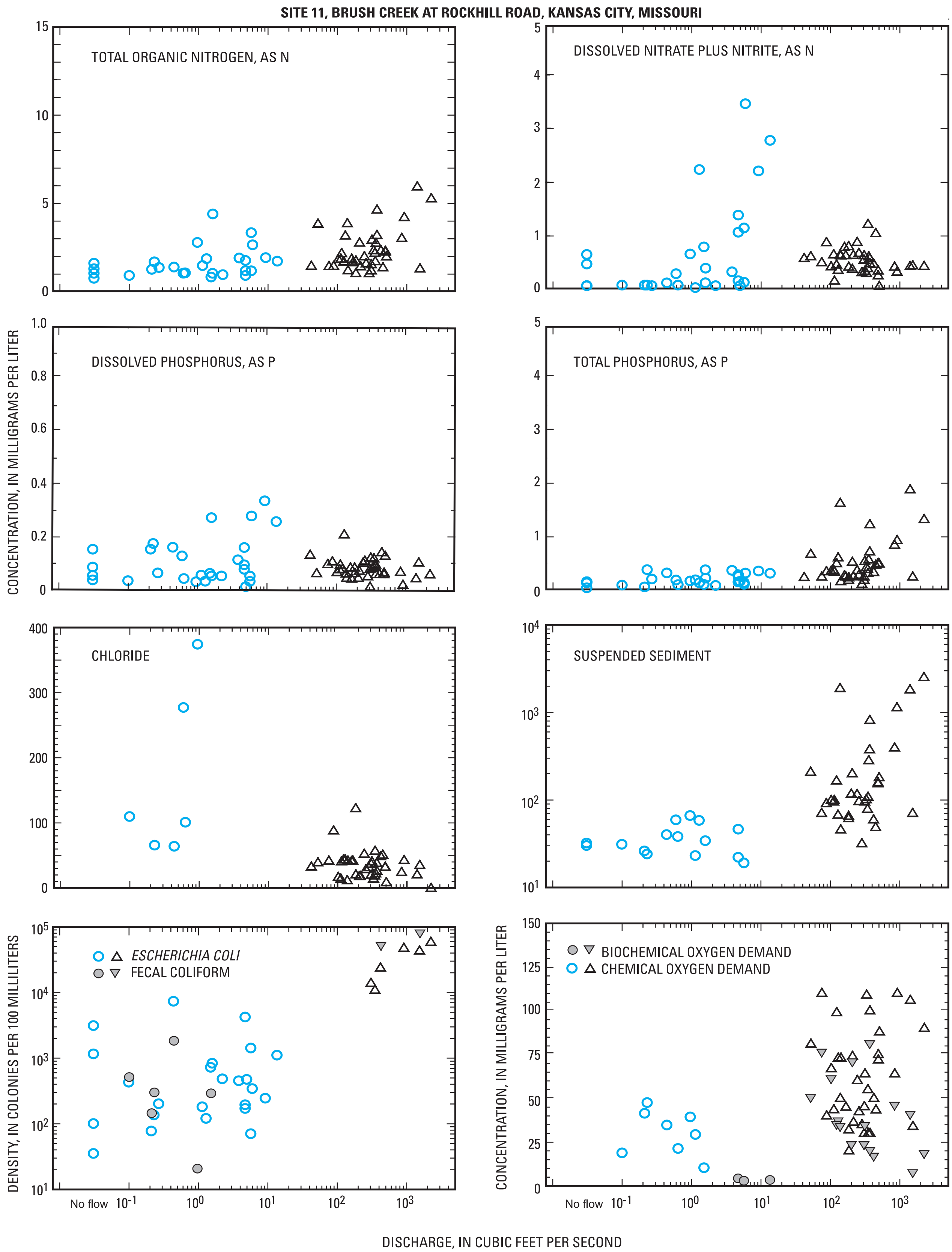



**Figure 17.** Concentrations of selected water-quality constituents in relation to stream discharge by site.—Continued

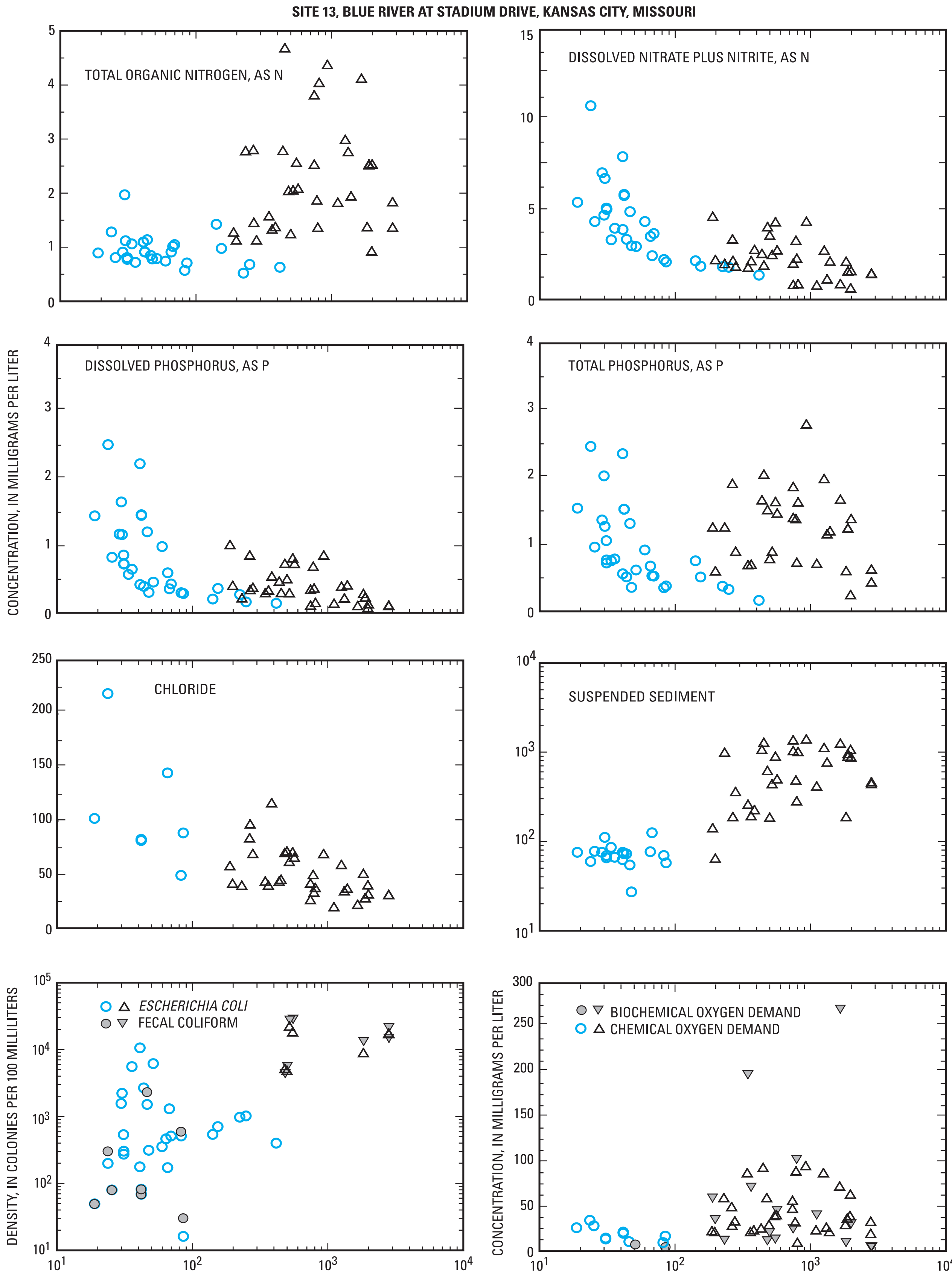



**Figure 17.** Concentrations of selected water-quality constituents in relation to stream discharge by site.—Continued

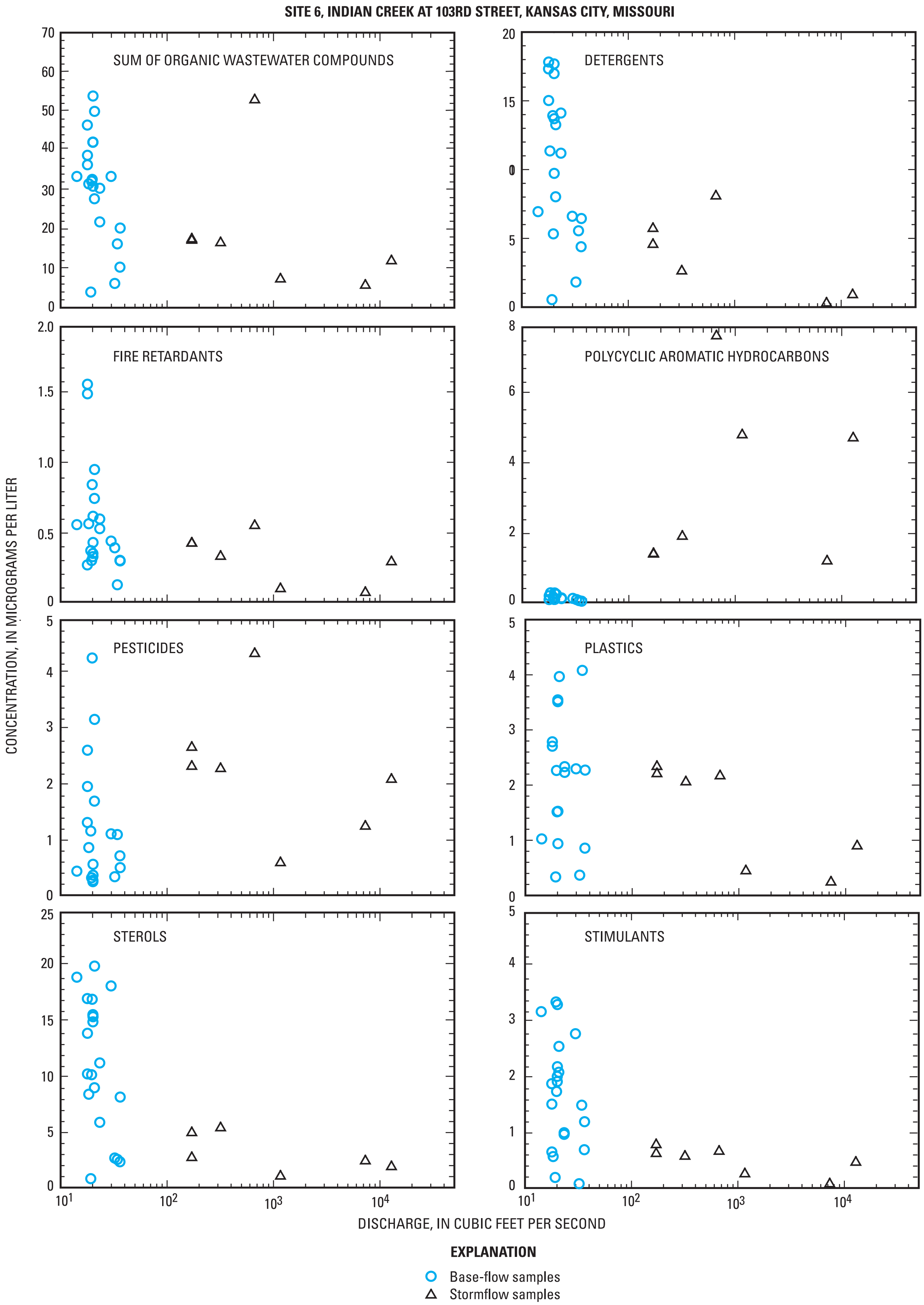

SITE 6, INDIAN CREEK AT 103RD STREET, KANSAS CITY, MISSOURI
SUM OF ORGANIC WASTEWATER COMPOUNDS
DETERGENTS
FIRE RETARDANTS
POLYCYCLIC AROMATIC HYDROCARBONS
PESTICIDES
PLASTICS
STEROLS
STIMULANTS
CONCENTRATION, IN MICROGRAMS PER LITER
DISCHARGE, IN CUBIC FEET PER SECOND
EXPLANATION
Base-flow samples
Stormflow samples

**Figure 18.**

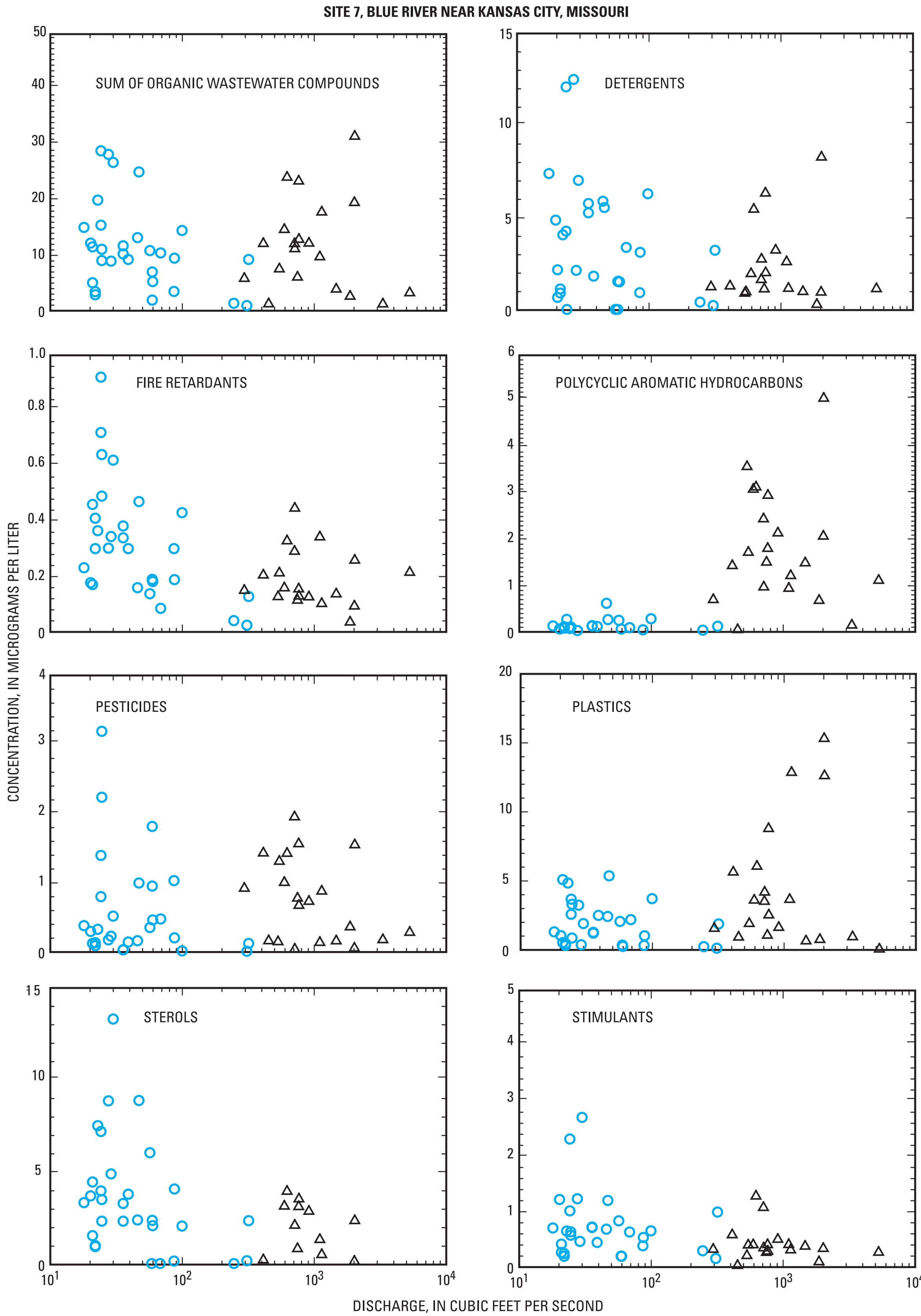



**Figure 18.** Concentrations of selected organic wastewater compounds in relation to stream discharge by site.—Continued

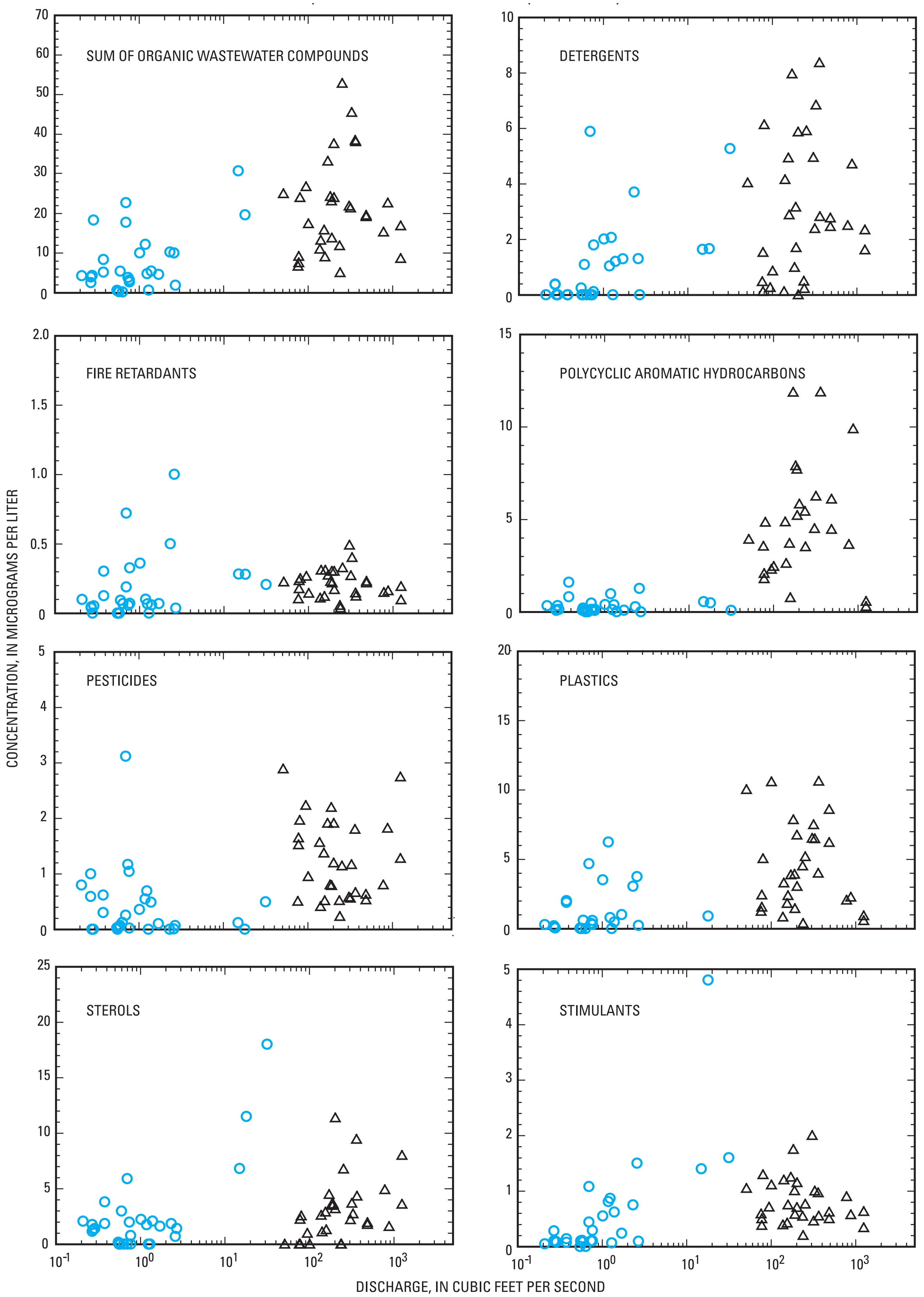



**Figure 18.** Concentrations of selected organic wastewater compounds in relation to stream discharge by site.—Continued

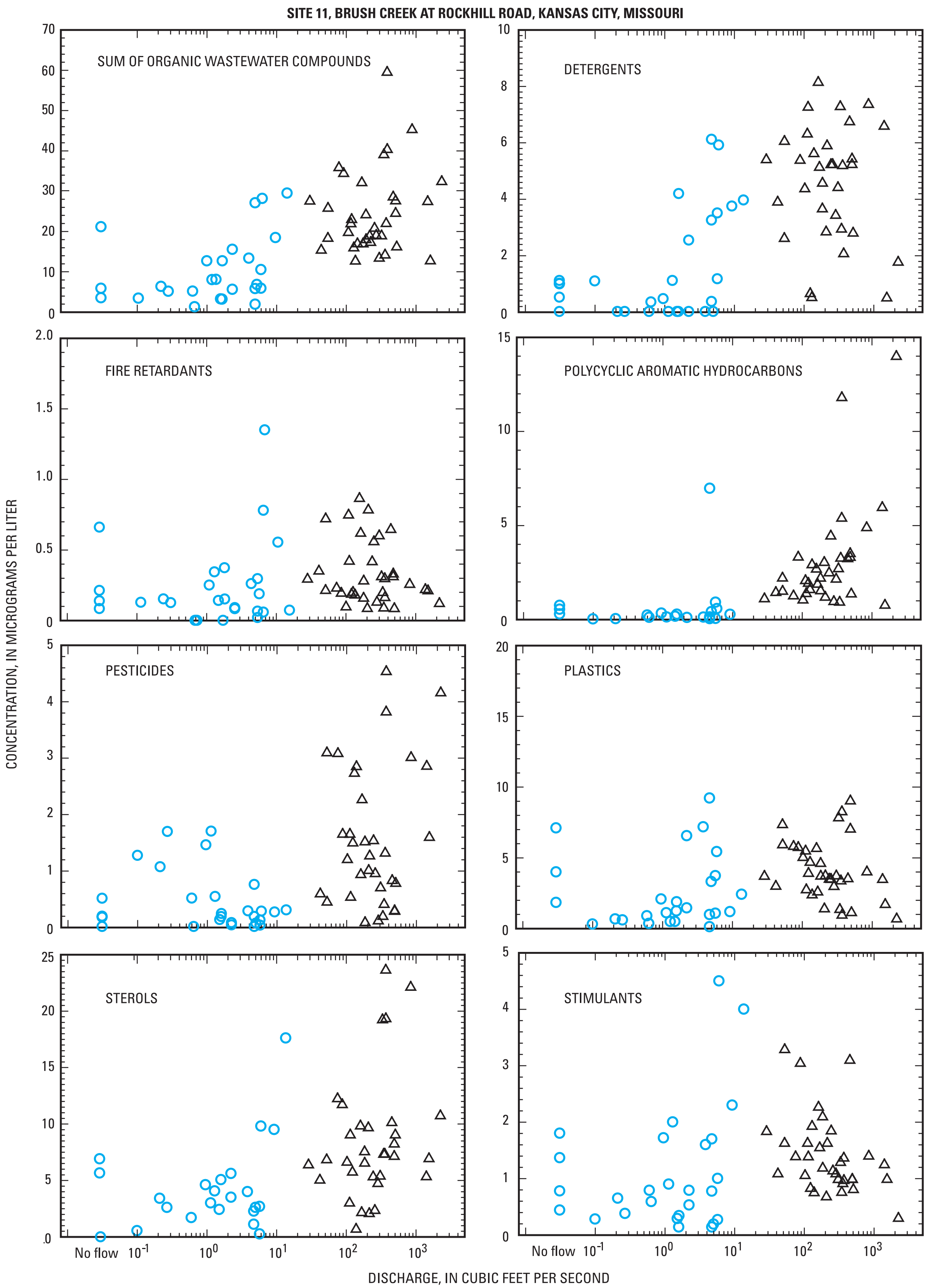



**Figure 18.** Concentrations of selected organic wastewater compounds in relation to stream discharge by site.—Continued

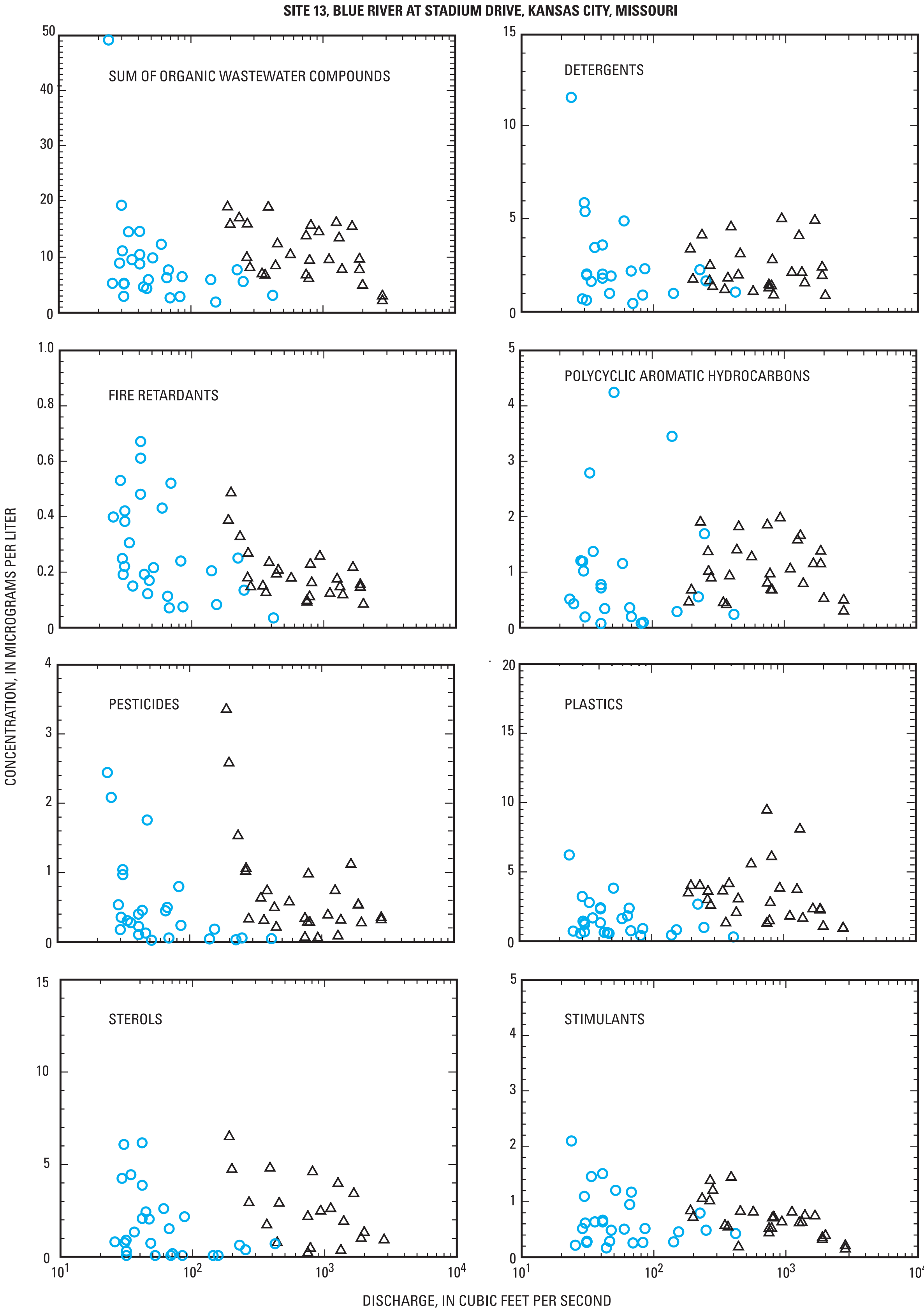



**Figure 18.** Concentrations of selected organic wastewater compounds in relation to stream discharge by site.—Continued

These data indicate that for most classes of total OWCs, concentrations decrease with increasing streamflow at most sites on Indian Creek and the Blue River, which is consistent with a constant source. Two exceptions to this trend were PAHs and pesticides, indicating that nonpoint sources play a role in the occurrence of these compounds during storm events. PAHs commonly originate from vehicle exhaust and are known to partition onto sediments in urban areas (Van Metre and others, 2000). Impervious surfaces, such as streets, parking lots, and roofs are likely sources for these compounds during storm runoff. Pesticides could originate from many nonpoint sources in the basin including lawns, riparian parks, and upstream agricultural areas.

Generally, OWC concentrations increased in Brush Creek samples with increasing stormflow (fig. 18). There was little difference between the relation between concentrations and discharge at site 9 upstream from most CSOs and site 11 located in the CSS area; data that indicate that the source of many OWCs in Brush Creek originated from non-CSO sources. Such sources would be expected to include storm sewers, SSOs and leaks, and WWTP by-passes but also may include contributions from impervious surfaces and nonpoint-source contributions from lawns, parks, and golf courses. Following storms, rainfall-induced infiltration and inflow rates result in extended increases in WWTP throughputs at site 18, an indication that the integrity of the CSS may be compromised in parts of the basin (Charles Raab, City of Kansas City Water Services Department, oral commun., 2005).

During base flow, typically more than one-half of OWCs measured in stream samples were detergents and sterols (table 12). The percentage of OWCs from detergents and sterols was highest (69 percent) at sites downstream from WWTPs, and lowest (33 percent) for sites without evident wastewater sources. These same two classes also composed the largest component of OWCs measured in most stream storm samples, although in some instances, such as sites downstream from large WWTPs, plastics composed a larger percentage of the OWCs. Although WWTPs were the largest source of many OWCs, the ubiquitous nature of some of these compounds in the urban environment is evident and underscores that even in areas with predominantly WWTP or CSO sources, nonpoint-source contributions of some classes of OWCs originated from other sources.

## Nutrient Load and Yield Estimates

Monthly total N and total P loads (fig. 19) and yields (fig. 20) at selected sites in the basin were estimated to allow comparison between nutrient sources in the basin. Estimates integrated base- and stormflow loads from July 2002 through September 2004, and related loads to stream discharge, hydrologic condition, and seasonal differences using minimum variance unbiased estimation models (table 14). Natural background estimates of total N and total P loads also were determined at these same sites (fig 19). Yields at basin sites were compared

**Table 14.** Minimum variance unbiased estimation models used to estimate monthly total nitrogen and total phosphorus loads at selected sites in the Blue River Basin.

[Load, in grams per second; Q, discharge minus center of discharge, in cubic feet per second; $Q_{bq}$, discharge divided by the center of discharge, in cubic feet per second; T, time minus center of time, in decimal years; $R^2$, coefficient of determination; SEP, average standard error of prediction in grams per second]

| Site number | Total nitrogen | $R^2$ | SEP |
|---|---|---|---|
| 2 | $\ln Load = 2.38 + 0.983\ln Q + 0.037\ln Q^2 + 0.282\cos 2\pi T - 0.279\sin 2\pi T$ | 0.97 | 3.64 |
| 6 | $\ln Load = 3.54 + 0.772\ln Q + 0.059\ln Q^2 + 0.159\cos 2\pi T + 0.113\sin 2\pi T$ | 0.99 | 3.36 |
| 7[1] | $\ln Load = 2.61 + 0.431\ln Q_{bq}$ | | |
| 7[2] | $\ln Load = 3.21 + 1.036\ln Q_{bq}$ | 0.94 | 4.24 |
| 11 | $\ln Load = -3.23 + 1.13\ln Q - 0.02\ln Q^2 + 0.01\cos 2\pi T - 0.166\sin 2\pi T$ | 0.96 | 0.45 |
| **Site number** | **Total phosphorus** | **$R^2$** | **SEP** |
| 2 | $\ln Load = 0.463 + 1.09\ln Q + 0.057\ln Q^2 + 0.367\cos 2\pi T - 0.403\sin 2\pi T$ | 0.95 | 1.32 |
| 6 | $\ln Load = 2.11 + 0.828\ln Q + 0.063\ln Q^2 + 0.362\cos 2\pi T + 0.148\sin 2\pi T$ | 0.95 | 2.10 |
| 7[3] | $\ln Load = 0.376 + 0.119\ln Q_{bq}$ | | |
| 7[4] | $\ln Load = 0.376 + 1.183\ln Q_{bq}$ | 0.86 | 2.96 |
| 11 | $\ln Load = -2.28 + 1.23\ln Q$ | 0.95 | 0.11 |

[1]Discharge less than or equal to 76 cubic feet per second.

[2]Discharge greater than 76 cubic feet per second.

[3]Discharge less than or equal to 68 cubic feet per second.

[4]Discharge greater than 68 cubic feet per second.

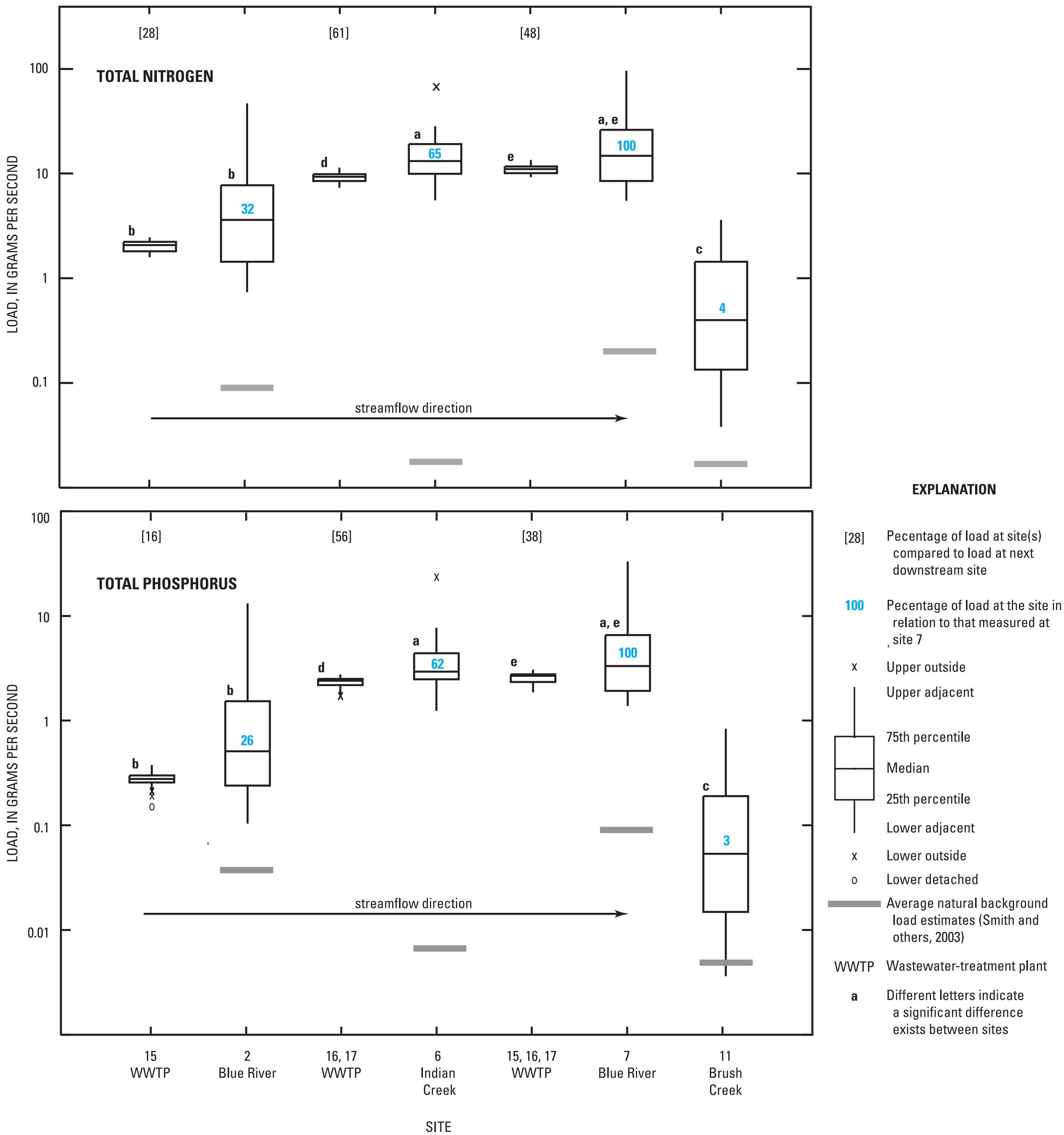



**Figure 19.** Estimated mean monthly total nitrogen and total phosphorus loads at sites in the Blue River Basin from July 2002 through September 2004.

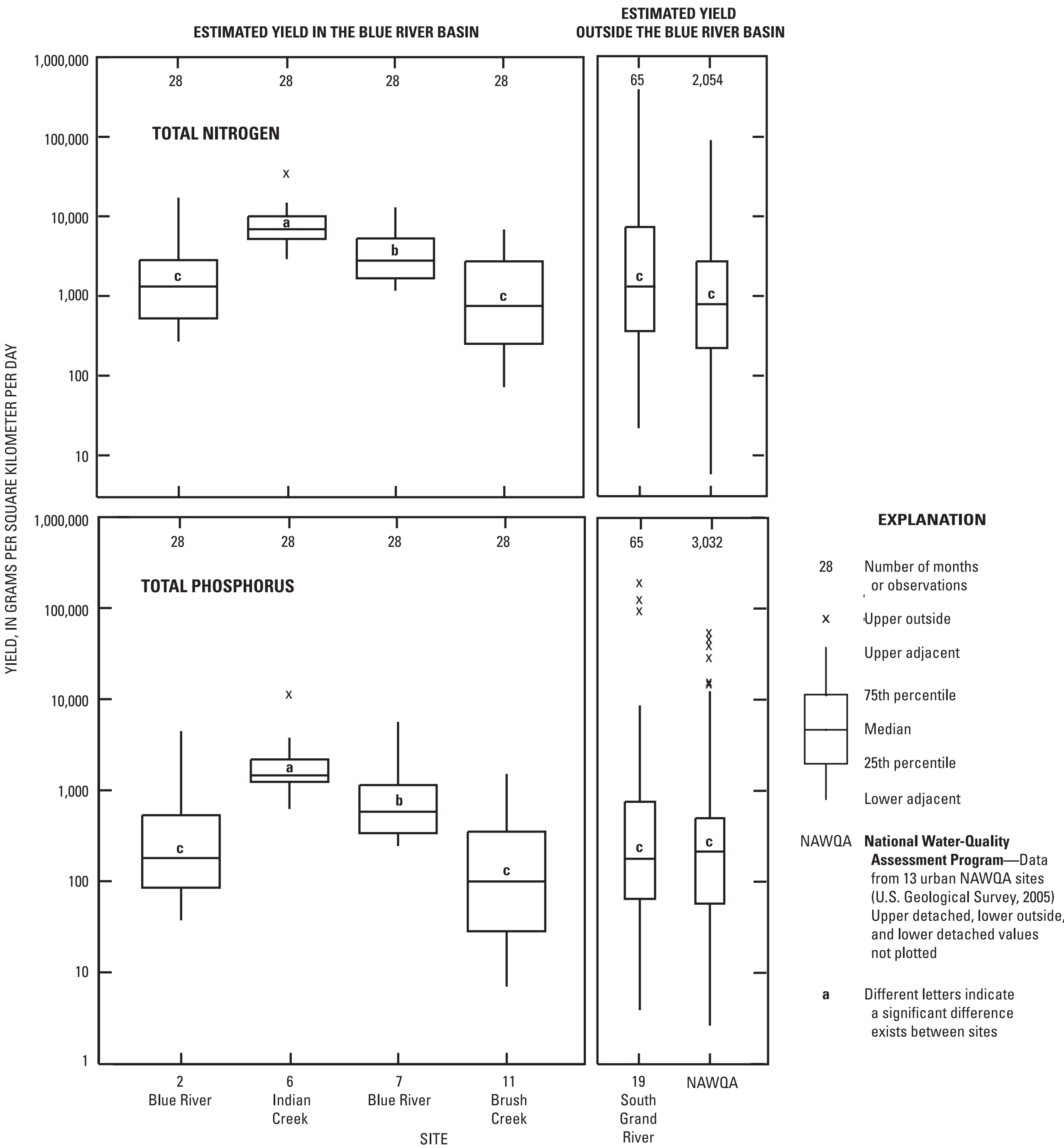



**Figure 20.** Estimated yields of total nitrogen and total phosphorus at selected sites in the Blue River Basin from July 2002 through September 2004.

to those at 13 urban sites across the coterminous U.S., and one site (site 19) outside of the basin (fig. 20).

There was no significant difference between the median total N and total P loads at the lower Indian Creek site (site 6) compared to downstream loads at site 7 on the middle Blue River (p=0.73 for total N; p=0.75 for total P). These data indicate that most of the nutrients observed at Blue River site 7 originated from the lower Indian Creek (fig. 19). Median nutrient loads at WWTP sites 16 and 17, upstream from site 6 on Indian Creek, were approximately 60 percent of the values measured at site 6 (fig. 19), indicating that most nutrients in lower Indian Creek resulted from the combination of upstream WWTP discharges. Other sources, primarily from urban nonpoint-source runoff, also contribute substantial amounts of nutrients (approximately 40 percent) to lower Indian Creek. Although sedimentation and biological uptake could have resulted in some loss as these nutrients moved downstream, the bulk of the nutrients originating from Indian Creek were carried downstream into the Blue River.

Median total N and total P loads measured in the upper Blue River (site 2) were significantly less than those measured downstream at site 7 (p<0.001), and also significantly less than those measured on Indian Creek (p<0.001). These data indicate that nutrient contributions from the upper Blue River to downstream reaches were substantially less than contributions from the Indian Creek tributary. Total N and total P loads measured at site 15, the smallest WWTP in the basin, were 28 and 16 percent of the loads measured at site 2. These data indicate that other sources, the bulk of which would be expected to be contributions from nonpoint-source runoff, constitute the greatest part of the nutrient load in the upper Blue River.

Median total N and total P loads measured at site 11 on Brush Creek were significantly less (p<0.001) than those measured at other sites in the basin (sites 2, 6, and 7). Nutrient loads measured on Brush Creek were less than 5 percent of the loads measured at site 7 on the Blue River (fig. 19). These data indicate that loadings from Brush Creek provide a much smaller contribution to the loads in Blue River than do loads from either Indian Creek or the upper reaches of Blue River.

Natural background total N and total P loads were estimated at selected sites in the basin (fig. 19) to determine the role that natural processes, such as atmospheric deposition and native soil inputs, may be contributing to basin nutrient loads. Estimated natural background levels were much (typically one to three orders of magnitude) lower than current total N and P loads observed in the basin (fig. 19). These data indicate that only a small percentage of the nutrients in the basin would be expected to occur from natural processes; urbanization effects and nonpoint-source runoff contributions were significantly (p<0.001) greater contributors of nutrients. The greatest disparity between current and natural background levels was observed at site 6, which receives the largest percentage of WWTPs inputs.

Load comparisons can be biased in favor of streams, or sites, with the largest drainage area because larger drainage areas often have higher discharges, which frequently translates into higher loads. Estimates of load per unit area, or yield, can remove this inherent bias and provide an equivalent measure for comparisons. Estimates of total N and total P yields at sites in the basin were compared to each other and to sites outside of the basin (fig. 20).

Median total N and total P yields estimated at site 6 on Indian Creek were significantly greater (p<0.001) than other sites in the Blue River Basin. Median total N yields at site 6 were five times greater than the median yield at site 2 (upper Blue River), two and one-half times greater than at site 7 (middle Blue River), and nine times greater than at site 11 on Brush Creek (fig. 20). Median total P yields on Indian Creek were 8 times greater than those from the upper Blue River, 2.5 greater than from the middle Blue River, and 15 times greater than from Brush Creek. Mean flows from the two WWTPs upstream from site 6 on Indian Creek were five times greater than the amount of treated effluent discharged from the WWTP (site 15) on the upper Blue River above site 2, consistent with the yield differences at these sites.

Nutrient yields from sites outside the basin (fig. 20) provide a relative measure of how sites in the Blue River Basin compare to other urban sites across the country, and to a control site in Missouri (site 19). The urban sites were sampled between 1980 and1990 as part of the National Water-Quality Assessment (NAWQA) program (U.S. Geological Survey, 2005). At least 6 of the 13 NAWQA sites were located in cities with a CSS; however, it was not determined how many, if any, of these sites were located in CSS areas. The control site was sampled monthly from July 1998 through September 2004 (Hauck and Nagel; 2000, 2001, 2002, 2003, 2004, 2005). Land use upstream from site 19 predominantly is agricultural. Samples collected at the urban and control sites included both base- and stormflow samples.

Total N and total P yields at sites 6 and 7 were significantly greater than those from NAWQA urban sites (p<0.001). Total N and total P yields at site 2 were not significantly different than the NAWQA urban sites (p=0.07 for total N; p=0.60 for total P). There also was no statistical difference between yields at the NAWQA urban sites versus those at site 11 (p=0.75 for total N; and p=0.08 for total P). Nutrient yields at sites that received either no WWTP effluent discharge but CSO discharges (site 11 on Brush Creek) or one WWTP discharge (site 2 on upper Blue River) had yields that were not statistically different from each other (p=0.18 for total N and p=0.08 for total P). Sites that received discharge from more than one WWTP (sites 6 and 7) had median nutrient yields that were three to nine times greater than those at other U.S. urban sites.

Nutrient yields at site 6 on Indian Creek were significantly greater (p<0.001) than the nutrient yields at site 19 outside the basin. Total N yields at site 7 were not significantly different than those measured at site 19 (p=0.06), but total P yields were (p<0.001). Nutrient yields at site 2 (upper Blue River) and site 11 (lower Brush Creek) were not significantly different than those at the control site (p-values ranged from 0.08 to 0.89).

## Bacteria Densities and Sources

The city of Kansas City measured fecal coliform and fecal streptococci bacteria densities at selected sites in Brush Creek from July 1995 to January 2003. Samples generally were collected once each week (Wednesday morning) from March through November of each year, and once or twice each month from December through February under a wide variety of flow conditions. Samples collected at eight sampling points were distributed approximately every one-half mile from near site 9 to near site 12. Median fecal coliform densities ranged from 200 col/100 mL (colonies per 100 milliliters) between sites 10 and 11 (fig. 21) to 600 col/100 mL just downstream from site 9. Lower median densities in stream samples collected in the reach from site 10 to site 11 may be related to aeration and recirculation processes in place within these reaches, photodegradation as the result of longer travel times through the shallower, impounded reaches, or from particle settling. The source of the higher median fecal coliform densities in the reach between sites 9 and 10 is unknown. The highest density of CSO diversion structures occurs in Lower Brush Creek, between sites 11 and 12. Median fecal coliform densities in lower reaches were less than, or equivalent to, upstream areas (where CSO densities are much less) indicating that other sources contribute substantially to the bacteria loads. Median fecal coliform densities were less than the secondary contact recreation limit of 1,800 col/100 mL (Missouri Department of Natural Resources, 2005). In Brush Creek reaches from site 9 to the mouth, however, 27 percent of samples had fecal coliform densities that were greater than the recommended secondary contact standard. Brush Creek is not currently (2006) a listed stream in the State of Missouri, so these standards do not presently apply.

Bacteria densities in Brush Creek are affected by the time of year (fig. 22). The largest densities occurred during the wettest months (May and June of each year). During these months, median fecal coliform densities were greater than 1,000 col/100 mL. Median monthly fecal coliform densities were below 100 col/100 mL from December through March. Median monthly fecal coliform densities also were strongly correlated with the number of days per month with precipitation events greater than 2.5 centimeters (Spearman's rho = 0.90) and to a lesser extent, the median monthly streamflow at site 11 (Spearman's rho = 0.66). These data indicate that bacteria densities in Brush Creek were linked strongly to wet weather events that occur primarily from spring through late summer, with rainfall events greater than 2.5 centimeters within 24 hours being the most problematic. Fecal coliform data are useful because fecal coliform and *E. coli* densities are strongly correlated (fig. 23; $R^2 = 0.95$); a measure of one can provide a reasonable estimate of the other. Median *E. coli* base-flow load at Brush Creek site 9 (upstream from the principal CSS area) was 66 percent of the median load measured at site 11 (in the CSS area). Additionally, *E. coli* storm loads at site 9 were 59 percent of the *E. coli* loads for the same storms measured at site 11. These data indicate that substantial amounts of the bacteria observed in Brush Creek originated from sources other than CSOs.

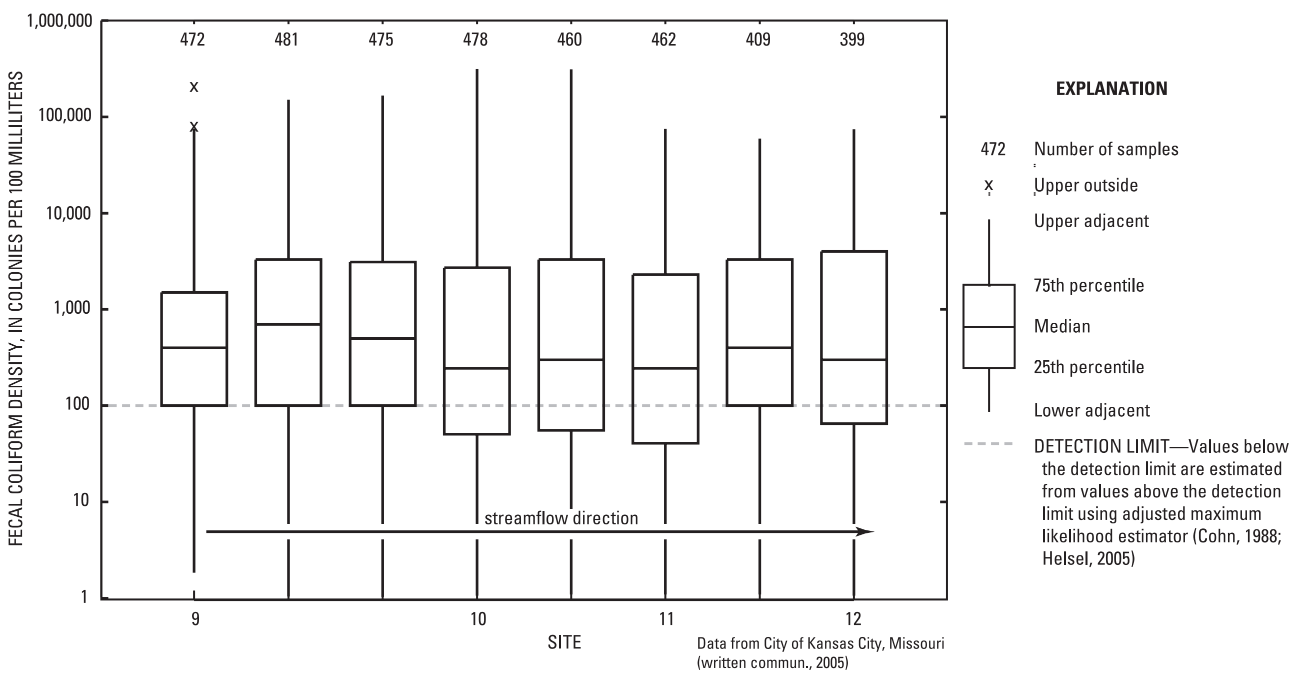



**Figure 21.** Brush Creek longitudinal fecal coliform density from July 1995 through September 2004 and relation to sampling points in this study.

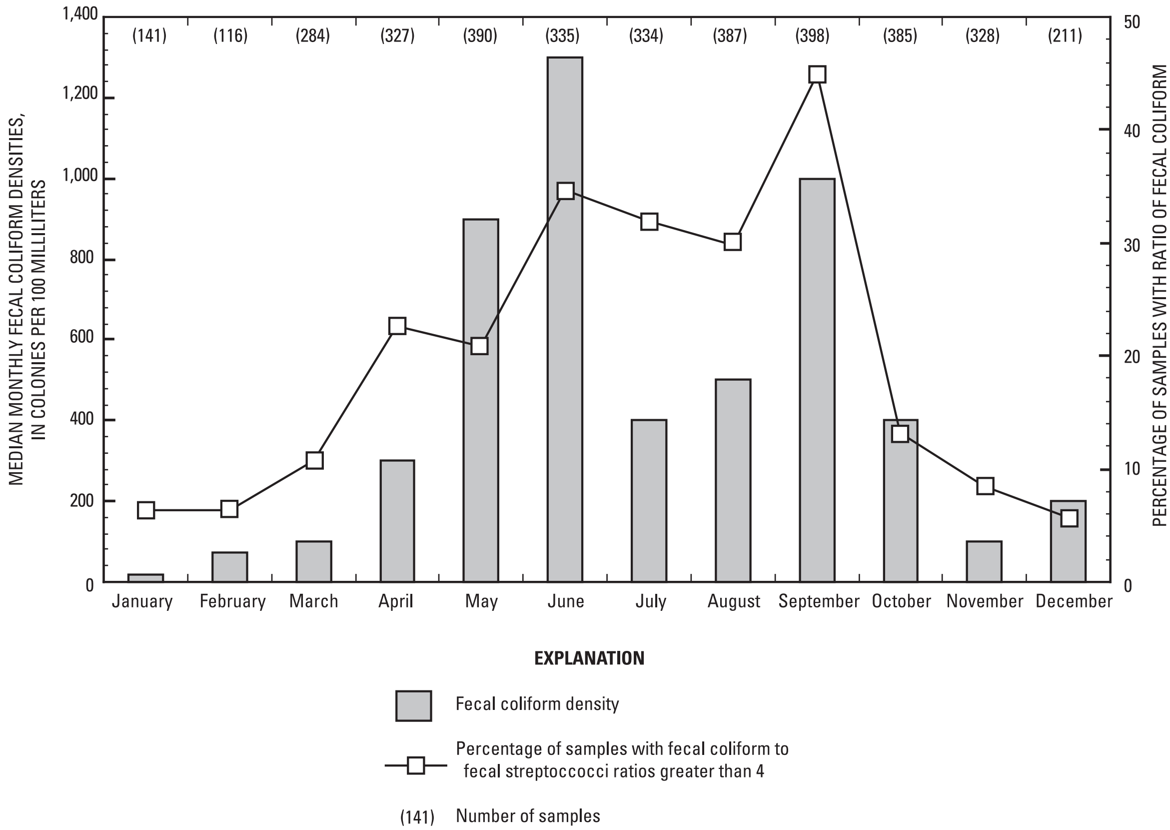



**Figure 22.** Median monthly fecal coliform densities measured in Brush Creek samples from July 1995 through January 2003, and percentage of samples with fecal coliform to fecal streptococci ratios greater than four.

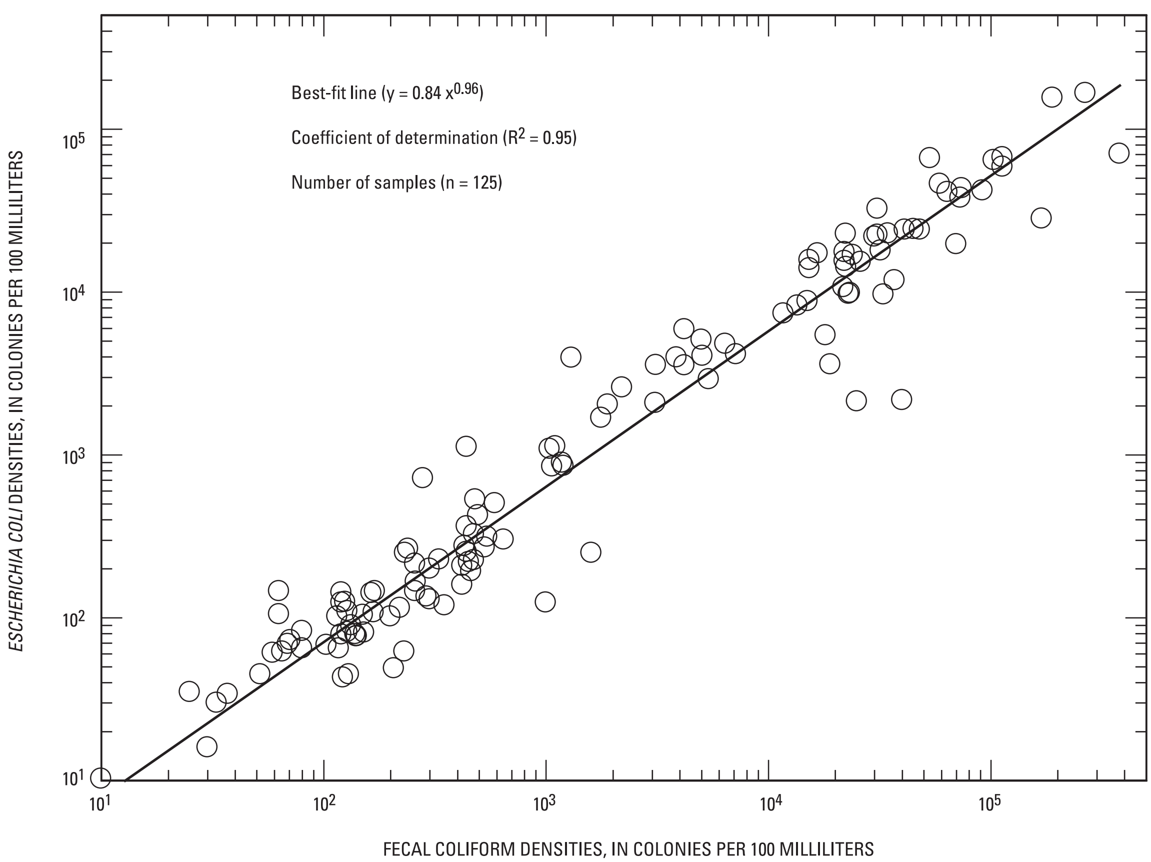



**Figure 23.** Relation between fecal coliform densities and *Escherichia coli* densities measured in stream samples.

Fecal indicator bacteria densities at sites 2 and 7 on Blue River and at site 6 on Indian Creek increased by several orders of magnitude during storms (fig. 17). This is because bacteria densities are strongly linked to suspended sediment concentrations, which also were dependent on discharge (fig. 17) and indicates that much of the observed bacteria in the basin originates from nonpoint sources.

Bacteria were evaluated to determine potential sources of *E. coli* to streams. Microbial source-tracking methods have been developed that use genetic markers to identify host sources (Carson and others, 2000; Dombek and others, 2000; Simpson and others, 2002; Myoda and others, 2003; Ahmed and others, 2005). These methods assign a presumptive source of waterborne bacteria through a statistical comparison of genetic markers isolated from environmental *E. coli* samples to genetic markers in a host-source library. Because temporal and spatial variations are known to exist in *E. coli* genetic markers, it is important to develop a representative host-source library for a given study area (Scott and others, 2003; Johnson and others, 2004; McLellan, 2004; Stoeckel and others, 2004). A local, representative host-source library containing 150 to 200 patterns for each potential host was developed from 2001 through 2004. This library of patterns was used for comparison to *E. coli* isolates from water samples in the basin.

Samples from six sites in the basin were analyzed for host sources of *E. coli* during three base-flow sampling events in 2002 and 2003. *E. coli* host-class densities were calculated by multiplying the percentage of each host class by the total number of *E. coli* determined from the same sample. When all samples were pooled together, 32 percent of the *E. coli* were from presumptive dog sources, 8 percent were from geese, 42 percent were from humans, and the remaining 18 percent were from unknown sources (fig. 24). Previous work (Wilkison and others, 2002), estimated presumptive sources to be almost equally divided among humans (23 percent), dogs (28 percent), geese (22 percent), and unknown sources (26). Attempts to characterize the composition of all bacteria in the basin based on these results should be strongly cautioned for several reasons. The relative percent contribution from various sources should not be expected to be constant with time (fig. 25), and the relative survival rates of different sources in the environment is not known. Additionally, even though *E. coli* has been shown to persist for extended periods in the environment (Byappanahalli and others, 2003; Muirhead and others, 2005), stormflow concentrations of bacteria are much greater than during base flow, and the relative percentages of storm-derived bacteria have not been characterized in the basin.

Median *E. coli* densities were highest for samples identified as dog (170 col/100 mL) and lowest (25 col/100 mL) for samples identified as originating from geese. Median *E. coli* densities from human sources were 110 col/100 mL, and from unknown sources were 55 col/100 mL. The median concentration of *E.coli* in all samples examined for host sources was 200 col/100 mL, which is near the concentrations of fecal coliform observed in the historical (1995 to 2003) Brush Creek data.

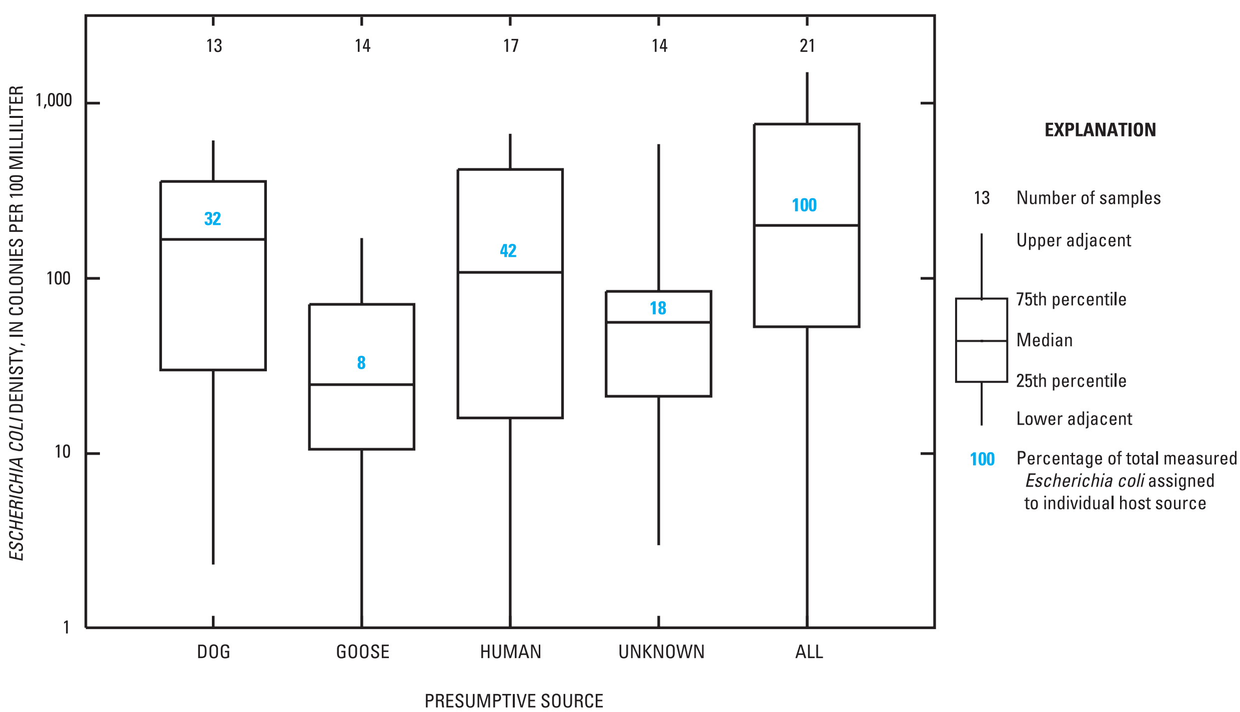
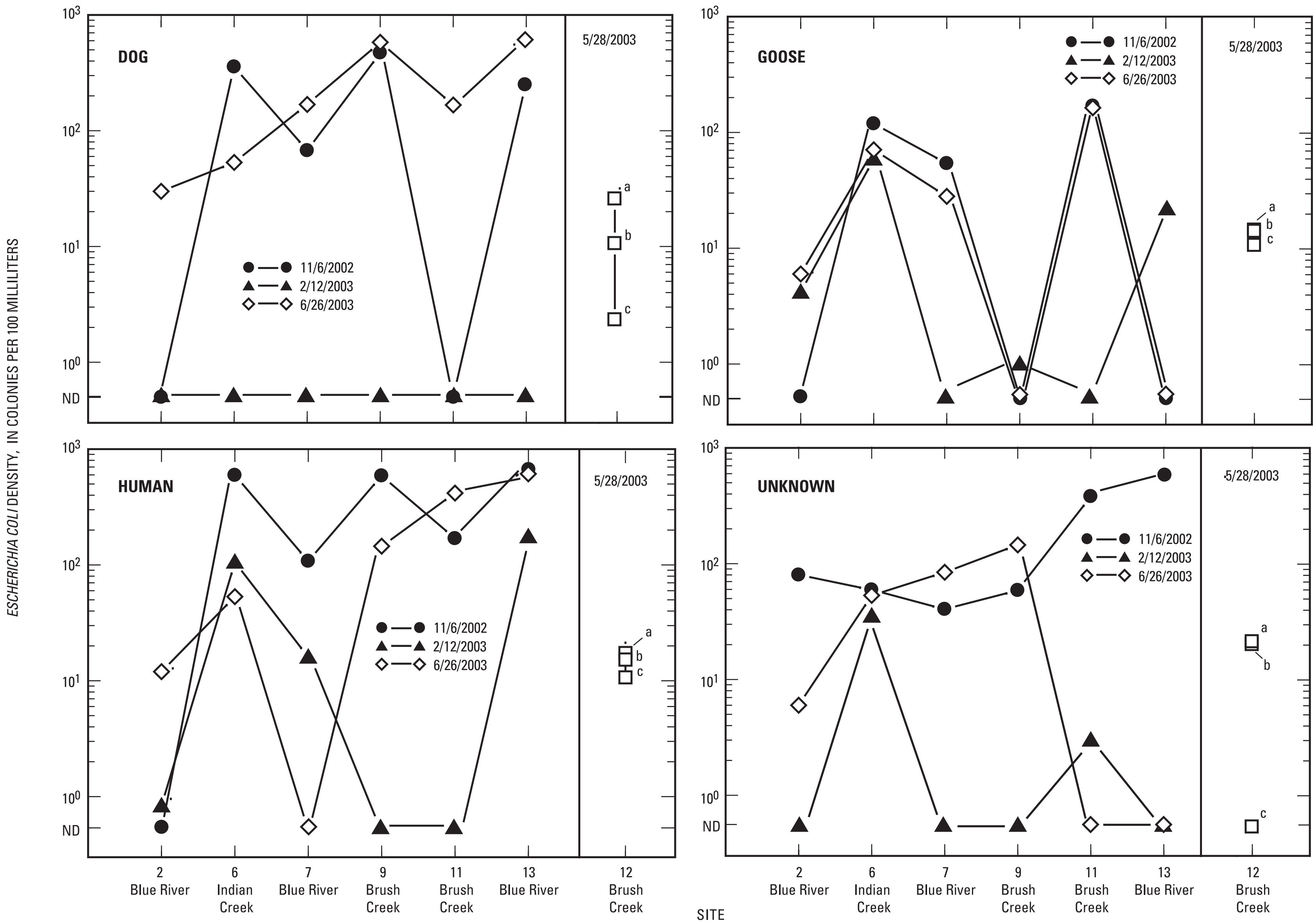



**Figure 24.** Presumptive sources of *Escherichia coli* measured in base-flow samples.




**EXPLANATION**

ND Not detected
a Sample from photic zone
b Sample from aphotic zone
c Bottom sediment pore-water sample

**Figure 25.** Temporal changes in *Escherichia coli* sources at selected stream sites.

When viewed by sampling event and site (fig. 25), the upstream Blue River site (site 2) typically had smaller amounts of all *E. coli* sources. Human and dog sources generally increased because of increased urbanization downstream in the basin. Goose sources were greatest at sites 6 and 11, where large flocks of geese tend to congregate in adjacent parks, impoundments, or fields for much of the year. February samples had substantially lower densities from all hosts, consistent with previous findings about lower densities during this time of the year (fig. 22).

Although the percentages changed somewhat from stream to stream, all streams in the basin showed the same general trend in host sources (table 15). For samples collected between November 2002 through May 2003, the largest percentage was assigned to human sources (average of 42 percent), followed by dogs (average of 32 percent), and then geese (average of 8 percent). Unknown, or unclassified sources were 18 percent of the total. Source attribution percentages for the period November 2002 through May 2003 at individual sites were generally within the range of those previously reported (table 15; Wilkison and others, 2002) where it was reported that human percentages of *E. coli* in stream samples were 28 percent, dog sources 26 percent, geese sources 19 percent, and unknown (or unclassified sources) were 28 percent. These data indicate that in a highly urbanized area, such as the Blue River Basin, *E. coli* of presumptive human origin were found in streams during base flow. However, the median densities of presumptive human *E. coli* bacteria (108 col/100 mL; fig. 24) were well below the *E. coli* secondary contact limit of 1,134 col/100mL for Missouri streams.

**Table 15.** Percentage of *Escherichia coli* measured in base-flow samples collected between November 2002 and June 2003 assigned to presumptive host sources.

[Numbers in bold are basin averages]

| Stream name | Site(s) included (fig. 1) | Number of samples | Number of isolates | Presumptive host source | | | |
|---|---|---|---|---|---|---|---|
| | | | | Dog | Goose | Human | Unknown or unclassified |
| **Sampled collected between November 2002 and June 2003** | | | | | | | |
| Brush Creek | 9, 11, 12 | 9 | 127 | 35 | 10 | 38 | 17 |
| Blue River | 2, 7, 13 | 9 | 88 | 31 | 3 | 44 | 22 |
| Indian Creek | 6 | 3 | 42 | 26 | 16 | 48 | 10 |
| **All streams** | **2, 6, 7, 9, 11, 12, 13** | 21 | 257 | 32 | 8 | 42 | 18 |
| **Previous work (Wilkison and others, 2002)** | | | | | | | |
| Brush Creek | 10,12 | 6 | 97 | 21 | 23 | 26 | 31 |
| Blue River | 7 | 3 | 48 | 35 | 10 | 33 | 21 |
| **All streams** | **7, 10, 12** | 9 | 145 | 26 | 19 | 28 | 28 |

Before the development of genetic source tracking methods, the ratio of fecal coliform colonies to fecal streptococci colonies (FC/FS) frequently was used in attempts to estimate human and/or animal source contributions. This methodology was based on inherent differences in population densities of fecal coliform when compared to fecal streptococci for each class, human or animal. Based on these differences, values of FC/FS greater than four were more likely to have a human origin, whereas those less than 0.7 were more likely to have originated from non-humans. Environmental survivability rates for fecal streptococci are lower than for fecal coliform; therefore, ratios can be biased high. This especially is problematic in agricultural settings where ratios can be incorrectly suggestive of human origins (Coyne and Howell, 1996; Edwards and others, 1997). However, FC/FS ratios can provide useful information, especially when samples are frequently collected and close to the source, sample sets are large, and only the percentages of indicative values are used rather than specific values or the mean of values (Feachem, 1975; Davenport and others, 1976; Coyne and Howell, 1995). The percentage of samples with FC/FS greater than 4 is shown by month in figure 22. These data indicate that from April through September of each year, between 21 and 45 percent of samples met the criteria for human-derived bacteria as determined by FC/FS. This time frame also coincided with the period of greatest bacteria densities, and with the most frequent and heaviest precipitation events. Remember, using this method has the potential to bias results in favor of human-derived bacteria, so some percentage of these samples may have been affected by uneven die-off rates. However, the utilitarian purpose of the FC/FS measurements is to determine whether the human bacteria percentages determined by genetic source-tracking methods are representative of longer periods, which they appear to be. Percentages of presumptive human bacteria determined from genetic-based methods for samples collected from Brush Creek were 26 percent for stream samples collected in 2001(table 15; Wilkison and others, 2002) and 38 percent for stream samples collected in 2002 and 2003 (table 15; this study).

## Brush Creek Impoundments

Impounded reaches of Brush Creek are known locally as the Plaza pool (reach upstream from site 10), the Volker pool (reach near site 11), and Lake of the Enshriners (reach near site 12; fig. 26). Water exchanges are important to the water quality of these reaches; without freshwater moving into them, water tends to stagnate in the pools. Runoff that enters the impoundments is affected by urban nonpoint-source and CSO contaminants; if stormwater is enriched in nutrients and organic matter, macrophytes and algal masses can form quickly, especially in the late summer. Sediments, and associated contaminants, can accumulate in impoundments as stream velocities decline and affect water quality long after storms have receded (Wilkison and others, 2002). Measurements of pool volumes, pool exchange rates, and vertical water-quality profiles were used to determine the role that the impounded reaches have on Brush Creek water quality.

### Mixing Effects on Water Quality

The volume of water needed to replace the pool volume above each site varies considerably. The Volker pool contains only about one-half the volume of the Plaza pool and less than 10 percent of the Lake of the Enshriners (table 16). During base flow it takes from several days to several months for the pool volume to be replaced at any given reach. For example, at a base flow of 1ft$^3$/s it takes approximately 11 days to replace the Plaza pool volume, 5 and one-half days to replace the Volker pool volume, and about 3 months to replace the pool volume in Lake of the Enshriners. These time estimates assume piston-flow through the impoundments, meaning any new water coming into the impoundments replaces an equivalent volume of older water. This is not always the case when the impoundments are strongly thermally stratified; thus, complete replacement could take substantially longer than the above minimal times. Storm runoff volumes often were sufficient to replace pool volumes many times over; however, small events with rainfall of less than 0.6 centimeter may result in slugs of water moving from upstream pools into downstream pools without completely leaving the basin.

**Table 16.** Pool volumes of three impounded reaches of Brush Creek.

| Impounded reach above | Volume, in cubic feet | Impoundment name |
|---|---|---|
| Site 10 | 978,000 | Plaza pool |
| Site 11 | 474,000 | Volker pool |
| Site 12 | 7,475,000 | Lake of the Enshriners |

From 1999 to 2004, there was, on average, sufficient daily flow to replace the volume in Volker pool 23 percent of the time (fig. 27). Water in the Plaza pool and Lake of the Enshriners was not replenished as frequently because of their larger volumes. Daily flow was sufficient to replace the Plaza pool volume 13 percent of the time and only 4 percent of the time at Lake of the Enshriners for the same period. Because less frequent mixing occurred in Lake of Enshriners, the reach would have been more prone to stratification and potential eutrophication than the Plaza or Volker pools.

Concurrent measurements of mean daily dissolved oxygen in three impounded reaches of Brush Creek indicate that dissolved oxygen concentrations were significantly higher in the Plaza pool than in the Volker pool or the Lake of the Enshriners (fig. 28; $p<0.001$). Median concentrations of dissolved oxygen declined in the downstream pools, although the difference between the Volker pool and Lake of the Enshriners was not statistically significant ($p = 0.18$). Differences between dissolved oxygen at Brush Creek sites were not related to temperature differences as concurrent measurements of temperature

Plaza pool upstream from site 10, February 2001.

Volker pool near site 11, September 2003.

Lake of the Enshriners near site 12, August 2003
(note the floating algal mats and periphytic growth encroaching from banks).

**Figure 26.** Views of impounded reaches on Brush Creek.

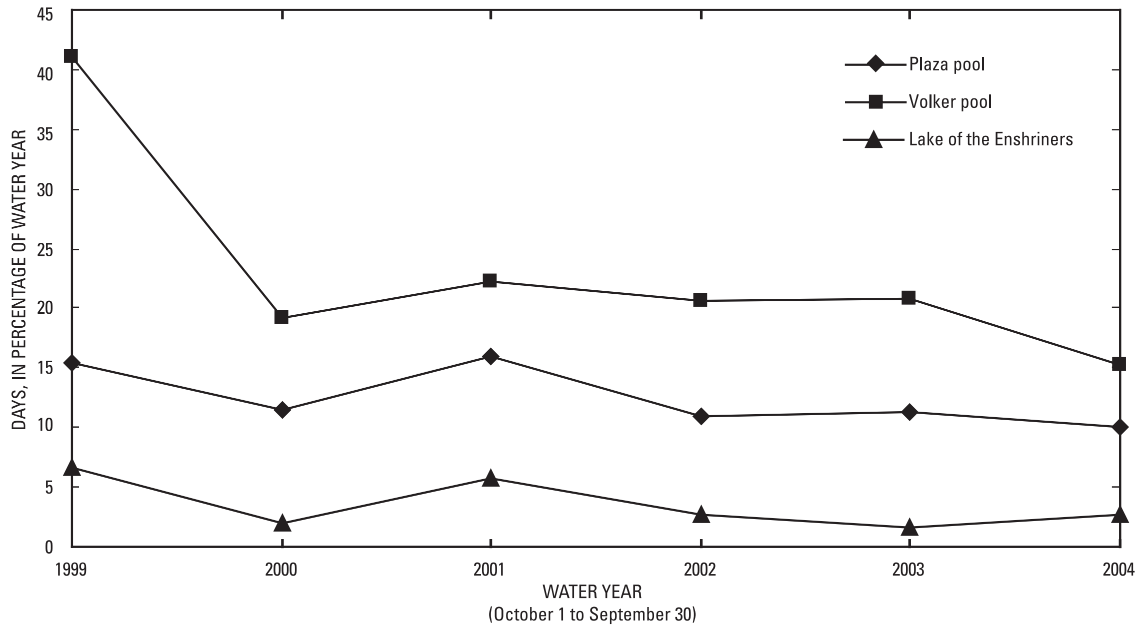



**Figure 27.** Percentage of days during 1999 to 2004 water years that mean daily flow was sufficient to replace the pool volume for selected impounded reaches of Brush Creek.

indicated that temperatures were nearly identical. Improved mixing, aided by artificial recirculation and air entrainment from fountains, likely resulted in higher dissolved oxygen concentrations in the Plaza pool. The less frequent mixing of Lake of the Enshriners likely contributed to the lower dissolved oxygen concentrations measured in this reach. Comparing long-term (1998 to 2004) mean daily dissolved oxygen concentrations measured in Brush Creek to those measured in the Blue River indicate significantly lower ($p<0.001$) dissolved oxygen concentrations (5.4 mg/L) in Brush Creek when compared to the Blue River at site 7 (7.4 mg/L; fig. 28). As discussed later, temperature differences, especially during the summer months, could account for a small part of this variation. Increased dissolved oxygen concentrations in the Blue River were more likely facilitated by higher stream velocities and improved mixing over that of Brush Creek.

Mixing processes also can play a role in streamwater temperatures. The Plaza and Volker pools are channelized entirely in concrete and lack any tree canopy; therefore, solar radiation affects are more pronounced than where stream canopies are more intact and riparian corridors less disturbed, such as at site 7 on the Blue River. Mean daily water temperature fluctuations were less pronounced in Brush Creek during April to mid-July than in the Blue River (fig. 29). Brush Creek impoundments likely moderated temperature fluctuations as stormwater mixed with older, more temperate water contained in the pools. However, during mid-July through September, mean daily water temperatures in Brush Creek consistently were greater than those in the Blue River by about 0.5 $^{o}$C (degrees Celsius). These differences likely result from the cumulative effects of solar radiation and lack of tree canopy on Brush Creek, coupled with the less frequent precipitation during this period.

## Vertical Water-Quality Profiles

Vertical water-quality profiles were performed when Brush Creek impoundments had the potential to thermally stratify, usually early spring to late summer after little, or no, precipitation. Profiles for dissolved oxygen saturation, redox potential, and dissolved orthophosphate, nitrate, and ammonia concentrations measured in impounded reaches of Brush Creek are shown in figures 30 and 31. These data indicate that only the Lake of the Enshriners is deep enough, or lacks sufficient mixing, to have persistent stratification. Dissolved oxygen concentrations decreased rapidly with depth during all measurements in this impoundment. Super-saturated dissolved oxygen conditions frequently occurred in the upper 1.5 m because of algal photosynthesis; however, below about 3 m deep dissolved oxygen concentrations diminished to near zero. In the shallower Plaza and Volker pools, sunlight sometimes penetrated through the entire water column. This allowed algal growth from the surface to near the bottom as indicated by super-saturated dissolved oxygen conditions for all depths at these sites during the September 10, 2003, profile.

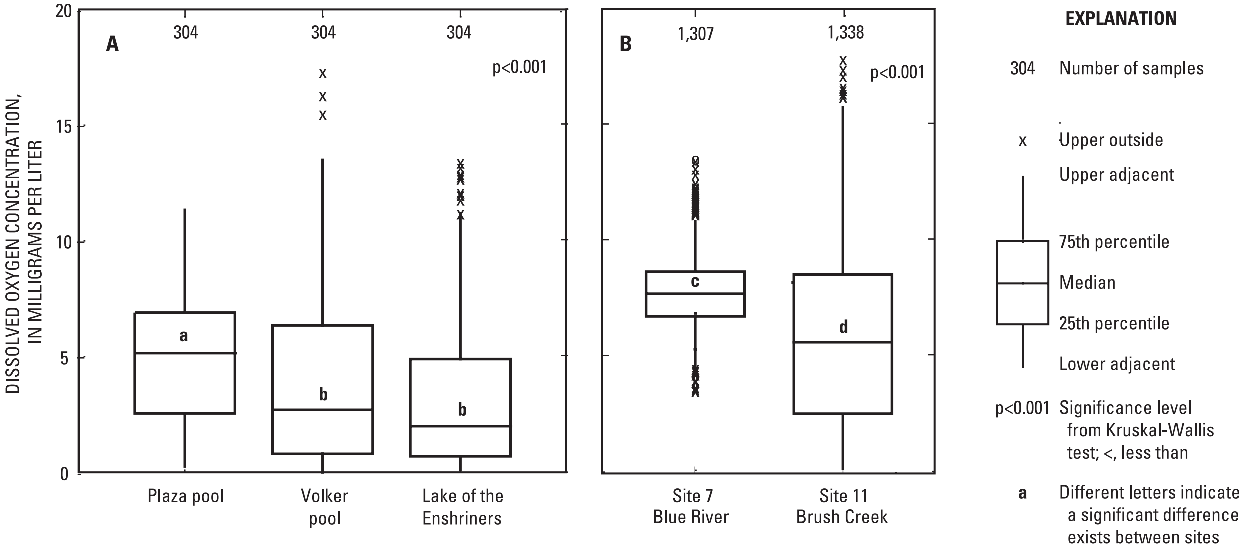



**Figure 28.** Concurrent measurements of mean daily dissolved oxygen concentrations at three Brush Creek impoundments (A) and long-term daily dissolved oxygen concentrations at sites on the Blue River and Brush Creek (B) 1998 to 2004.

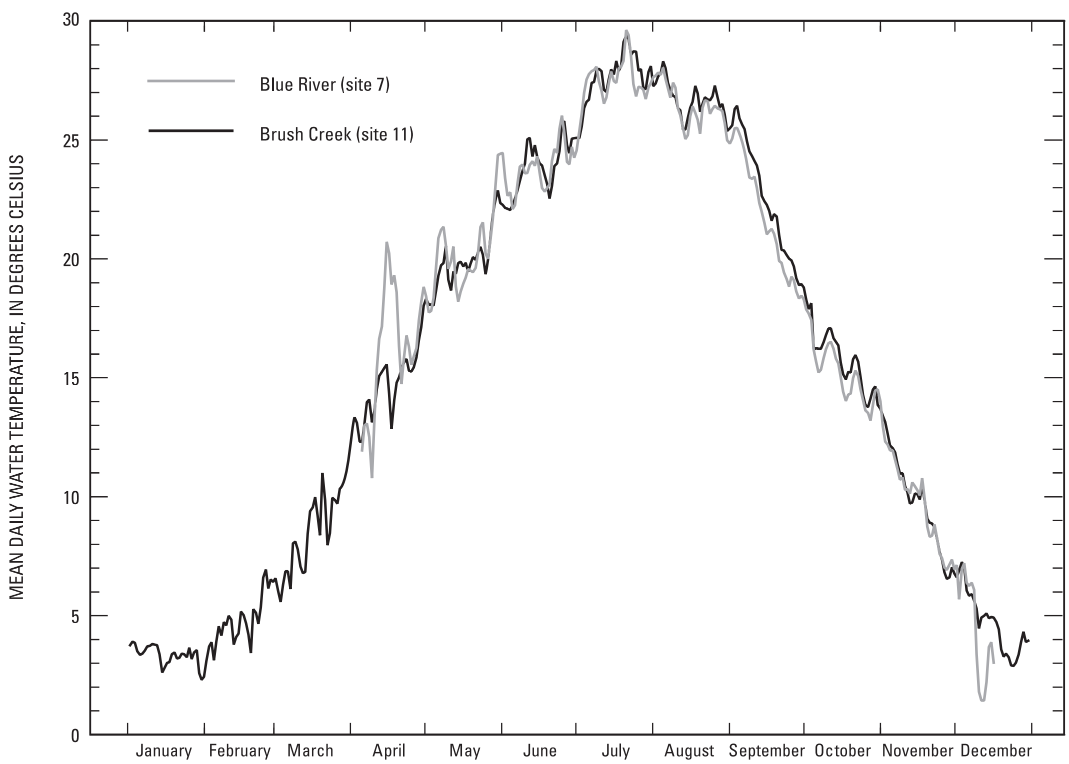



**Figure 29.** Mean daily water temperatures in the Blue River and Brush Creek from August 1998 to September 2004.

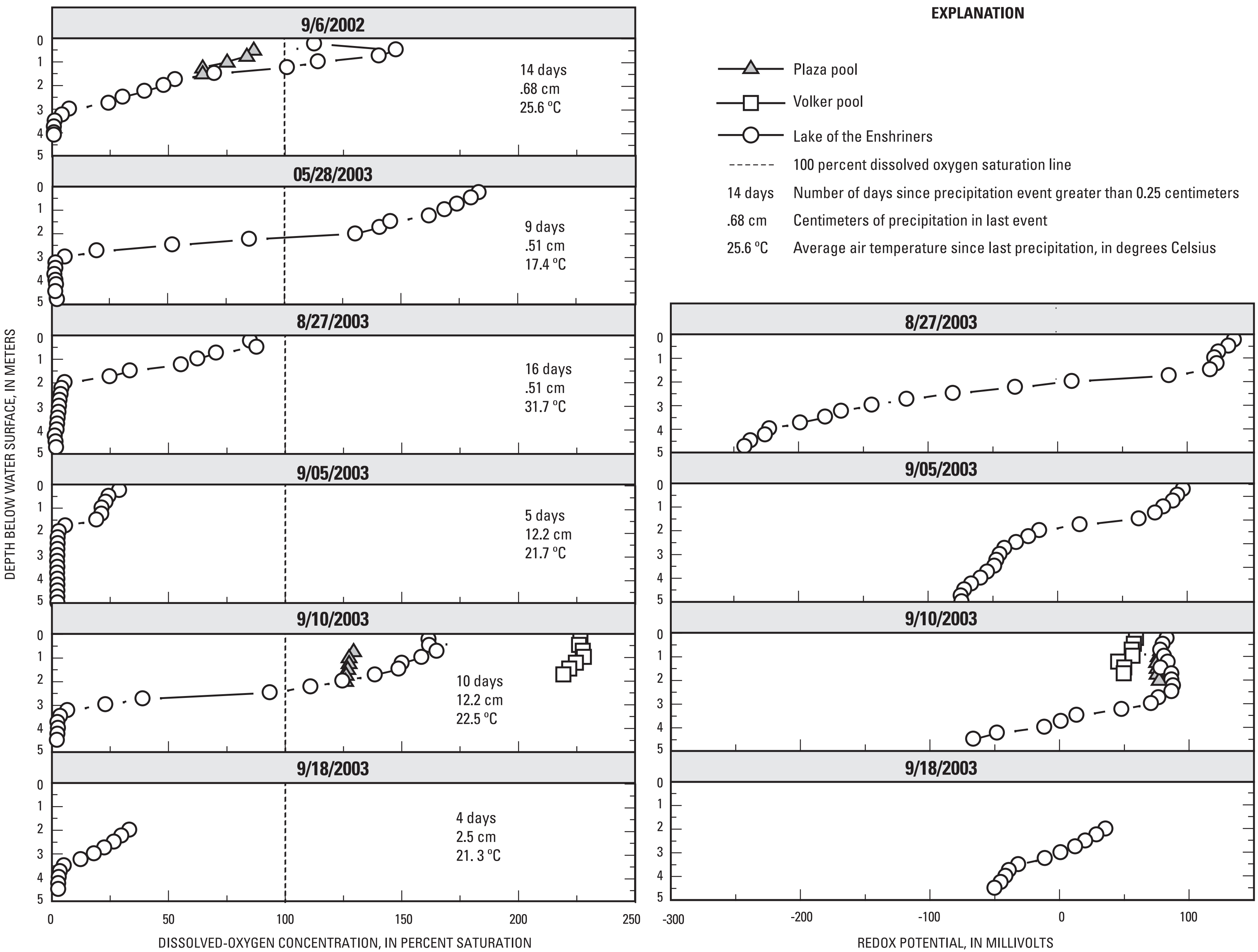



**Figure 30.** Concentration profiles with depth for dissolved oxygen and redox potential for impounded reaches of Brush Creek.

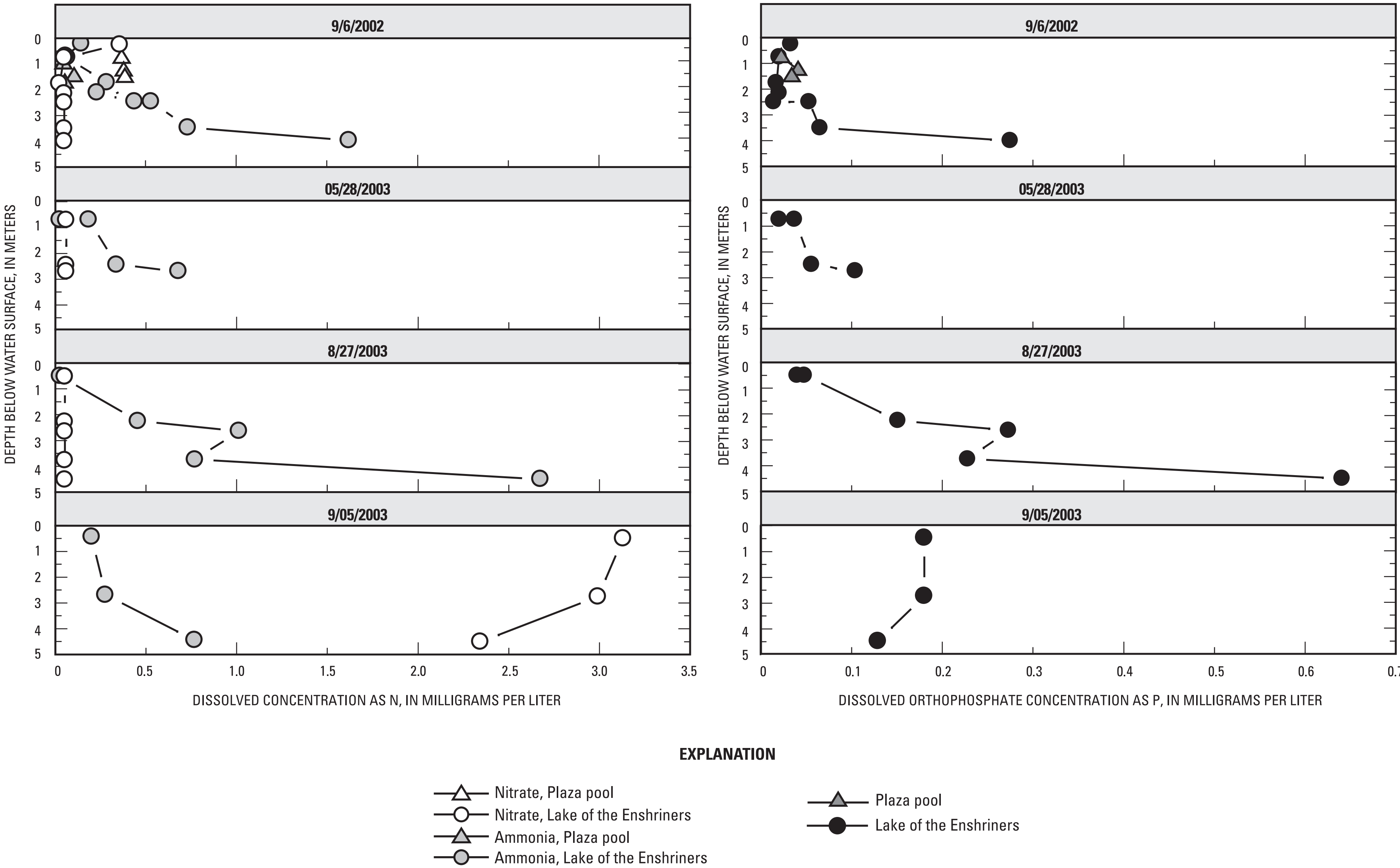



**Figure 31.** Concentration profiles with depth for dissolved nitrate, ammonia, and orthophosphate for impounded reaches of Brush Creek.

The greatest concentration changes of some constituents with depth were observed in Lake of the Enshriners. Ammonia concentrations and orthophosphate concentrations typically increased with depth, whereas dissolved nitrate concentrations generally were at, or near, the detection limit. The exception was the September 5, 2003, sampling event when nitrate concentrations exceeded 2 mg/L throughout the water column. This sampling occurred 4 days after a large rainfall event in the basin. Redox and dissolved oxygen measurements indicated that strong reducing conditions existed in bottom sediments before this runoff event (August 27, 2003). Stratification likely had been in place for some time as less than 2.54 centimeters of rain fell in the basin in the 30 days prior. Without the addition of freshwater, the zone of low dissolved oxygen concentrations had expanded upward; dissolved oxygen concentrations were below100 percent saturation at the surface. Consequently, reducing conditions were favorable for orthophosphate release from bottom sediments into the overlying water column, and downward trends in orthophosphate concentrations from the bottom sediments to the surface indicated this was likely occurring. Similar trends in orthophosphate and dissolved oxygen concentrations and low dissolved $NO_3$ concentrations throughout the water column were observed during the September 6, 2002, and May 28, 2003, sampling events. Additionally, ammonia concentrations in bottom sediments during these two sampling events averaged 410 mg/kg compared to 0.95 mg/kg for $NO_3$ and more than 60 percent of the organic matter measured in bottom sediments occurred as elemental carbon (Wilkison and others, 2005). The ratio of carbon-to-nitrogen in Lake of the Enshriners bottom sediments averaged 16, much less than the average of 22 measured in Plaza pool bottom sediments (Wilkison and others, 2005). The shift in carbon-to-nitrogen ratios at Lake of the Enshriners suggest that redox conditions in bottom sediments were sometimes favorable for methanogenesis to occur. Under methanogenesis, anaerobic bacteria in bottom sediments convert organic carbon compounds into methane and carbon dioxide, which are then released into the atmosphere (Chapelle, 2000). Before methanogenesis, other electron acceptors, such as $NO_{3,}$ are reduced and converted to N gas which also escapes to the atmosphere and this process effectively removes N from the system. Nitrate concentrations were at, or below, analytical detection limits during all sampling events except for September 5, 2003, indicating that some N loss occurs in the lower Brush Creek impoundment during extended warm and dry periods.

More than 23 centimeters of rain fell in the basin between August 27 and September 1, 2003. The event was sufficiently large to replace the pool volumes many times over, and the runoff would have been expected to contain measurable amounts of nutrients; $NO_3$ concentrations did increase in the following sampling of Lake of the Enshriners. Low dissolved oxygen concentrations throughout the water column during this event may be the result of a high biochemical oxygen demand from organic material brought in during the storm and subsequently trapped in the impoundment. Such storm events would be expected to push out existing algal populations. Chlorophyll *a* concentrations were less than 1 mg/L on September 5, 2003, compared to 37 mg/L on August 27, 2003, (Wilkison and others, 2005).

Dry, warm, and sunny conditions prevailed until the next sampling event (September 10, 2003). By this time, biochemical oxygen demand processes apparently had run their course and algal populations had again begun to colonize stream reaches. This was evidenced by dissolved oxygen concentrations ranging from near zero at the bottom to values greatly in excess of saturation near the surface in Lake of the Enshriners. In the shallower impoundments, the Plaza and Volker pools, dissolved oxygen concentrations were above saturation levels from the top to the bottom. There is some evidence to suggest that redox conditions in sediments in the lower reach may have begun to denitrify $NO_3$, but as yet had not released orthophosphate into the water column.

## Diurnal Changes in Water Chemistry

Substantial diurnal changes in water chemistry occurred in response to daily cycles of photosynthesis and respiration, especially during extended periods of dry, sunny weather such as occurred during most of August 2003 (fig. 32). As solar radiation increased during the day, the water temperature steadily rose. Because sufficient nutrients were present to sustain growth, algal populations rapidly expanded. As photosynthesis in the algal biomass proceeded, the pH and dissolved oxygen concentrations increased, often to amounts well in excess of saturation. As solar energy decreased later in the day, the water temperature declined. The cessation of photosynthesis and algal respiration caused the pH and dissolved oxygen concentration to decline. Dissolved oxygen concentrations often fell well below100 percent saturation during the nighttime as a result of algal respiration (fig. 32). The cycle began each day (when new solar energy entered the system) because impounded reaches of Brush Creek were not nutrient limited. Even in the absence of $NO_3$, there was enough ammonia and orthophosphorus available in the pools to sustain algal blooms throughout most of August 2003.

Substantial rainfall events, such as those that occurred between August 27 and 31, 2003, disrupted the diurual cycle. These events replaced existing pool water and pushed out established algal populations. Water temperature and pH declined as freshwater entered the system; however, sediment and organic matter brought in by storms increased biochemical oxygen demand and caused sharp declines in dissolved oxygen concentrations (fig. 32).

## Impoundment Productivity

The productivity of Brush Creek impounded reaches were determined using measures designed to classify algal productivity (table 17; Carlson, 1977; Jones and Knowlton, 1993). Based on Secchi depth values, total N, and total P concentrations, impounded reaches of Brush Creek generally were classified as eutrophic to hypereutrophic. Total N and total P values for all

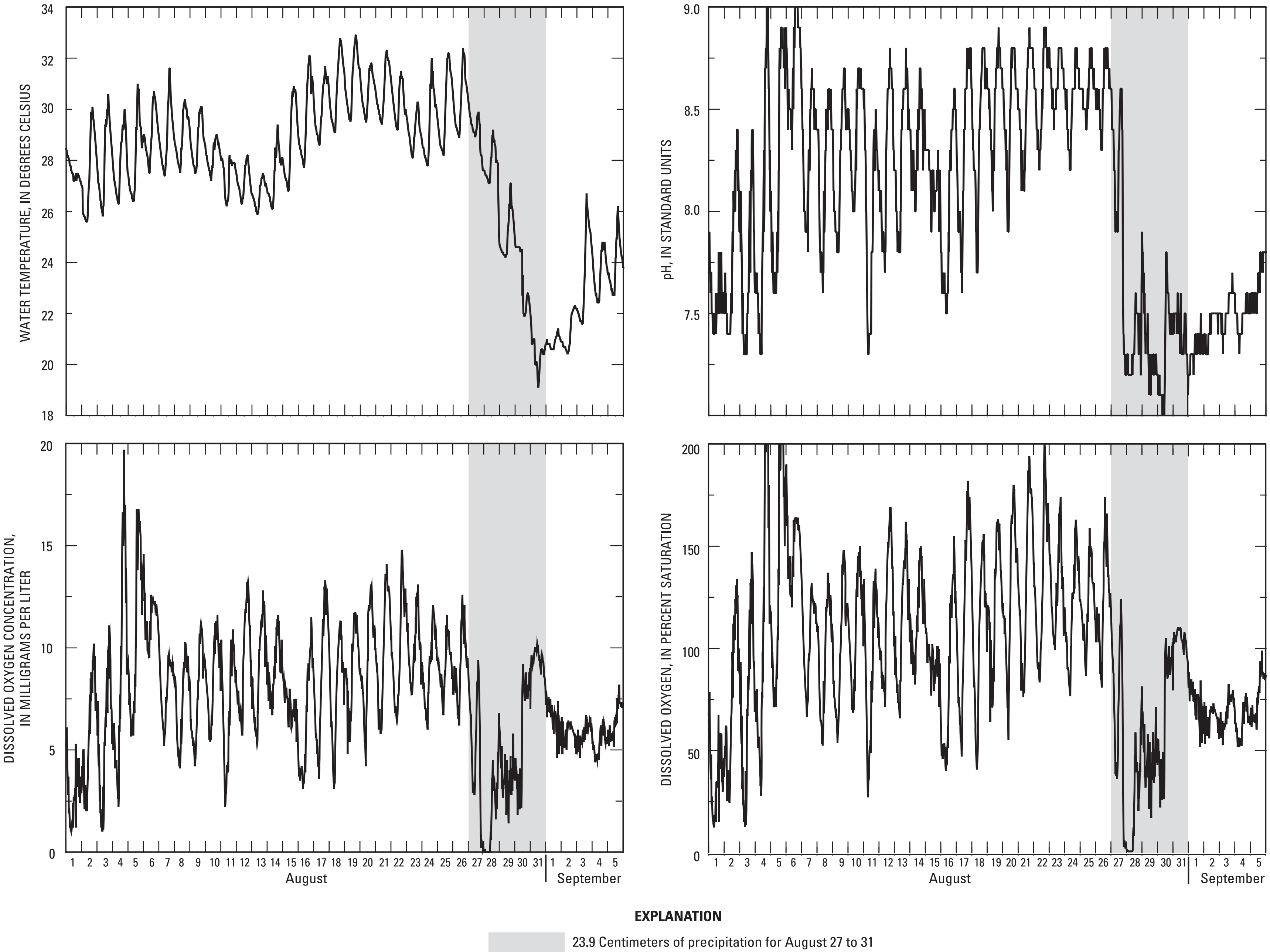



**Figure 32.** Continuous (every 15 minutes) water temperature, pH values, dissolved oxygen concentrations, and dissolved oxygen saturation from August 1 to September 5, 2003, at site 11.

**Table 17.** Algal productivity of Brush Creek impoundments and four urban lakes in Missouri.

[Avg., average; µg/L, micrograms per liter; TSI, Trophic State Index value (Carlson, 1977); TS, Trophic State (Jones and Knowlton, 1993); mg/L, milligrams per liter; E, eutrophic; M, mesotrophic; --, not applicable; H, hypereutrophic; O, oligotrophic]

| | | | Chlorophyll *a* | | | | Secchi depth | | | | Total nitrogen | | | | Total phosphorus | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | Surface area (acres) | Date | Avg. value (µg/L) | TSI | Productivity | TS | Avg. value (m) | TSI | Productivity | TS | Avg. value (mg/L) | TSI | Productivity | TS | Avg. value (mg/L) | TSI | Productivity | TS |
| Lake of the Enshriners | 26 | 08/10/2000 | 4.2 | 45 | M | M | 0.39 | 74 | H | -- | 1.92 | 64 | E | H | 0.25 | 84 | H | H |
| Lake of the Enshriners | | 09/06/2002 | 70.6 | 72 | H | H | .48 | 70 | E | -- | 2.09 | 65 | E | H | .24 | 83 | H | H |
| Lake of the Enshriners | | 05/28/2003 | 46.7 | 68 | E | E | .50 | 70 | E | -- | 1.96 | 64 | E | H | .23 | 82 | H | H |
| Lake of the Enshriners | | 08/27/2003 | 36.7 | 66 | H | H | .60 | 67 | E | -- | 1.78 | 63 | E | H | .25 | 84 | H | H |
| Lake of the Enshriners | | 09/05/2003 | .46 | 23 | O | O | 1.05 | 59 | E | -- | 4.34 | 76 | H | H | .18 | 79 | H | H |
| Plaza pool | 7 | 08/10/2000 | 7.9 | 51 | E | M | .52 | 69 | E | -- | 2.75 | 69 | E | H | .24 | 83 | H | H |
| Plaza pool | | 09/25/2002 | 7.1 | 50 | M | M | 1.05 | 59 | E | -- | 1.13 | 56 | E | E | .12 | 72 | H | H |
| Volker pool | -- | 08/10/2000 | 11.5 | 55 | E | E | .47 | 71 | H | -- | 2.37 | 67 | E | H | .25 | 70 | E | H |
| Creve Coeur Lake[1] | 320 | 2003 | 71.0 | 72 | H | H | .38 | 74 | H | -- | .67 | 49 | M | H | .19 | 80 | H | E |
| Blue Springs Lake[1] | 727 | 2003 | 12.1 | 55 | E | E | 1.19 | 57 | E | -- | .56 | 46 | M | E | .03 | 53 | E | E |
| Lake Jacomo[1] | 1068 | 2003 | 10.4 | 54 | E | E | 1.35 | 56 | E | -- | .44 | 42 | M | M | .03 | 52 | E | E |
| Longview Lake[1] | 798 | 2003 | 6.9 | 50 | E | M | 1.14 | 58 | E | -- | .42 | 42 | M | M | .02 | 45 | M | M |
| Osage Plains[1,2] | -- | 2003 | 20.2 | 60 | E | E | .71 | 65 | E | -- | .78 | 51 | E | E | .07 | 66 | E | E |

[1]Data from Thorpe and others, 2003.

[2]Average of 22 lakes in Osage Plains Physiographic Region (Thorpe and others, 2003).

reaches of Brush Creek were generally higher than values observed for 4 urban lakes in Missouri and 20 lakes in the same physiographic region (Thorpe and others, 2004). It is important to note, however, that Brush Creek lakes are in much more densely populated urban areas and are much smaller than the comparison lakes (table 17). Available concentrations of dissolved N and P indicate that algae in impounded reaches of Brush Creek are not nutrient limited, but may be limited by other factors such as zooplankton grazing (Carlson and Simpson, 1996).

Because trophic states are an estimate of the amount of algal biomass in a waterbody, chlorophyll values are viewed as the best predictor indices for this determination (Carlson and Simpson, 1996). When classified by chlorophyll *a* concentrations, Brush Creek productivity values ranged from oligotrophic to hypereutrophic. Hypereutrophic periods in Lake of the Enshriners coincided with periods of little, or no, rainfall during the previous 2 weeks. Trophic states measured within 5 days of heavy rainfall events (September 5, 2003, sampling) indicated marked declines in chlorophyll *a* concentrations, and changed trophic states from hypereutrophic to oligotrophic. Chlorophyll *a* concentrations in the Plaza and Volker pools (7.1 to 11.5 μg/L) generally were in the range of other lakes measured in the Kansas City area (6.9 to 12.1 μg/L), but Secchi depths were slightly less, indicating that non-algal sources of turbidity existed in these reaches. The majority of lakes in the Ozark Plains Physiographic Region region were classified as eutrophic in 2003 (table 17).

Water-quality differences between impounded reaches were attributable largely to the size and depth differences of the pools. During base flow, water frequently was trapped for extended periods in Brush Creek impoundments. The larger the impoundment, the less frequent the total exchange of freshwater into them, which affected the water quality. Some vertical water-quality variations occasionally were observed in the Plaza and Volker pools; however, because of their smaller size and depth, less energy was required to keep them mixed and they did not thermally stratify. Vertical water-quality changes were greatest in Lake of the Enshriners, the largest and deepest impoundment, and unlike the upper pools, was prone to lasting thermal stratification. During extended dry periods, bottom sediments in Lake of the Enshriners became anoxic, and reducing conditions consumed $NO_3$ and released orthophosphate and ammonia into the overlying water column. Lack of thermal stratification and more oxic conditions in the upper pools likely limited processes that would have led to N removal in bottom sediments of the upper reaches. Bottom sediments are periodically (every 1 to 3 years) removed from the Plaza and Volker pools (fig. 33), but not in the Lake of the Enshriners.

Algal blooms occurred during extended warm, sunny periods in all impounded reaches because Brush Creek was not nutrient limited. During wet periods, precipitation events frequently caused replacement of impoundment water, which had the benefit of pushing out algae matter and stagnant, anoxic water; however, stormwater brought sediment, organic matter, and nutrients into impoundments where it collected. Biochemical oxygen demand often reduced impoundment oxygen levels for several days following storms. Trophic states, as measured from chlorophyll *a* concentrations, ranged from oligotrophic after rainfall events to hypereutrophic during extended dry periods. Chlorophyll *a* values measured in Brush Creek were similar to values measured in other urban lakes in Missouri.

**Figure 33.** Sediment accumulation in Plaza pool, upstream from site 10, being prepared for removal, January 2000.

## Bottom Sediments

Sediments accumulate in Brush Creek impoundments because these reaches have lower stream gradients and velocities than free reaches. Most sediments are transported during storm runoff. Therefore, bottom sediments include contributions from urban nonpoint-source runoff and CSOs. Bottom-sediment samples from impounded reaches of Brush Creek were analyzed for nutrients, OWCs, pharmaceuticals, and fecal indicator bacteria to determine constituent concentrations, and evaluate contaminant storage in sediments (Wilkison and others, 2005). Summaries of analytical results from bottom sediment samples are shown in tables 18 to 20.

Ammonia, total N, and total P concentrations typically were three to four orders of magnitude greater in bottom sediment samples (table 18) than in water samples from Brush Creek, whereas $NO_3$ concentrations in bottom sediments were of similar magnitude to those measured in water samples (tables 6 and 11). As previously discussed, $NO_3$ can be removed from bottom sediments under certain anoxic conditions through biogeochemical processes. Ammonia can be removed from bottom sediments by several pathways, including upward diffusion through the water column, plant uptake, or denitrification (Mitsch and Gosselink, 1993). However, during anoxic conditions, anaerobic bacteria convert ammonia back to organic matter, which can then build up in sediments (Mitsch and Gosselink, 1993). Both oxic and anoxic conditions would have been expected to occur within the impounded reaches; however,

**Table 18.** Mean concentration of nutrients (milligrams per kilogram) and fecal indicator bacteria densities (colonies per 100 milligrams) in Brush Creek bottom sediment samples collected from September 2002 to September 2003.

[--, not analyzed]

| Impoundment | Sampling date | Number of samples | Ammonia, as N | Nitrate, as N | Total nitrogen | Total phosphorus | *Escherichia coli* | *Fecal coliform* |
|---|---|---|---|---|---|---|---|---|
| Plaza pool | 9/25/2002 | 3 | 80 | 0.47 | 2,790 | 800 | -- | -- |
| Plaza pool | 3/12/2003 | 2 | 170 | 0.30 | 2,290 | 840 | -- | -- |
| Lake of the Enshiners | 9/06/2002 | 3 | 470 | 1.6 | 3,630 | 1,100 | -- | -- |
| Lake of the Enshiners | 5/28/2003 | 2 | 350 | 0.55 | 3,380 | 1,100 | 33 | -- |
| Lake of the Enshiners | 8/27/2003 | 2 | 375 | 0.40 | 3,150 | 1,060 | 30 | 33 |
| Lake of the Enshiners | 9/05/2003 | 2 | 335 | 0.60 | 2,560 | 1,010 | -- | -- |

**Table 19.** Mean concentration (micrograms per kilogram) of organic wastewater compounds (OWC) in Brush Creek bottom sediment samples collected from September 2002 to May 2003.

[PAH, polycyclic aromatic hydrocarbons; OWC, organic wastewater compounds; nd, not detected]

| | | | Organic wastewater-use category | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Impoundment | Sampling date | Number of samples | Detergent | Disin-fectant | Fire | Flavor/ Frag | PAH | Pesti-cides | Plastic | Sterol | Solvent | Sum of OWC |
| Plaza pool | 1/26/1999 | 2 | 1,370 | 770 | nd | 250 | 11,300 | 770 | 260 | 710 | 130 | 15,560 |
| Plaza pool | 9/25/2002 | 3 | 9,010 | 320 | 80 | 2,700 | 68,000 | 3,070 | 11,300 | 96,800 | nd | 191,280 |
| Plaza pool | 3/12/2003 | 2 | 940 | 70 | nd | 730 | 27,600 | 1,230 | 2,090 | 34,900 | 220 | 67,780 |
| Volker pool | 1/26/1999 | 3 | 570 | 690 | nd | 460 | 12,100 | 690 | 230 | 1,800 | 300 | 16,840 |
| Volker pool | 2/25/2003 | 2 | 2,150 | 430 | nd | 700 | 21,600 | 530 | 2,930 | 29,600 | 130 | 58,070 |
| Lake of the Enshiners | 9/6/2002 | 3 | 39,200 | 1,540 | 90 | 5,500 | 57,400 | 3,190 | 7,990 | 136,000 | 80 | 250,990 |
| Lake of the Enshiners | 5/28/2003 | 2 | 8,940 | 210 | nd | 710 | 12,600 | 480 | 5,040 | 64,500 | 270 | 92,750 |

**Table 20.** Mean concentration (micrograms per kilogram) of pharmaceutical compounds in Brush Creek bottom sediment samples collected from February 2003 to September 2003.

[OTC, over-the-counter medications; nd, not detected]

| | | | Pharmaceutical-use category | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Impoundment | Sampling date | Number of samples | Anal-gesic | Antacid | Antibiotics/ Antifungal | Anticon-vulsants | Anti-diabetics | Anti-depress-ants | Asthma | Choles-terol | Narcotic | Stimu-lants | Caffeine Caff. metabolite | OTC | Sum of Pharma-ceuticals |
| Volker pool | 2/25/2003 | 2 | nd | 5.4 | 2.7 | 38 | nd | nd | 13 | 6.7 | nd | 34 | 30 | 34 | 100 |
| Lake of the Enshiners | 5/28/2003 | 2 | nd | 1.9 | 0.7 | 8.0 | nd | nd | 2.5 | nd | nd | 2.8 | nd | 2.8 | 16 |
| Lake of the Enshiners | 8/27/2003 | 2 | nd | nd | 0.9 | 12 | nd | nd | 12 | nd | nd | 38 | 36 | 38 | 63 |

there was a gradual decline of ammonia and total N concentrations in Lake of the Enshriners bottom sediments from September 2002 through September 2003. Rainfall during this period was 60 percent of normal, so nutrient losses from bottom sediments during this time may have exceeded inputs. The higher ammonia, total N concentrations, and total P concentrations in Lake of the Enshriners bottom sediments, when compared to the Plaza pool sediments, may have resulted from more favorable biogeochemical conditions in Lake of the Enshriners bottom sediments, but also could be reflective of higher deposition rates, or different sedimentation sources in the lower reach.

Many OWCs strongly sorb to sediments (Cordy and others, 2004; Talmedge, 1994; Mansell and others, 2004; Xia and others, 2004). Concentrations of many OWCs, therefore, would be expected to be greater in bottom sediments than in water samples, and previous work indicated that PAH concentrations in bottom sediments were three to four orders of magnitude greater than concentrations in the overlying water column (Wilkison and others, 2002).

Although samples are small, bottom sediment OWC concentrations followed several distinct patterns. The largest concentrations of OWCs in bottom sediments occurred in the sterols, PAHs, plastics, and detergents use categories (table 19). Coprostanol comprised from 10 to 48 percent of the sterols observed in bottom sediments (Wilkison and others, 2005), with the largest percentage in samples from Lake of the Enshriners. Coprostanol has been shown to be an efficient wastewater tracer, but some sterols, cholesterol, stigmastanol, and sistosterol, have natural plant matter sources in addition to wastewater sources (Elhmmali and others, 2000). PAHs are ubiquitous in urban lake sediments, in part because of urbanization and our increased reliance on automobiles and the myriad of potential pathways including nonpoint-source runoff, atmospheric deposition, and wastewater (Paxeus, 1996; Van Metre and others, 2000). Diethylhexl phthalate, used as a plasticizer in many products and commonly present in freshwater sediments (Kao and others, 2005), was responsible for almost all of the plastics OWC component in bottom sediment samples. Detergents comprised from 1 to 10 percent of the total OWCs observed in bottom sediments, less than the percentage observed in Brush Creek base-flow or stormflow samples (table 9). The largest percentage of detergents were observed in samples collected from Lake of the Enshriners.

Concentrations of OWCs in bottom sediments also tended to increase with impoundment size and to decrease with time. Concentrations, as evidenced by the sum of all detections of (total) OWCs were lowest in the smallest impoundment, Volker pool, and greatest in the largest impoundment, Lake of the Enshriners (table 19). Total OWC concentrations in bottom sediments from the intermediately sized Plaza pool were between these values. Although the environmental fate of many OWCs has not been well characterized, several factors and processes could have influenced these differences. Increased photolysis and oxidative processes in the upper impoundments potentially could decrease some OWC concentrations. Sediment sources and sediment trapping efficiencies likely vary among impoundments. Lake of the Enshriners is located in the area of Brush Creek with a greater density of CSO diversion structures than are the other impoundments, which could have affected concentrations.

Bottom sediment samples collected in the Plaza pool and Lake of the Enshriners during September 2002 had much higher total OWC concentrations than did samples collected 6 to 8 months later (table 19). Total OWC concentrations in the later sampling were approximately one-third (33 to 37 percent) of the previous value at the Plaza pool and Lake of the Enshriners. These data indicate that OWCs likely were degraded in bottom sediments, as rainfall was approximately 60 percent of normal between the samplings, with few events (6) in excess of 1.25 centimeters.

Concentrations of OWCs in Brush Creek bottom sediments were compared to those measured in streambed sediments collected between March 31 and April 3, 2003, at sites in the basin and previously reported (Lee and others, 2005). Streambed sediments at three sites in the upper Blue River, two sites on Indian Creek, and one site on Indian Creek were analyzed for the same suite of OWCs that were analyzed in impoundment bottom sediments. The largest total OWC concentrations [approximately 78,000 µg/kg (microgram per kilogram)] in streambed sediments were observed in samples collected just downstream from site 17 in this study (Lee and others, 2005). Total OWC concentrations measured in Brush Creek bottom sediments in September 2002 were two and one-half to three times greater than these concentrations, and five to six times greater than in streambed sediments measured in samples collected just upstream from site 6 (total OWC concentrations of 40,000 µg/kg; Lee and others, 2005). Total OWC concentrations measured in Brush Creek bottom sediment samples collected between February 25, 2003, and May 28, 2003, ranged from approximately 56,000 µg/kg to 91,000 µg/kg, which is more within the ranges observed in streambed sediments immediately downstream from WWTP discharges, but still much greater than streambed concentrations in the upper Blue River. A number of factors could affect these comparisons. Deposition environments in streams can be quite different from those in lakes, and decomposition rates that are not well characterized could differ substantially between the impounded and stream reaches. However, these data indicate that OWC concentrations in Brush Creek bottom sediments were enriched substantially in many wastewater compounds, often to concentrations equivalent to, or greater than, those observed in stream sediments near WWTP discharges.

Summary results of pharmaceutical compounds analyzed in bottom sediments are listed in table 20. Over-the-counter medications accounted for a smaller percentage (18 to 60) of the total pharmaceuticals in bottom sediments than in water samples (table 10), with caffeine the bulk of the over-the-counter medications. The anti-convulsant, carbamazepine, generally accounted for a substantial part (23 to 50 percent) of the total pharmaceuticals detected in bottom sediments. Carbemazepine has been shown to sorb strongly to sediments and to be relatively stable once released into the environment (Jones and others, 2002; Lam and others, 2004).

Although the small number of samples makes extensive comparisons impractical, concentrations of the sum of pharmaceutical compounds in Brush Creek bottom sediments (values ranged from 16 to 100 μg/kg) generally were similar to those measured in streambed sediments that were sampled downstream from WWTPs (Lee and others, 2005). Total pharmaceutical concentrations measured in streambed sediments downstream from site 4 was 180 μg/kg, and total concentrations in streambed sediments just upstream from site 6 were 85 μg/kg (Lee and others, 2005). As with OWC compounds, there are many processes and factors that could have affected pharmaceutical concentrations in streambed and lake bottom sediments that could hinder these comparisons. Many of these processes are not well understood; however, these data are another indication that impoundments along Brush Creek accumulate sediments that were derived, in part, from wastewater sources.

Fecal-indicator bacteria densities were measured in bottom sediments in Lake of the Enshriners during the May 2003 and August 2003 sampling (table 18). The intent was to examine the possibility of long-term viability of bacteria in bottom sediments, and the potential for subsequent contributions if sediments were to be resuspended during later storms. There were no runoff events for the 9 days before the May 2003 event and for the 16 days before the August 2003 event; therefore, recent storm inputs were not an issue. *E. coli* densities in bottom sediments were approximately 10 percent of the median values measured in base-flow samples from Brush Creek (340 col/100 mL; table 6) and three orders of magnitude less than the median value in Brush Creek storm samples (38,700 col/100 mL; table 11). Whereas these data indicate that some *E. coli* survive in bottom sediments for extended periods, the densities measured indicate that resuspension of these sediments during high flows would account for but a small part of the storm loads.

## Macroinvertebrate Community Assessments

The diversity and abundance of macroinvertebrate stream fauna at stream sites within the basin were measured in 2002, 2003, and 2004 using standardized measures known as metrics. Selected metrics (Sarver, 2001; Kansas Department of Health and Environment, 2000) were used to make assessments of aquatic life status (ALS) listed in tables 21 and 22.

When metric scores were adjusted for proportionality, the upper Blue River sites (sites 1 and 2), consistently scored at, or above, the control site (site 19) score, indicating that streamwater quality was sufficient to support a diverse biological component in the upper Blue River. There was a general overall decrease in community integrity downstream in the basin (fig. 34). Aquatic community integrity was correlated strongly with the percent of vegetation and urbanization at sampled sites (fig. 35). Proportional metric scores increased as the percent of vegetation—defined as the sum of the land use/land cover devoted to forests and grassland—increased (Spearman's rho, 0.81) and decreased as the amount of urbanization—defined as the sum of the land use/land cover devoted to commercial and/or residential development, and roadways—increased in the basin (Spearman's rho, -0.83). Although stream habitat assessments were not part of this study, riparian disturbances likely contribute substantially to the urbanization gradient as many stream reaches, especially in the lower basin, have been altered or channelized.

Scores at sites located immediately downstream from WWTPs (sites 2, 4, and 6, fig. 34) showed a marked decline in scores from sites immediately upstream although, as previously noted, scores at site 2 were similar to those at the control site. This site is downstream from the smallest of the WWTPs (site 15) that discharges into the basin, and the plant uses extended aeration and activated sludge as part of its secondary waste treatment (Lee and others, 2005). Activated sludge treatment processes, although not completely effective in removing many endocrine-disrupting chemicals from effluent (Johnson and Sumpter, 2001), typically are more effective than the trickling filter method utilized at site 17 (Glassmeyer and others, 2005). There was some evidence of recovery in the middle reach of the Blue River (between sites 7 and 8). Much of the riparian corridor remains intact along this section of the Blue River, which likely helps foster a more diverse aquatic fauna in this reach.

Brush Creek at Elmwood Avenue (site 12) consistently had the lowest rank of all sites in the basin. These samples were collected in the free-flowing part of the stream downstream from the impoundment. A number of factors likely influenced the low score for the Brush Creek site. Little of the natural hydrologic regime and native habitat of Brush Creek remains intact, which likely unduly affects aquatic communities. Dissolved oxygen levels measured on Brush Creek at site 11 frequently (36 percent of the time) were less than the warm-water aquatic life standard of 5 mg/L (Wilkison and others, 2005).

When sites were grouped by four potential wastewater sources, there was a significant difference between all categories except WWTP and WWTP/CSO (fig. 36; $p<0.001$). Sites with other sources (defined as no sources and contributions from septic systems, sewer lines, and WWTP by-passes) had the highest scores; the CSO category had the lowest proportional scores. The deleterious effects of upstream impoundments on water quality, especially on habitat availability and reduced dissolved oxygen levels, likely plays an important role in the low CSO category scores.

Aquatic community integrity, as measured by multi-metric scores, was correlated with water-quality scores at the sites (fig. 37); these factors cannot necessarily be viewed as separate from the previously described urbanization effects. Proportional metric scores increased as the proportional water-quality score increased for all categories of water quality (Spearman's rho, 0.66 to 0.88) except for the nutrients measured in stormwater, which declined (Spearman's rho, -0.49). The reason for the difference probably is because base-flow nutrients originate predominately from point sources that supply a fairly steady stream of nutrients to streams, whereas a substantial part of storm nutrients originate from nonpoint sources, which tend to move

**Table 21.** Stream Condition Index (SCI) scores for Missouri Department of Natural Resources core metrics and aquatic life support (ALS) status for sites sampled in 2002.

[EPT, Ephemeroptera-Plecoptera-Trichoptera; MO, Missouri; SCI, Stream Condition Index; ALS, aquatic life support; F-M, February - March; F, fully supporting; P, partially supporting; N, not supporting; S, September]

| Site number (table 1) | Sample period | Total Taxa Richness | | EPT Taxa Richness | | MO-Biotic Index | | Shannon-Wiener Diversity Index | | SCI score | ALS status |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Metric value | Score | Metric value | Score | Metric value | Score | Metric value | Metric score | | |
| 1 | F-M | 37 | 5 | 8 | 3 | 6.2 | 3 | 2.74 | 5 | 16 | F |
| 2 | F-M | 23 | 3 | 6 | 3 | 6.6 | 3 | 1.99 | 5 | 14 | P |
| 3 | F-M | 14 | 3 | 2 | 1 | 6.5 | 3 | 1.59 | 3 | 10 | P |
| 4 | F-M | 15 | 3 | 1 | 1 | 7.1 | 3 | 2.06 | 5 | 12 | P |
| 5 | F-M | 22 | 3 | 3 | 1 | 6.6 | 3 | 1.48 | 3 | 10 | P |
| 6 | F-M | 12 | 1 | 1 | 1 | 7.2 | 3 | 1.49 | 3 | 8 | N |
| 7 | F-M | 21 | 3 | 2 | 1 | 7.1 | 3 | 1.57 | 3 | 10 | P |
| 8 | F-M | 15 | 3 | 2 | 1 | 6.6 | 3 | 1.35 | 3 | 10 | P |
| 12 | F-M | 12 | 1 | 0 | 1 | 7.9 | 1 | 1.47 | 3 | 6 | N |
| 13 | F-M | 16 | 3 | 1 | 1 | 6.8 | 3 | 0.98 | 3 | 10 | P |
| 19 | F-M | 26 | 5 | 7 | 3 | 6.2 | 3 | 1.51 | 3 | 14 | P |
| 1 | S | 34 | 5 | 7 | 3 | 6.2 | 5 | 2.78 | 5 | 18 | F |
| 1 | S[1] | 33 | 5 | 9 | 3 | 6.7 | 3 | 2.41 | 5 | 16 | F |
| 2 | S | 24 | 5 | 7 | 3 | 6.2 | 5 | 2.09 | 5 | 18 | F |
| 3 | S | 25 | 5 | 7 | 3 | 6.7 | 5 | 2.28 | 5 | 18 | F |
| 4 | S | 20 | 3 | 5 | 3 | 7.0 | 3 | 2.12 | 5 | 14 | P |
| 5 | S | 21 | 3 | 5 | 3 | 6.1 | 5 | 1.83 | 3 | 14 | P |
| 6 | S | 20 | 3 | 5 | 3 | 6.7 | 3 | 2.03 | 5 | 14 | P |
| 7 | S | 13 | 3 | 5 | 3 | 6.2 | 5 | 1.42 | 3 | 14 | P |
| 8 | S | 22 | 3 | 7 | 3 | 6.4 | 5 | 1.86 | 3 | 14 | P |
| 12 | S | 12 | 1 | 1 | 1 | 8.6 | 1 | 0.66 | 1 | 6 | N |
| 13 | S | 17 | 3 | 5 | 3 | 6.4 | 5 | 1.72 | 3 | 14 | P |
| 19 | S | 35 | 5 | 9 | 3 | 6.4 | 5 | 2.47 | 5 | 18 | F |

[1]Sampled November 8, 2002.

**Table 22.** Kansas Department of Health and Environment core metric values and aquatic life support (ALS) status for sites sampled in 2003 and 2004.

[EPT, Ephemeroptera-Plecoptera-Trichoptera; ALS, aquatic life use support; N, not supporting; P, partially supporting; F, fully supporting; F-M, February - March]

| Site number (table 1) | Sample period | EPT Taxa Richness | | Macroinvertebrate Biotic Index | | Kansas Biotic Index | | Percent EPT | | Average (4-metric[1]) | ALS status |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Metric value | Score | Metric value | Score | Metric value | Score | Metric value | Metric score | | |
| 1 | F-M | 6 | 1 | 5.47 | 1 | 2.71 | 2 | 24.8 | 1 | 1.25 | N |
| 2 | F-M | 6 | 1 | 5.36 | 2 | 3.17 | 1 | 45.5 | 2 | 1.50 | P |
| 3 | F-M | 5 | 1 | 6.18 | 1 | 2.70 | 2 | 17.6 | 1 | 1.25 | N |
| 4 | F-M | 2 | 1 | 7.17 | 1 | 2.79 | 2 | 1.6 | 1 | 1.25 | N |
| 5 | F-M | 5 | 1 | 5.72 | 1 | 3.29 | 1 | 19.9 | 1 | 1.00 | N |
| 6 | F-M | 1 | 1 | 7.68 | 1 | 3.76 | 1 | 12.0 | 1 | 1.00 | N |
| 7 | F-M | 4 | 1 | 5.68 | 1 | 2.91 | 2 | 37.1 | 2 | 1.50 | P |
| 8 | F-M | 2 | 1 | 5.08 | 2 | 2.95 | 2 | 53.1 | 3 | 2.00 | P |
| 12 | F-M | 0 | 1 | 7.88 | 1 | 4.55 | 1 | 0 | 1 | 1.00 | N |
| 13 | F-M | 2 | 1 | 5.70 | 1 | 3.23 | 1 | 47.5 | 2 | 1.25 | N |
| 19 | F-M | 5 | 1 | 5.51 | 1 | 3.04 | 1 | 30.2 | 2 | 1.25 | N |
| | | | | | | | | | | | |
| 1 | F-M | 9 | 2 | 5.22 | 2 | 2.68 | 2 | 32.8 | 2 | 2.00 | P |
| 2 | F-M | 4 | 1 | 6.12 | 1 | 3.19 | 1 | 20.6 | 1 | 1.00 | N |
| 3 | F-M | 4 | 1 | 6.68 | 1 | 3.25 | 1 | 8.0 | 1 | 1.00 | N |
| 4 | F-M | 1 | 1 | 7.14 | 1 | 2.80 | 2 | 1.0 | 1 | 1.25 | N |
| 5 | F-M | 2 | 1 | 6.10 | 1 | 3.38 | 1 | 12.1 | 1 | 1.00 | P |
| 6 | F-M | 2 | 1 | 8.12 | 1 | 3.50 | 1 | 7.0 | 1 | 1.00 | P |
| 7 | F-M | 3 | 1 | 6.71 | 1 | 2.92 | 2 | 19.9 | 1 | 1.25 | N |
| 8 | F-M | 3 | 1 | 5.26 | 2 | 3.40 | 1 | 46.4 | 2 | 1.50 | P |
| 12 | F-M | 0 | 1 | 9.16 | 1 | 4.50 | 1 | 0 | 1 | 1.00 | N |
| 13 | F-M | 4 | 1 | 7.11 | 1 | 3.74 | 1 | 26.9 | 1 | 1.00 | N |
| 19 | F-M | 7 | 1 | 5.57 | 1 | 3.14 | 1 | 31.6 | 2 | 1.25 | N |

[1]Percent mussel loss not included in average.

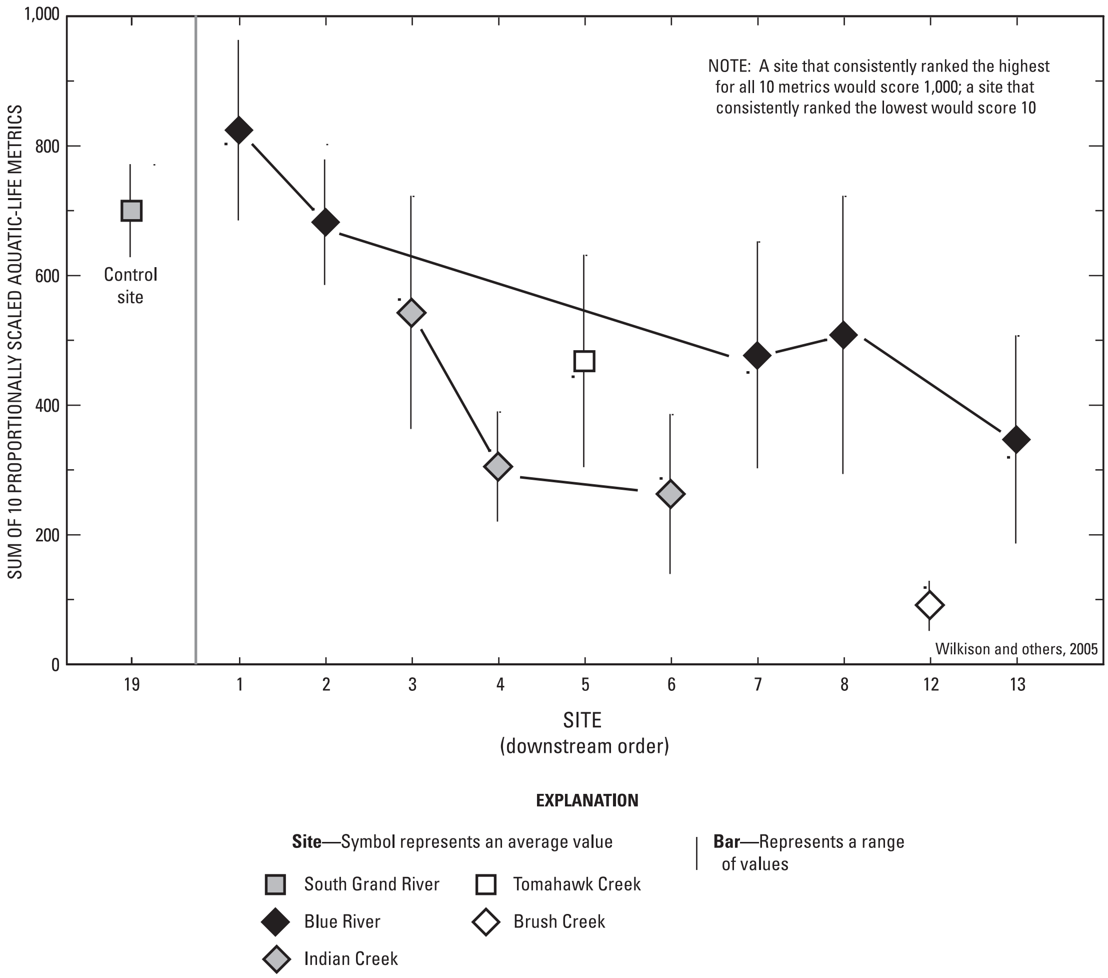



**Figure 34.** Sum of 10 proportionally scaled aquatic-life metrics by site for 4 sampling periods, March and September 2002 and February 2003, 2004.

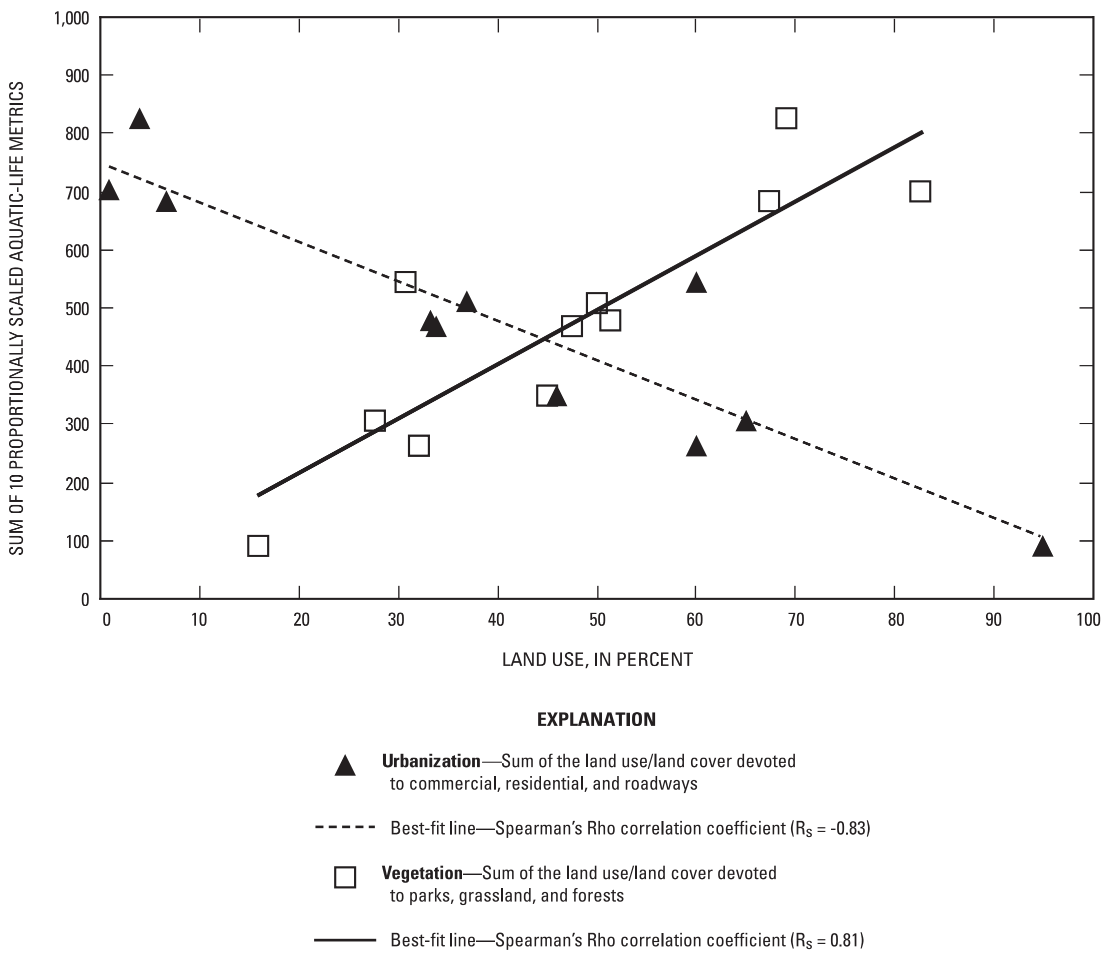



**Figure 35.** Relation between proportional metric score and the percentage of vegetative cover and urbanized land use at sample sites in Blue River Basin.

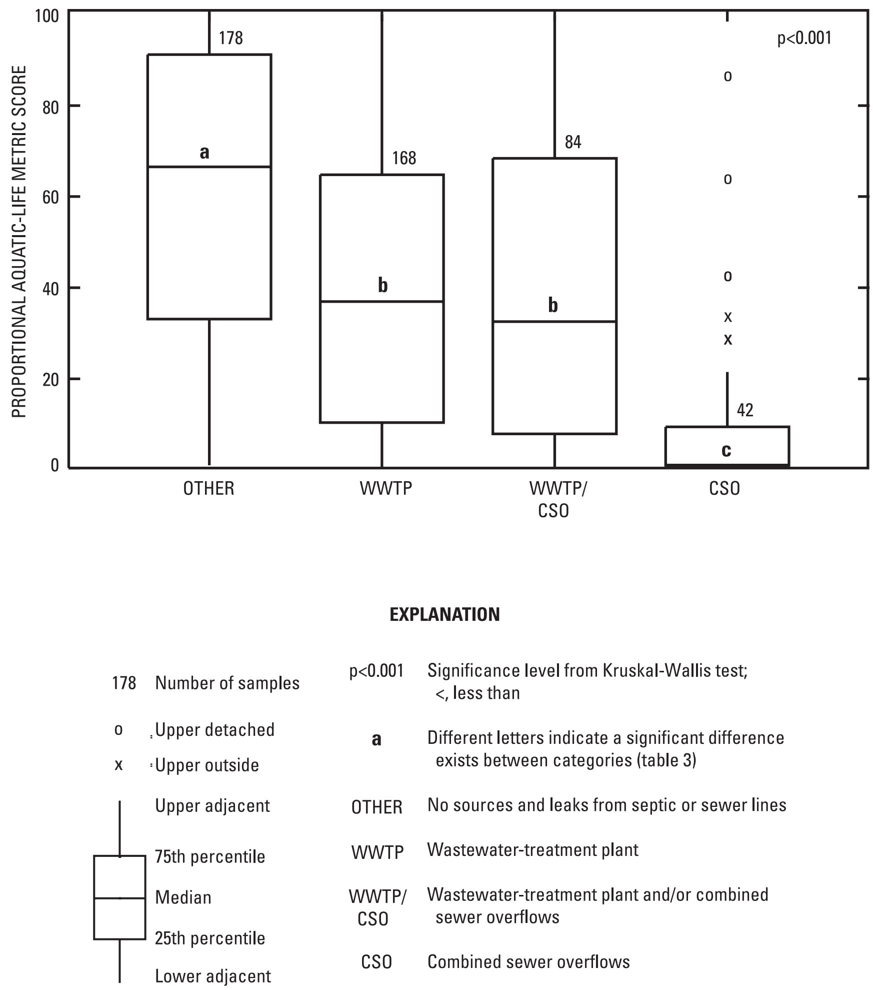



**Figure 36.** Proportional aquatic-life metric score by potential wastewater sources.

quickly through the system. These data indicate that at the concentrations measured, the continuous stream of nutrients that originate during base-flow conditions may affect the ecological condition of streams more adversely than do ephemeral non-point-source nutrients that originate during storms. Aquatic environments have been demonstrated to be effected by changes in ecosystem nutrient dynamics and effluent-dominated streams (McCormick and others, 2004; Brooks and others, 2006) and indirect deleterious affects are suspected for some detergent by-products and pesticides (Fleeger and others, 2003; Sumpter and Johnson, 2005). From the data collected in this study, the effect, if any, that OWCs and pharmaceuticals might have on aquatic integrity at sites cannot be separated from those associated with urbanization and nutrient enrichment.

Because of the inter-jurisdictional nature of the basin, ALS values were determined using State of Missouri Department of Natural Resources protocols during two sampling events in 2002 (table 21), and using Kansas Department of Health and Environment (KDHE) protocols in 2003 and 2004 (table 22). Although these protocols use slightly different metrics, the goals are similar; to allow comparisons with reference sites through the use of unbiased estimators (metrics) of aquatic integrity. Some metrics decrease in response to system perturbations, and others are expected to increase (table 23). There currently (2006) is no mechanism in place to transfer an ALS determination using the protocols of one state to that of another, regardless of whether or not the basin is inter-jurisdictional. There is no change in ecoregion as one passes from one political boundary to the next; therefore, when a standard protocol is used across all the sites, the political boundary would not be expected to affect the results, and the methods would be expected to provide a relative performance measure of stream aquatic integrity for any given sampling event.

For sites sampled in March 2002, only one site on the upper Blue River (site 1) was evaluated as fully biologically supporting, two sites, one on Indian Creek and one on Brush Creek (sites 6 and 12), were considered nonsupporting, and the remainder, including the outside control site (site 19), were determined to be partially supporting. In September 2002, ALS improved from partially to fully supportive at three sites on

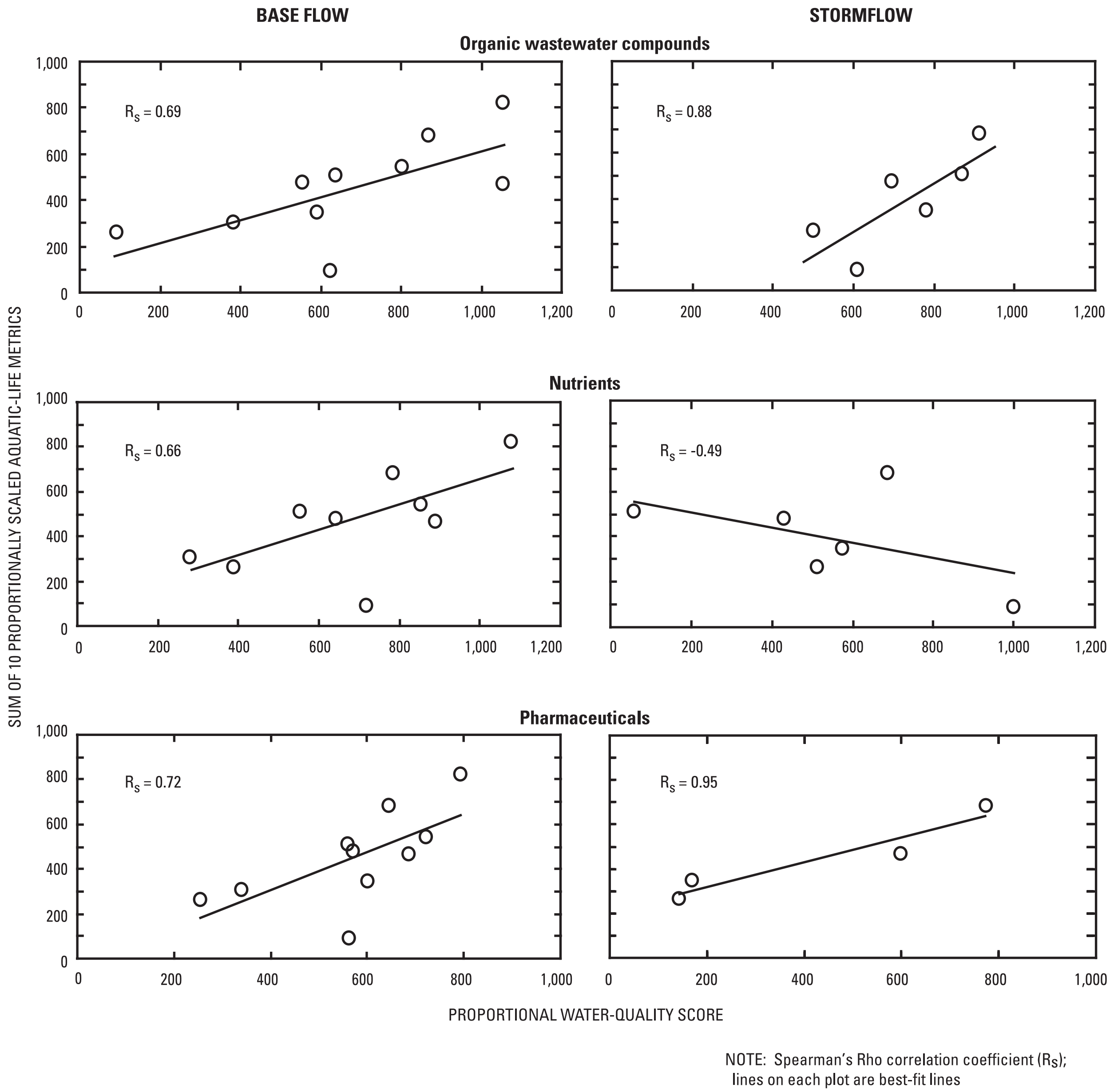



**Figure 37.** Relation between proportional metric score and proportional water-quality scores for base-flow and stormflow conditions.

Blue River and Indian Creek (sites 2, 3, and 4) and at the control site (site19) and from nonsupportive to partially supportive at site 6 on Indian Creek. Aquatic life status at site 12 on Brush Creek remained nonsupportive during both events.

Aquatic life status determinations for sites in 2003 and 2004 (table 22) indicated that no sites were considered fully biologically supporting, and, in fact, the majority of sites were evaluated as being nonsupportive of aquatic life. This may be an artifact of using the Kansas protocol to make ALS determinations, or may partly be the result of the sampling dates during the year. Samples were collected in February 2003 and 2004; samples collected in the winter months seemed to indicate a higher degree of impairment. Winter impairment may result from the deleterious affects of winter road salting on aquatic communities, or from the increased percentage of wastewater effluent that constitutes streamflow during drier winter months.

Because metric values can be sensitive to hydrologic extremes, data collected during this study are shown in comparison to values measured at two KDHE biological monitoring stations maintained in the Blue River Basin (fig. 38). The KDHE Blue River station (station 205) is located approximately midway between sites 1 and 2 and has been monitored since 1982. The Indian Creek station (station 204) is approximately midway between sites 4 and 6 on Indian Creek and was monitored from 1980 to 1990 (S. Cringan, Kansas Department of Health and Environment, oral commun., 2005).

**Table 23.** Summary of benthic macroinvertebrate metrics used as part of the assessment of biotic integrity and the expected response to system perturbations.

[EPT, Ephemeroptera, Plecoptera, Trichoptera; MO, Missouri; KS, Kansas; KDHE, Kansas Department of Health and Environment; modified from Poulton, 2005]

| Metric | Method summary | Expected response to perturbation | Reference |
|---|---|---|---|
| Total Taxa Richness | Measures total taxa present. | Decreases with a corresponding increase in tolerant groups. | Barbour and others, 1999 |
| EPT Taxa Richness | Measures total taxa within the orders Ephemeroptera, Plecoptera, and Trichoptera. | Decrease. However, tolerant EPT species may increase in abundance in response to mild organic enrichment. | Klemm and others, 1990 |
| Macrobiotic Index<br>MO-Biotic Index<br>KS-Biotic Index | Relates tolerance and number of individual species to total number of organisms. | Increases as organic enrichment increases. | Hilsenhoff, 1982<br>Rabeni and others, 1997<br>KDHE, 2000 |
| Shannon-Weiner Index | Estimates the richness and evenness of community diversity. | Decreases with corresponding reduction in species richness and evenness. | Washington, 1984 |
| Percent EPT | Measures percent of total taxa from the orders Ephemeroptera, Plecoptera, and Trichoptera. | Decrease. However, tolerant EPT species may increase in abundance in response to mild organic enrichment. | Barbour and others, 1999 |

For two of the four metrics shown in figure 37 (Total Taxa Richness and Kansas Biotic Index), the median metric value at station 205 fell midway between the median value at site 1 (just upstream) and site 2 (just downstream). Median values for Macrobiotic Index (MBI) and percent Ephemoptera-Plecoptera-Tricoptera (EPT), were lower at station 205 compared to sites 1 and 2. The median MBI value was lower at station 205 (4.78) compared to site 1 (5.34) and site 2 (5.74). The median percent EPT at station 205 was 19 percent compared to 25 percent at site 1 and 42 percent at site 2; however, EPT taxa richness at station 205 was 7, midway between the EPT taxa richness observed at sites 1 and 2 which had EPT taxa richnesses of 8 and 6. EPT at sites 1 and 2 was dominated by large numbers of a few taxa which could account for the differences in percent EPT observed at station 205 compared to sites 1 and 2. Although determination of trends in aquatic community diversity was beyond the scope of this project, these data generally indicate that samples collected during 2002-2004 were within the range of the long-term values seen in the Upper Blue River.

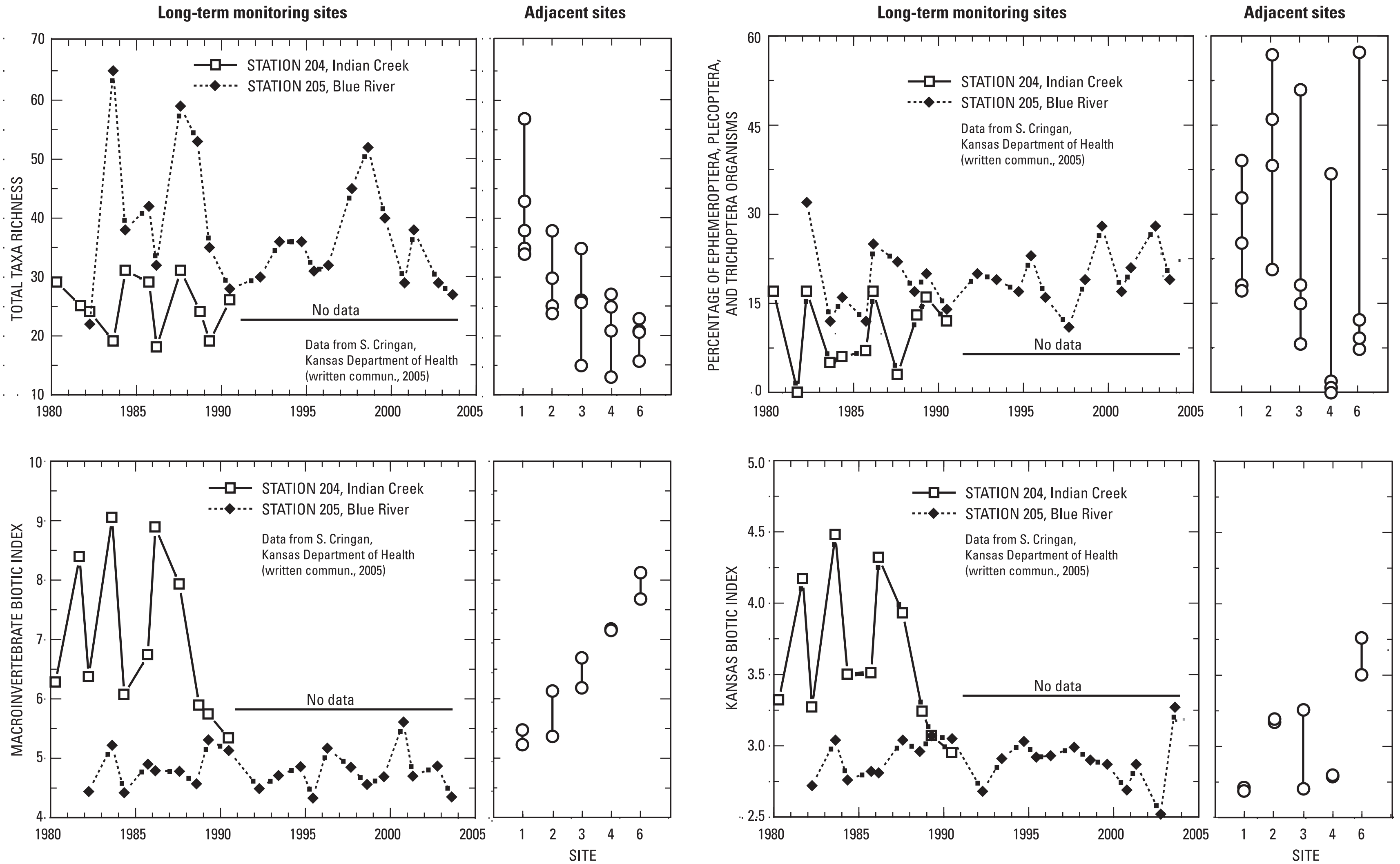
Metric values at the KDHE Indian Creek station 204 from 1980 through 1990 were within the range of values at Indian Creek sites (sites 3, 4, and 6) during 2002 to 2004. Median values at station 204 were similar to those measured at the nearest site, site 6. Median total taxa richness at station 204 was 25, compared to 22 at site 6. Median percent EPT at station 204 was 12 percent, compared to 10.5 percent at site 6. The Kansas Biotic Index (KBI) values also were similar between the sites; median value of 3.50 at station 204, compared to 3.63 at site 6 (fig. 38). Median MBI values were 6.37 at station 204, compared to 7.90 at site 6. At the Indian Creek KDHE station, aquatic community integrity, as measured by metrics, had greater fluctuations and less diversity than the Blue River KDHE station.

# Conceptual Models

Data from this and previous studies (Wilkison and others, 2002, 2005) were used to develop conceptual models for various water-quality concerns in the basin. These conceptual models serve as a historical record of current (2006) understandings about water-quality issues in the basin, and the foundation for further inquiry into factors affecting basin dynamics and water quality.

## Nutrients

Urbanization factors play a substantial role in the occurrence of nutrients in the Blue River basin. Some stream reaches, notably the upper Blue River and Brush Creek, have nutrient yields similar to those in other U.S. urban areas, while other reaches, the lower Indian Creek and the middle and lower Blue River, have nutrient yields that are greater. In all reaches of the basin, however, nutrient concentrations were generally many times greater over natural background estimates, and typically 5 to 25 times greater than U.S. Environmental Protection Agency water-quality recommendations (U.S. Environmental Protection Agency, 2000).




NOTE: Station 204 located approximately midway between sites 4 and 6 sampled 1980-90 only;
Station 205 located approximately midway between sites 1 and 2

**Figure 38.** Metric values from 1980 to 2004 at two Kansas Department of Health and Environment long-term monitoring sites in the Blue River Basin and comparison to five adjacent sites in the basin from 2002 to 2004.

Loadings from WWTP effluent are the dominant source of nutrients in the Blue River and Indian Creek during base flow; nonpoint sources are dominant during wet weather. Only a small part of effluent nutrients are assimilated or removed by in-stream processes, an indication that such contributions frequently exceed the ecological assimilation capacity of many reaches. Nonpoint-source loadings during storms can be many times greater than during base flow, although the water-quality effect of nonpoint-source nutrients on aquatic life is less pronounced. The relative magnitude of wet weather nonpoint nutrient sources compared to that of WWTP effluent at basin sites is determined by the number and size of the plant(s) that discharge upstream from the site and the site drainage area. Greater than 70 percent of nutrients in the upper Blue River originate from nonpoint sources, primarily nonpoint-source runoff. The smallest WWTP that discharges into the basin is located on the upper Blue River and it accounts for a substantial part of the remaining nutrient contributions to the upper Blue River. Nonpoint-source runoff contributions are approximately 40 percent of the total in-stream nutrient load in lower Indian Creek, downstream from two WWTPs, that together discharge five times the amount of effluent into a smaller drainage area as the one upper Blue River plant. Nutrient loads and yields are greater in lower Indian Creek than at other sites in the basin. Because of that, nutrient loads in the middle and lower Blue River primarily originate from the Indian Creek tributary, and to a much lesser extent from the upper Blue River. Nonpoint sources contribute approximately 60 percent of the total P to the middle and lower Blue River, and approximately one-half of the total N; most of the remaining nutrient contributions in the middle and lower Blue River result from the combination of the three upstream WWTPs.

Brush Creek differs from the Blue River and Indian Creek in that a combination of nonpoint source and CSO contributions account for almost all of the nutrients that enter the stream. Nonpoint-source nutrient loads in Brush Creek originate from a myriad of urban sources, including runoff from parks, golf courses, lawns, impervious surfaces, storm sewers, compromised sewer lines, and ground- and surface-water interactions with these sources. In the CSS areas, at least some contributions from CSOs occur during many rain events, especially those that produce precipitation in excess of 1.25 centimeters within 24 hours. Wastewater-treatment plant by-passes occasionally occur upstream from the Missouri-Kansas state line during heavy precipitation events, but likely contribute much smaller loads than do those from nonpoint-source runoff and CSOs. Total N and total P loads and yields in Brush Creek were much smaller than those from lower Indian Creek. Nutrient contributions from the Brush Creek tributary are small in comparison to those from the Indian Creek tributary. Although total N and total P loads from Brush Creek are smaller than those from the upper Blue River, yields are not, indicating that the per unit contribution from these areas are similar.

The effects of nutrient loadings in Brush Creek are extended and complicated by the series of impoundments that occur along the middle and lower reaches. Although the majority of N flushed into Brush Creek occur as particulate organic N during storms, there is no shortage of dissolved phase nutrients to limit algal growth in the Brush Creek lakes. Consequently, algal blooms are a common occurrence within the impoundments. These blooms typically begin with the advent of warm weather in the late spring, and persist throughout the summer and early fall and become most pronounced during extended hot and dry periods when pool-water retention times are extended. The upper impoundments are too small or shallow for strong thermal stratification, and blooms can result in super-saturated dissolved oxygen concentrations through the entire water column in these reaches. These conditions can occur quickly or change over the course of just a few hours, which can cause dissolved oxygen concentrations in some impoundments to drop near, or below, the aquatic life threshold of 5 mg/L for short periods.

The lowest impounded reach, Lake of the Enshriners, stratifies during warm, dry periods, and this can result in dissolved oxygen concentrations that range from super-saturation near the surface to near zero at depth. Particulate nutrients, trapped in anoxic lake bottom sediments undergo biogeochemical transformations that affect water quality. Reducing conditions release P back into the water column where it becomes available to algae and increases productivity. Nitrogen removal, through denitrification which occurs during extended dry periods, is likely to be minor compared to total inputs; therefore, sediments rich in organic matter and nutrients, such as those originating from some nonpoint sources and CSO's, are a major contributor to eutrophication problems in Brush Creek lakes.

## Organic Wastewater and Pharmaceutical Compounds

The dominant source of organic wastewater and pharmaceutical compounds in the Blue River and Indian Creek are WWTP effluent. Nonpoint-source contributions occur as well, primarily during stormflows, but nonpoint-source loadings of OWCs and pharmaceutical compounds are much less than nonpoint-source nutrient loadings. Like nutrients, nonpoint-source contributions of OWCs and pharmaceuticals to the Blue River and Indian Creek are superimposed on a larger WWTP effluent signature that continues, and may be elevated, if storm-generated by-passes occur during events.

On Brush Creek, nonpoint sources and CSOs contribute OWCs and pharmaceuticals to stream reaches. Nonpoint sources can be especially important during base flows where ground-water flow paths intersect sewer lines, or if a direct hydraulic connection exists between the sewers and receiving waters. Storm runoff contributes OWCs nonpoint sources and, if storm intensity is great enough, CSO contributions. Sediment-bound OWCs are trapped in catch basins and storm sewers after precipitation ends; however, these sediments and bound constituents can move into receiving waters during the next precipitation event, where they are again trapped by a series of impounded reaches. Remobilization of sediments during storms, especially in reaches designed with higher gradients, resuspends contaminated sediments back into the water column. Even in large flood events, there is insufficient energy to thoroughly transport most sediment out of the impoundment; therefore, sediment accumulates behind the low-water dams where complex geochemical processes act to degrade some OWCs and pharmaceuticals, while preserving others. This phenomenon is most pronounced in the lower impoundment reach of Brush Creek because of its larger size and longer hydraulic residence time.

## Bacteria

Nonpoint sources that originate during wet weather constitute the majority of fecal coliform and *E. coli* loads to the Blue River, Brush Creek and Indian Creek. Nonpoint-source contributions primarily from urban storm runoff frequently elevate in-stream bacteria densities to several orders of magnitude greater than base-flow densities. Following storm inputs, bacteria can be harbored in bottom sediments and later resuspended during high flows; a process more important in Brush Creek because of the series of impounded reaches that act to slow stream velocities and trap sediments. However, sediment resuspension would account for but a small part of the total storm loads.

Point sources, such as from CSOs, WWTP discharges, or by-passes, contribute lesser amounts of bacteria to receiving streams than do nonpoint sources. Because CSOs are expected to contribute at least some part of the in-stream bacteria during many storm events, the relative importance of point sources is likely much greater in CSS areas than in areas served by WWTPs. Wastewater-treatment plants, although not 100 percent effective in the elimination of bacteria to receiving waters, disinfect effluent, which greatly reduces bacteria densities in their discharge. Intense precipitation events can sometimes trigger WWTP by-passes, resulting in the discharge of partially treated, or untreated effluent, to receiving waters that can contribute to in-stream bacteria, but these sources are expected to be small when compared to wet-weather nonpoint sources. Longitudinal profiles of fecal coliform densities along Brush Creek indicate that the highest densities are not necessarily linked to the highest density of CSOs, indicating that nonpoint-source contributions likely plays a substantial, and perhaps an equivalent role, to that of CSOs.

Sources of fecal indicator bacteria vary temporally and spatially in the basin. Human and dog contributions typically constitute the largest percentage of the total in-stream bacteria. Average human contributions ranged from 26 to 42 percent and average dog contributions ranged from 26 to 32 percent of the total measured in-stream bacteria. Average contributions from geese ranged from 8 to 19 percent, and contributions from unknown (or unclassified) sources ranged from 18 to 28 percent.

## Macroinvertebrate Communities

Macroinvertebrate communities in the upper reaches of the basin are similar to those measured in outside control locations. Biological diversity in these reaches, as measured by aquatic life indicators and biological assessment frameworks outlined by Kansas and Missouri for wadeable streams, remains largely intact. Macroinvertebrate communities in the lower reaches of the Blue River, Indian Creek and Brush Creek are impaired—in some cases substantially—when measured by the same indicators and assessment tools. Aquatic life impairment is associated with urbanization effects that result from a variety of urban-related factors, many of which overlap, cannot be easily separated, and likely act together synergistically. Channelization and stream-bank armoring reduce bank erosion and the interaction of the stream with adjacent riparian areas that deplete streams of the necessary sediment, organic matter, and woody debris needed to sustain healthy benthic invertebrate populations. Wastewater-treatment plant effluents enrich streams with nutrients and contain other endocrine-disrupting contaminants known to be deleterious to aquatic life. A number of benthic organisms also are sensitive to many nonpoint-source contaminants, notably PAHs, that are present in these streams. Because benthic invertebrate populations serve as an ecological base for higher organisms, reductions in their diversity likely translates into reduced fish populations on some stream reaches.

A series of low-water dams on Brush Creek has resulted in the creation of lentic reaches, and in large part the stream ecosystem has been replaced with a lake ecosystem in much of the middle and lower reaches. The lake ecosystems are degraded by inputs of organic material, nutrients, and sediments (often enriched with toxic pollutants) and frequent periods of eutrophication that periodically stress aquatic organisms by reducing available oxygen.

# Summary and Conclusions

Stream water-quality and biologic data were collected in the Blue River Basin from July 1998 to October 2004 to provide an assessment of water-quality conditions throughout the basin, characterize contaminant sources, and provide data to support the development of strategies designed to minimize the effects of combined sewer overflows (CSOs) on receiving streams water quality. Water-quality data were derived from base-flow samples at 18 sites in the basin, storm samples from 10 sites, vertical water-quality profiles and bottom-sediment samples from 3 sites, and continuous water-quality data from 5 sites. Benthic macroinvertebrate data were collected at 10 sites in the basin and 1 outside control site. Stream samples were analyzed for selected physical properties, nutrients, selected organic wastewater and pharmaceutical compounds, and fecal- indicator bacteria. Total nitrogen and total phosphorus loads and yields were calculated for selected stream reaches and sources in the basin to determine the relative contribution of reaches and sources. Aquatic community assessments in the basin were determined through the collection of benthic macroinvertebrates and the use of standardized metrics and related to land use and water quality.

The combination of many urban-related factors have produced deleterious effects on water-quality in many stream reaches throughout the Blue River Basin. Such factors include disruption of riparian areas, hydrologic alterations to streamflow, urban nonpoint-source runoff, wastewater-treatment plant (WWTP) effluent, and CSO discharges. Many of these factors are conjunctive. Urbanization and flood-control projects have resulted in substantial losses of riparian vegetation, many miles of stream channelization, stream-bank armoring, extensive loss of native pool and riffle sequences, and altered flow regimes. Wastewater-treatment plant effluent discharged into the upper basin has increased base flow in downstream reaches. Urban nonpoint-source runoff contributes a substantial part of the contaminant load to the basin. In areas served by WWTPs and combined sewer systems (CSSs), discharges of treated and untreated wastewater additionally contribute nutrients and other contaminants to streams. Deleterious water-quality affects are most pronounced in lower Indian Creek, the lower and middle reaches of the Blue River, and lower Brush Creek. More than 90 percent of base-flow samples had nutrient concentrations in excess of U.S. Environmental Protection Agency level III, ecoregion 40 nutrient criteria and nutrient loads at basin sites typically ranged from one to three orders of magnitude greater than expected background loads.

There were distinct differences between the primary sources of nutrients during base flows and stormflows within the basin and within selected reaches. Land use in the upper reaches of the Blue River, Indian Creek, Tomahawk Creek, and Brush Creek ranged from agricultural to suburban to urban. Base-flow nutrient concentrations in the furthest upper reaches were not derived from WWTPs or CSOs, but likely from other sources such as ground water, land-use practices, leaks from septic and/or sanitary sewer systems, natural soil processes, and atmospheric deposition. Wastewater-treatment plants provided the dominant source of nutrients to the middle and lower Indian Creek (downstream from site 4) and the Blue River (downstream from site 2) during base flow. Although there is some daily and seasonal variance in WWTPs loads, these facilities provided relatively stable nutrient contributions to streams; in-stream nutrient assimilation and transformation processes removed only a small part of these nutrients. During storms, the predominant source of nutrients shifted from point sources to nonpoint sources. As runoff increased during storms, the relative contribution from WWTPs declined, whereas contributions from nonpoint sources increased. Median nutrient loads during storms increased by a factor of approximately 25 over those observed in base flows for the lower Indian Creek and the Blue River.

In Brush Creek, wet weather events provided the dominant source of nutrients. Storm-event nutrient loads, a combination of nonpoint and CSO sources, increased by 200 to 300 percent over base flow in Brush Creek. Because of hydrologic alterations to Brush Creek, nutrients were trapped in impounded sections, which promoted algal blooms during warm, dry, and sunny periods. In the lowest impounded reach, chemical processes altered or removed nutrient species during extended dry periods. Brush Creek contributed a small percentage, less than 5 percent, of the total nutrient loads to the Blue River. Nutrient yields measured in Brush Creek were similar to those observed in the upper reaches of the Blue River. Lentic, or slow moving reaches, of Brush Creek alter the stream hydrology and effect water quality in many ways. Because nutrients were not limited in these reaches, algal blooms sometimes altered dissolved oxygen concentrations to values that ranged from greatly in excess of saturation to those less than the amount needed for full support of aquatic life. The upper pools, being smaller and shallower, were subject only to brief periods of stratification. Streamflow in Brush Creek was sufficient to replace the water in these impoundments at rates about three to six times that of the lowest impounded reach from 1999 to 2004. During dry, warm periods thermal stratification occurred mainly in the lowest impounded reach, and reducing conditions in bottom sediments sometimes induced denitrification, phosphorus release, and methanogenesis. These processes may have resulted in the loss of nitrogen and carbon from bottom sediments into the atmosphere and the release of readily bioavailable phosphorus into the overlying water column. Chlorophyll *a* concentrations from impounded reaches of Brush Creek indicated that when water was stagnate in the pools, these waters were classified as mesoeutrophic to hypereurtrophic. Precipitation events large enough to replace pool volumes brought in freshwaters, which temporarily reduced productivity and provided nutrients for later productivity.

Total nitrogen and total phosphorus loads and yields estimated for four sites in the basin indicated that most of the observed nutrients at site 7 on the Blue River originated from lower Indian Creek (site 6). Nutrient loads and yields at sites 6 and 7 were significantly greater than at other basin sites, an outside control site, and other urban sites primarily because of substantial contributions from upstream WWTP effluent. Nutrient yields in the upper Blue River (site 2) and from Brush Creek (site 11) were not significantly different from each other, the control site, or other urban sites.

At sites on Indian Creek and the Blue River, organic wastewater and pharmaceutical compounds were largely attributable to WWTP discharges during base flow. Detergents and sterols constituted the majority of organic wastewater compounds (OWCs), and over-the-counter medications constituted the bulk of the measured pharmaceuticals measured in stream samples. Concentrations of most OWCs and pharmaceuticals declined in stormflow samples, which is consistent with a predominantly point-source origin for these compounds in most reaches of Indian Creek and the Blue River. However, concentrations for two classes of OWCs (pesticides and polycyclic aromatic hydrocarbons) increased during storms, indicating significant nonpoint-source contributions of these compounds during runoff events.

On Brush Creek, sources of OWCs and pharmaceuticals were largely attributable to a combination of wet weather urban nonpoint and CSO sources, as evidenced by general increases in concentrations of these contaminants with flow. The occurrence of many of these compounds at site 9 (upstream from most CSOs) during both base flow and stormflows indicates that other factors may be as important in the occurrence of these compounds in Brush Creek as are CSOs. Elevated fecal coliform counts in areas with few CSOs also underscore the importance that nonpoint sources likely has on Brush Creek stream-water quality.

Wet weather urban nonpoint sources were the greatest contributor of bacteria to streams in the basin. Fecal coliform densities in Brush Creek were greatest from May through September of each year and correlated strongly with periods of precipitation greater than 1.25 centimeters within 24 hours. Small longitudinal differences existed in median bacteria concentrations along Brush Creek; areas with the highest density of CSOs had median concentrations similar to those in upstream areas with few CSOs indicating that other factors likely played an equivalent role in the observed densities. Estimates of bacteria sources indicated that human and dog sources likely constitute the largest percent of the total bacteria. Human sources in the basin averaged from 26 to 42 percent, dog sources averaged from 26 to 32 percent, geese contributed from 8 to 19 percent, and unknown sources contributed approximately 18 to 28 percent of in-stream bacteria during base-flow conditions. Bacteria sources and relative percentages change temporally and likely change in response to flow conditions; the representativeness of source-characterization percentages to storm loads is unknown.

Aquatic assessments at 10 sites in the basin indicated that biological integrity was greatest in headwater streams and declined in downstream reaches. Declines in aquatic integrity were correlated to a number of inter-related, overlapping urbanization factors including declines in upstream vegetative cover and increases in upstream impervious cover and roadways, nutrient enrichment, and increased wastewater inputs. The relative importance of each of these factors could not be determined.

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# Tables

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Discharge, mean instantaneous ($ft^3/s$)** | | | | | | | | | | | | | | | |
| Minimum value | 0.01 | 2.2 | 18.1 | 22.6 | 19.1 | 0.01 | 0.36 | 1.40 | 14.3 | 0.36 | 0.21 | 1.67 | 0.01 | 0.19 | 0.01 |
| Maximum value | 7.0 | 72.0 | 320 | 332 | 418 | 418 | 5.0 | 15.0 | 36.5 | 36.5 | 31.7 | 24.5 | 13.6 | 8.0 | 31.7 |
| Mean value | 3.3 | 12.9 | 65.6 | 82.8 | 76.0 | 60 | 1.8 | 9.2 | 24.1 | 14.2 | 2.81 | 10.5 | 2.7 | 3.1 | 4.2 |
| Median value | 3 | 5.8 | 37.1 | 50.0 | 43.1 | 36 | 1.3 | 10.5 | 20.9 | 14.6 | 0.70 | 7.1 | 1.4 | 2.8 | 1.7 |
| Number of samples | 4 | 20 | 34 | 21 | 34 | 113 | 12 | 10 | 20 | 42 | 32 | 17 | 28 | 20 | 97 |
| **Turbidity (NTU)** | | | | | | | | | | | | | | | |
| Minimum value | 3.9 | 5.2 | 5.1 | 6.1 | 9.5 | 3.9 | 1.4 | 1.7 | <1 | <1 | <1 | <1 | <1 | 4.2 | <1 |
| Maximum value | 9.6 | 39 | 64 | 51 | 120 | 120 | 31 | 7.1 | 14 | 31 | 27 | 34 | 42 | 355 | 355 |
| Mean value | 6.1 | 15 | 16 | 25 | 41 | 25 | 11 | 4.3 | 7.0 | 7.5 | 6.1 | 10 | 11 | 36 | 15 |
| Median value | 5.4 | 14 | 13 | 22 | 33 | 17 | 8.8 | 3.9 | 5.8 | 5.6 | 5.1 | 8.7 | 9.8 | 12 | 8.3 |
| Number of samples | 4 | 19 | 32 | 21 | 31 | 107 | 10 | 8 | 15 | 33 | 29 | 17 | 28 | 20 | 94 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Oxygen, dissolved (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 4.5 | 6.0 | 5.0 | 5.1 | 5.6 | 4.5 | 4.4 | 5.3 | 6.2 | 4.4 | 3.0 | 2.0 | 0.9 | 1.5 | 0.9 |
| Maximum value | 15.5 | 18.4 | 15.7 | 20.5 | 15.9 | 20.5 | 17.6 | 13.0 | 9.3 | 17.6 | 14.4 | 12.4 | 15.9 | 18.3 | 18.3 |
| Mean value | 10.4 | 11.2 | 9.5 | 9.4 | 10.0 | 10.0 | 11.7 | 8.4 | 8.6 | 9.7 | 8.8 | 8.0 | 8.5 | 8.8 | 8.6 |
| Median value | 10.8 | 11.3 | 9.3 | 9.0 | 10.2 | 10.0 | 13.4 | 8.3 | 15.4 | 8.7 | 8.6 | 8.1 | 8.7 | 9.3 | 8.9 |
| Number of samples | 4 | 19 | 32 | 21 | 32 | 108 | 11 | 10 | 19 | 40 | 30 | 16 | 28 | 20 | 94 |
| LRL (or LRL range) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH (standard units)** | | | | | | | | | | | | | | | |
| Minimum value | 7.20 | 7.54 | 7.09 | 7.19 | 7.12 | 7.09 | 6.90 | 6.54 | 6.94 | 6.54 | 6.58 | 7.07 | 7.08 | 6.57 | 6.57 |
| Maximum value | 8.17 | 8.70 | 8.52 | 8.50 | 8.30 | 8.70 | 8.51 | 7.90 | 8.60 | 8.60 | 8.13 | 8.47 | 9.00 | 8.43 | 9.00 |
| Mean value | 7.82 | 8.08 | 7.83 | 7.74 | 7.78 | 7.84 | 7.93 | 7.44 | 7.69 | 7.69 | 7.55 | 7.81 | 8.05 | 7.62 | 7.76 |
| Median value | 7.95 | 8.02 | 7.84 | 7.80 | 7.75 | 7.85 | 7.99 | 7.50 | 7.62 | 7.67 | 7.62 | 7.80 | 8.03 | 7.72 | 7.80 |
| Number of samples | 4 | 19 | 32 | 21 | 32 | 108 | 11 | 10 | 19 | 40 | 30 | 17 | 28 | 20 | 94 |
| LRL (or LRL range) | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Specific conductance (µµS/cm)** | | | | | | | | | | | | | | | |
| Minimum value | 460 | 555 | 510 | 564 | 518 | 460 | 623 | 896 | 819 | 623 | 469 | 297 | 250 | 198 | 198 |
| Maximum value | 584 | 1,220 | 2,000 | 1,730 | 1,680 | 2,000 | 4,810 | 1,870 | 2,440 | 4,810 | 6,850 | 4,290 | 2,825 | 2,300 | 6,850 |
| Mean value | 537 | 792 | 895 | 905 | 894 | 865 | 1,490 | 1,129 | 1,070 | 1,200 | 1,102 | 646 | 646 | 745 | 937 |
| Median value | 552 | 767 | 865 | 865 | 829 | 811 | 837 | 1,094 | 985 | 997 | 747 | 860 | 860 | 619 | 664 |
| Number of samples | 4 | 19 | 32 | 21 | 32 | 108 | 11 | 10 | 19 | 40 | 30 | 17 | 28 | 20 | 95 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Water temperature (×C)** | | | | | | | | | | | | | | | |
| Minimum value | 5.4 | 2.3 | 1.8 | 1.4 | 0.6 | 0.6 | 1.8 | 15.3 | 6.6 | 1.8 | 1.3 | 1.5 | 2.0 | 2.8 | 1.3 |
| Maximum value | 24.8 | 30.3 | 29.4 | 27.0 | 29.5 | 30.3 | 27.9 | 26.6 | 33.4 | 33.4 | 30.4 | 29.9 | 33.5 | 33.4 | 33.5 |
| Mean value | 12.1 | 15.1 | 15.6 | 14.0 | 15.5 | 15.0 | 14.4 | 21.3 | 19.6 | 18.6 | 16.3 | 17.3 | 17.7 | 17.2 | 17.1 |
| Median value | 9.2 | 13.1 | 14.6 | 13.7 | 15.0 | 14.2 | 12.2 | 21.8 | 22.5 | 21.8 | 14.3 | 17.7 | 16.4 | 17.6 | 17.0 |
| Number of samples | 4 | 19 | 32 | 21 | 32 | 108 | 11 | 10 | 19 | 40 | 29 | 17 | 28 | 20 | 94 |
| LRL (or LRL range) | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| **Chloride, dissolved (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 74 | 33 | 61 | 136 | 49 | 33 | 173 | 146 | 92 | 92 | 41 | 105 | 64 | 54 | 41 |
| Maximum value | 74 | 144 | 196 | 136 | 219 | 219 | 173 | 146 | 203 | 203 | 276 | 105 | 374 | 54 | 374 |
| Mean value | 74 | 75 | 104 | 136 | 110 | 99 | 173 | 146 | 141 | 145 | 161 | 105 | 165 | 54 | 152 |
| Median value | -- | 66 | 97 | -- | 89 | 86 | -- | -- | 134 | 146 | 139 | -- | 105 | -- | 103 |
| Number of samples | 1 | 6 | 6 | 1 | 7 | 20 | 1 | 1 | 6 | 8 | 8 | 1 | 6 | 1 | 16 |
| LRL (or LRL range) | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| **Ammonia plus organic nitrogen, total, as N (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 0.55 | 0.52 | 0.55 | 0.57 | 0.60 | 0.52 | 0.29 | 1.30 | 0.93 | 0.29 | 0.28 | 0.46 | 0.58 | 0.55 | 0.28 |
| Maximum value | 0.55 | 3.05 | 3.22 | 2.26 | 2.55 | 3.22 | 0.74 | 4.73 | 5.33 | 5.33 | 2.57 | 2.87 | 26.3 | 7.6 | 26.2 |
| Mean value | 0.55 | 0.85 | 1.19 | 0.97 | 1.19 | 1.09 | 0.53 | 2.31 | 2.53 | 1.99 | 0.74 | 1.24 | 2.29 | 1.76 | 1.49 |
| Median value | -- | 0.67 | 0.95 | 0.89 | 1.09 | 0.92 | 0.53 | 1.74 | 2.06 | 1.69 | 0.57 | 0.91 | 1.21 | 1.35 | 1.01 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 14 | 93 |
| LRL (or LRL range) | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Ammonia, dissolved as N (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | <0.04 | 0.01 | 0.01 | <0.02 | <0.02 | 0.01 | <0.02 | 0.10 | <0.02 | <0.02 | 0.01 | <0.02 | 0.01 | <0.02 | 0.01 |
| Maximum value | <0.04 | 1.93 | 1.53 | 0.72 | 0.91 | 1.93 | 0.06 | 3.50 | 3.42 | 3.50 | 0.40 | 0.71 | 22.0 | 1.30 | 22.0 |
| Mean value | <0.04 | 0.15 | 0.24 | 0.15 | 0.27 | 0.22 | 0.03 | 0.92 | 1.14 | 0.82 | 0.08 | 0.21 | 0.95 | 0.28 | 0.40 |
| Median value | -- | 0.03 | 0.06 | 0.13 | 0.19 | 0.10 | 0.02 | 0.26 | 0.76 | 0.33 | 0.04 | 0.17 | 0.07 | 0.07 | 0.06 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.04 | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) |
| **Organic nitrogen, total, as N (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 0.51 | 0.48 | 0.49 | 0.43 | 0.52 | 0.43 | 0.27 | 1.20 | 0.91 | 0.27 | 0.25 | 0.38 | 0.46 | 0.41 | 0.25 |
| Maximum value | 0.51 | 1.12 | 1.96 | 1.54 | 1.96 | 1.96 | 0.72 | 1.70 | 1.91 | 1.91 | 2.24 | 2.69 | 4.22 | 7.06 | 7.06 |
| Mean value | 0.51 | 0.71 | 0.95 | 0.81 | 0.93 | 0.87 | 0.50 | 1.39 | 1.39 | 1.18 | 0.67 | 1.04 | 1.39 | 1.47 | 1.10 |
| Median value | -- | 0.63 | 0.88 | 0.82 | 0.90 | 0.83 | 0.49 | 1.34 | 1.33 | 1.23 | 0.56 | 0.82 | 1.14 | 1.16 | 0.86 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| **Nitrite plus nitrate, dissolved, as N (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 1.70 | 1.70 | 1.65 | 1.44 | 1.34 | 1.34 | 0.05 | 11.1 | 5.17 | 0.05 | 0.03 | <0.05 | 0.01 | <0.05 | 0.01 |
| Maximum value | 1.70 | 14.5 | 11.7 | 7.61 | 10.8 | 14.5 | 1.76 | 18.3 | 12.8 | 18.3 | 3.37 | 3.76 | 3.51 | 3.20 | 3.76 |
| Mean value | 1.70 | 6.25 | 5.46 | 3.96 | 4.19 | 4.88 | 0.51 | 13.6 | 8.81 | 7.90 | 0.64 | 0.96 | 0.68 | 0.99 | 0.77 |
| Median value | -- | 5.70 | 4.90 | 3.92 | 3.91 | 4.28 | 0.22 | 12.9 | 8.67 | 8.67 | 0.11 | 0.29 | 0.21 | 0.59 | 0.29 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| **Nitrite, dissolved, as N (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 0.173 | 0.018 | 0.017 | 0.036 | 0.028 | 0.017 | 0.005 | 0.062 | 0.040 | 0.005 | 0.006 | <0.008 | <0.008 | <0.01 | <0.008 |
| Maximum value | 0.173 | 0.279 | 0.558 | 0.163 | 0.305 | 0.558 | 0.032 | 0.149 | 0.728 | 0.728 | 0.320 | 0.338 | 0.258 | 0.349 | 0.349 |
| Mean value | 0.173 | 0.068 | 0.147 | 0.085 | 0.107 | 0.110 | 0.013 | 0.278 | 0.274 | 0.212 | 0.045 | 0.068 | 0.045 | 0.086 | 0.057 |
| Median value | -- | 0.042 | 0.097 | 0.060 | 0.093 | 0.082 | 0.012 | 0.240 | 0.234 | 0.185 | 0.013 | 0.057 | 0.027 | 0.057 | 0.030 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.008 | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Nitrate, dissolved, as N (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 1.53 | 1.53 | 1.61 | 1.40 | 1.30 | 1.30 | 0.04 | 10.8 | 5.02 | 0.04 | 0.03 | 0.30 | 0.004 | 0.04 | 0.004 |
| Maximum value | 1.53 | 14.5 | 11.3 | 7.55 | 10.6 | 14.5 | 1.74 | 18.2 | 12.2 | 18.2 | 3.29 | 3.65 | 3.35 | 3.20 | 3.64 |
| Mean value | 1.53 | 6.18 | 5.32 | 3.88 | 4.08 | 4.77 | 0.50 | 13.3 | 8.53 | 7.75 | 0.59 | 0.89 | 0.63 | 0.91 | 0.72 |
| Median value | -- | 5.61 | 4.74 | 3.80 | 3.84 | 4.21 | 0.21 | 12.6 | 8.44 | 8.44 | 0.10 | 0.25 | 0.17 | 0.55 | 0.25 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| **Nitrogen, total (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 2.25 | 2.25 | 2.26 | 2.10 | 2.15 | 2.10 | 0.48 | 14.1 | 6.46 | 0.48 | 0.33 | 0.54 | 0.63 | 1.35 | 0.33 |
| Maximum value | 2.25 | 15.5 | 14.8 | 8.75 | 12.8 | 15.5 | 2.40 | 19.7 | 18.1 | 19.7 | 5.86 | 6.64 | 26.6 | 9.00 | 26.6 |
| Mean value | 2.25 | 7.10 | 6.66 | 4.93 | 5.39 | 5.97 | 1.04 | 15.9 | 11.3 | 9.96 | 1.38 | 2.20 | 2.97 | 2.75 | 2.26 |
| Median value | -- | 6.34 | 5.98 | 4.81 | 5.18 | 5.25 | 0.80 | 15.2 | 11.4 | 11.4 | 0.93 | 1.56 | 1.46 | 2.09 | 1.42 |
| Number of samples | | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| **Nitrate, percent of total N** | | | | | | | | | | | | | | | |
| Minimum value | 68.0 | 67.8 | 62.6 | 63.9 | 51.1 | 51.1 | 8.8 | 69.4 | 64.6 | 8.8 | 4.4 | 3.3 | 0.1 | 1.9 | 0.8 |
| Maximum value | 68.0 | 93.5 | 87.3 | 87.6 | 86.5 | 93.5 | 72.4 | 92.2 | 88.0 | 92.2 | 74.6 | 59.3 | 60.5 | 72.6 | 74.6 |
| Mean value | 68.0 | 84.7 | 79.2 | 76.5 | 73.7 | 77.8 | 36.9 | 83.6 | 75.9 | 66.5 | 29.2 | 27.7 | 20.1 | 29.9 | 26.2 |
| Median value | -- | 86.9 | 81.9 | 77.8 | 76.7 | 78.4 | 31.5 | 86.8 | 76.7 | 68.3 | 16.6 | 19.0 | 8.1 | 22.5 | 16.8 |
| Number of samples | 2 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| **Organic nitrogen, percent of total N** | | | | | | | | | | | | | | | |
| Minimum value | 22.5 | 5.9 | 9.7 | 11.1 | 10.0 | 5.8 | 25.0 | 6.1 | 9.7 | 6.1 | 21.3 | 26.1 | 15.8 | 19.6 | 15.8 |
| Maximum value | 22.5 | 23.6 | 29.9 | 28.9 | 35.0 | 35.0 | 85.8 | 11.1 | 17.9 | 85.6 | 88.0 | 92.4 | 97.5 | 95.1 | 97.5 |
| Mean value | 22.5 | 12.6 | 15.6 | 18.1 | 19.2 | 16.8 | 58.0 | 8.9 | 12.6 | 22.7 | 61.8 | 58.5 | 69.6 | 54.9 | 62.2 |
| Median value | -- | 11.3 | 14.6 | 17.0 | 18.9 | 14.9 | 61.7 | 9.4 | 11.7 | 11.7 | 73.5 | 53.0 | 77.7 | 53.0 | 67.3 |
| Number of samples | 2 | 16 | 30 | 17 | 30 | 92 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Orthophosphate, dissolved, as P (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 0.28 | 0.11 | 0.38 | 0.37 | 0.23 | 0.11 | 0.01 | 2.98 | 1.03 | 0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Maximum value | 0.28 | 2.41 | 2.73 | 1.28 | 2.28 | 2.73 | 0.11 | 4.09 | 3.87 | 4.09 | 0.10 | 0.04 | 0.22 | 0.06 | 0.22 |
| Mean value | 0.28 | 0.89 | 1.42 | 0.76 | 0.92 | 1.04 | 0.04 | 3.36 | 2.37 | 2.05 | 0.04 | 0.51 | 0.05 | 0.03 | 0.05 |
| Median value | -- | 0.86 | 1.50 | 0.83 | 0.78 | 0.84 | 0.03 | 3.25 | 2.42 | 2.42 | 0.04 | 0.07 | 0.02 | 0.02 | 0.03 |
| Number of samples | 1 | 16 | 18 | 15 | 18 | 58 | 8 | 8 | 17 | 33 | 19 | 5 | 16 | 5 | 45 |
| LRL (or LRL range) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) |
| **Phosphorus, dissolved (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 0.30 | 0.13 | 0.16 | 0.11 | 0.14 | 0.11 | 0.03 | 3.10 | 1.11 | 0.03 | 0.02 | 0.03 | <0.01 | 0.03 | <0.01 |
| Maximum value | 0.30 | 2.33 | 2.95 | 1.93 | 2.51 | 2.95 | 0.06 | 4.32 | 3.69 | 4.32 | 0.29 | 0.40 | 0.34 | 0.26 | 0.40 |
| Mean value | 0.30 | 0.93 | 1.31 | 0.80 | 0.81 | 0.98 | 0.04 | 3.61 | 2.51 | 2.18 | 0.08 | 0.13 | 0.11 | 0.10 | 0.10 |
| Median value | -- | 0.85 | 1.13 | 0.85 | 0.62 | 0.84 | 0.04 | 3.61 | 2.47 | 2.47 | 0.05 | 0.08 | 0.07 | 0.08 | 0.07 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| **Phosphorus, total (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 0.30 | 0.17 | 0.26 | 0.23 | 0.16 | 0.16 | 0.03 | 3.02 | 1.13 | 0.03 | 0.03 | 0.06 | 0.03 | 0.08 | 0.03 |
| Maximum value | 0.30 | 2.46 | 3.89 | 2.14 | 2.46 | 3.89 | 0.09 | 4.32 | 4.09 | 4.32 | 0.41 | 0.51 | 0.37 | 4.42 | 4.42 |
| Mean value | 0.30 | 0.97 | 1.41 | 0.91 | 0.93 | 1.08 | 0.06 | 3.52 | 2.57 | 2.19 | 0.11 | 0.18 | 0.19 | 0.46 | 0.21 |
| Median value | -- | 0.90 | 1.14 | 0.90 | 0.75 | 0.88 | 0.05 | 3.47 | 2.58 | 2.58 | 0.08 | 0.12 | 0.15 | 0.24 | 0.13 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| LRL (or LRL range) | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| **Dissolved phosphorous, percent of total P** | | | | | | | | | | | | | | | |
| Minimum value | 99.3 | 74.3 | 57.5 | 22.0 | 26.6 | 22.0 | 39.4 | 98.5 | 90.2 | 39.4 | 27.7 | 8.3 | 6.8 | 0.8 | 0.8 |
| Maximum value | 99.3 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Mean value | 99.3 | 93.3 | 90.7 | 82.7 | 82.2 | 87.1 | 76.4 | 99.8 | 97.1 | 92.6 | 67.5 | 58.3 | 55.3 | 46.3 | 58.3 |
| Median value | -- | 95.8 | 93.8 | 87.5 | 84.9 | 91.2 | 77.4 | 100.0 | 96.9 | 98.5 | 70.0 | 65.6 | 52.7 | 36.7 | 60.5 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Dissolved organic carbon (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 4.20 | 4.04 | 5.14 | 5.20 | 4.93 | 4.04 | 3.20 | 7.20 | 5.39 | 3.20 | 3.31 | 4.09 | 4.12 | 5.75 | 3.31 |
| Maximum value | 4.20 | 7.37 | 13.0 | 5.90 | 8.48 | 13.0 | 7.70 | 8.30 | 11.1 | 11.1 | 7.91 | 11.4 | 10.6 | 7.66 | 11.4 |
| Mean value | 4.20 | 5.59 | 6.90 | 5.55 | 6.17 | 6.15 | 5.09 | 7.82 | 8.01 | 7.34 | 5.12 | 7.72 | 6.89 | 6.71 | 6.05 |
| Median value | -- | 5.63 | 6.26 | -- | 5.89 | 5.89 | 4.37 | 7.80 | 8.05 | 7.70 | 4.90 | -- | 6.70 | -- | 5.79 |
| Number of samples | 1 | 12 | 13 | 2 | 13 | 41 | 5 | 5 | 13 | 23 | 15 | 2 | 11 | 2 | 30 |
| LRL (or LRL range) | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 |
| **Total organic carbon (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 4.0 | 4.4 | 5.8 | 6.6 | 5.7 | 4.0 | 4.1 | 8.0 | 6.5 | 4.1 | 3.8 | 4.0 | 3.9 | 5.5 | 3.9 |
| Maximum value | 4.0 | 11.1 | 12.2 | 7.6 | 10.1 | 12.2 | 9.3 | 10.2 | 14.1 | 14.1 | 11.4 | 15.4 | 15.3 | 9.5 | 15.4 |
| Mean value | 4.0 | 6.5 | 8.5 | 7.4 | 7.9 | 7.6 | 7.0 | 9.3 | 9.9 | 9.1 | 6.1 | 7.8 | 9.3 | 7.2 | 7.6 |
| Median value | -- | 6.0 | 8.5 | 7.5 | 7.7 | 7.6 | 7.9 | 9.6 | 9.9 | 9.5 | 5.5 | 6.5 | 9.1 | 7.8 | 6.7 |
| Number of samples | 1 | 14 | 17 | 5 | 16 | 53 | 7 | 8 | 16 | 31 | 18 | 5 | 15 | 5 | 43 |
| LRL (or LRL range) | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| **Biochemical oxygen demand (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | -- | <2 | 3.6 | 4.9 | -- | <2 | -- | -- | 3.6 | 3.6 | 12 | -- | 2.8 | -- | 2.8 |
| Maximum value | -- | <2 | 4.7 | 6.8 | -- | 6.8 | -- | -- | 5.6 | 5.6 | 240 | -- | 4.2 | -- | 240 |
| Mean value | -- | <2 | 4.2 | 5.7 | -- | 4.2 | -- | -- | 4.6 | 4.6 | 126 | -- | 3.4 | -- | 53 |
| Median value | -- | -- | -- | 5.5 | -- | 4.7 | -- | -- | -- | -- | -- | -- | 3.3 | -- | 4.2 |
| Number of samples | -- | 2 | 2 | 3 | -- | 7 | -- | -- | 2 | 2 | 2 | -- | 3 | -- | 5 |
| LRL (or LRL range) | -- | 2 | 2 | 2 | -- | 2 | -- | -- | 2 | 2 | 2 | -- | 2 | -- | 2 |
| **Chemical oxygen demand (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | -- | <10 | <10 | -- | <10 | <10 | -- | -- | 17 | 17 | <10 | 48 | <10 | 15 | <10 |
| Maximum value | -- | 30 | 42 | -- | 35 | 42 | -- | -- | 51 | 51 | 30 | 48 | 47 | 15 | 48 |
| Mean value | -- | 19 | 25 | -- | 20 | 21 | -- | -- | 31 | 31 | 19 | 48 | 30 | 15 | 25 |
| Median value | -- | 18 | 26 | -- | 19 | 21 | -- | -- | 33 | 33 | 18 | -- | 32 | -- | 21 |
| Number of samples | -- | 8 | 9 | -- | 10 | 27 | -- | -- | 8 | 8 | 10 | 1 | 8 | 1 | 20 |
| LRL (or LRL range) | -- | 10 | 10 | -- | 10 | 10 | -- | -- | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| ***Escherichia coli* (col/100 mL)** | | | | | | | | | | | | | | | |
| Minimum value | 7 | <1 | <1 | 150 | <1 | <1 | 42 | 95 | <1 | <1 | <1 | <1 | <1 | <1 | <1 |
| Maximum value | 7 | 7,600 | 2,750 | 4,600 | 10,500 | 10,500 | 860 | 1,100 | 4,600 | 4,600 | 11,300 | 12,500 | 7,300 | 35,000 | 35,000 |
| Mean value | 7 | 690 | 655 | 1,380 | 1,300 | 1,000 | 255 | 425 | 620 | 510 | 1,330 | 2,830 | 840 | 6,180 | 2,360 |
| Median value | -- | 80 | 295 | 915 | 480 | 380 | 55 | 250 | 115 | 115 | 310 | 500 | 220 | 355 | 340 |
| Number of samples | 1 | 13 | 30 | 17 | 30 | 91 | 4 | 4 | 13 | 21 | 29 | 17 | 28 | 17 | 91 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| ***Fecal coliform* (col/100 mL)** | | | | | | | | | | | | | | | |
| Minimum value | -- | 37 | 69 | -- | 30 | 30 | -- | -- | 25 | 25 | <10 | 645 | 8 | 450 | <10 |
| Maximum value | -- | 230 | 1,770 | -- | 2,300 | 2,300 | -- | -- | 1,100 | 1,100 | 600 | 645 | 1,770 | 450 | 1,770 |
| Mean value | -- | 123 | 574 | -- | 437 | 390 | -- | -- | 274 | 274 | 231 | 645 | 429 | 450 | 350 |
| Median value | -- | 122 | 320 | -- | 80 | 139 | -- | -- | 174 | 174 | 182 | -- | 280 | -- | 280 |
| Number of samples | -- | 7 | 8 | -- | 8 | 23 | -- | -- | 8 | 8 | 8 | 1 | 7 | 1 | 17 |
| LRL (or LRL range) | -- | 10 | 10 | -- | 10 | 10 | -- | -- | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| **Suspended sediment (mg/L)** | | | | | | | | | | | | | | | |
| Minimum value | 29 | 7 | 13 | 61 | 27 | 7 | 5 | 3 | 2 | 2 | 8 | 24 | 2 | 17 | 2 |
| Maximum value | 29 | 79 | 70 | 105 | 124 | 124 | 76 | 62 | 66 | 76 | 635 | 74 | 66 | 98 | 635 |
| Mean value | 29 | 49 | 50 | 79 | 72 | 60 | 47 | 49 | 45 | 46 | 74 | 39 | 33 | 56 | 53 |
| Median value | -- | 50 | 59 | 77 | 72 | 61 | 53 | 55 | 52 | 54 | 44 | 34 | 31 | 58 | 39 |
| Number of samples | 1 | 15 | 19 | 7 | 19 | 61 | 7 | 7 | 16 | 30 | 19 | 5 | 17 | 6 | 47 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Nitrogen, instantaneous mass (mg/s)** | | | | | | | | | | | | | | | |
| Minimum value | 445 | 366 | 2,910 | 4,640 | 3,410 | 366 | 7 | 674 | 3,540 | 7 | 4 | 66 | 0 | 12 | 0 |
| Maximum value | 445 | 2,830 | 23,360 | 22,850 | 25,450 | 25,450 | 86 | 6,510 | 10,750 | 10,750 | 4,820 | 4,250 | 1,760 | 744 | 4,820 |
| Mean value | 445 | 1,385 | 8,475 | 9,230 | 8,620 | 7,370 | 36 | 3,665 | 7,250 | 4,630 | 334 | 780 | 284 | 287 | 392 |
| Median value | -- | 1,235 | 7,840 | 7,450 | 6,860 | 6,230 | 23 | 3,650 | 6,880 | 5,990 | 21 | 397 | 57 | 184 | 85 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Nitrate, instantaneous mass (mg/s)** | | | | | | | | | | | | | | | |
| Minimum value | 303 | 249 | 2,490 | 3,285 | 2,890 | 249 | 1.02 | 616 | 3,008 | 1.02 | 0.268 | 5.78 | 0.011 | 0.215 | 0.011 |
| Maximum value | 303 | 2,530 | 15,020 | 14,600 | 15,400 | 15,400 | 52.2 | 5,160 | 8,760 | 8,760 | 2,415 | 2,330 | 1,065 | 512 | 2,415 |
| Mean value | 303 | 1.11 | 6,540 | 6,860 | 6,090 | 5,475 | 17.9 | 3,060 | 5,475 | 3,565 | 176 | 331 | 103 | 112 | 171 |
| Median value | -- | 0.905 | 5,570 | 5,470 | 5,400 | 4,950 | 5.22 | 3,020 | 5,415 | 4,485 | 2.72 | 40.6 | 4.95 | 52 | 14.6 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| **Organic nitrogen, instantaneous mass (mg/s)** | | | | | | | | | | | | | | | |
| Minimum value | 100 | 48.4 | 381 | 588 | 481 | 48.4 | 5.15 | 47.7 | 499 | 5.15 | 2.92 | 32.9 | 0.160 | 4.24 | 0.160 |
| Maximum value | 100 | 634 | 6,930 | 6,610 | 7,400 | 7,400 | 41.8 | 723 | 1,500 | 1,500 | 2,010 | 1,720 | 593 | 584 | 2,010 |
| Mean value | 100 | 181 | 1,450 | 1,780 | 1,800 | 1,390 | 16.8 | 341 | 910 | 555 | 131 | 375 | 121 | 146 | 175 |
| Median value | -- | 106 | 1,125 | 1,360 | 1,200 | 1,075 | 15.0 | 256 | 770 | 656 | 7.64 | 203 | 45.1 | 92.0 | 44 |
| Number of samples | 1 | 20 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| **Mass phosphorus, dissolved (mg/s)** | | | | | | | | | | | | | | | |
| Minimum value | 58.9 | 48.4 | 767 | 202 | 407 | 48.4 | 0.555 | 140 | 718 | 0.555 | 0.208 | 1.42 | 0.009 | 0.893 | 0.009 |
| Maximum value | 58.9 | 423 | 2,464 | 2,000 | 2,590 | 2,590 | 2.14 | 1,560 | 2,390 | 2,390 | 261 | 250 | 99.6 | 48.2 | 261 |
| Mean value | 58.9 | 164 | 1,343 | 1,220 | 1,064 | 1,018 | 1.28 | 841 | 1,575 | 1,015 | 18.0 | 46.4 | 12.0 | 10.7 | 20.2 |
| Median value | -- | 146 | 1,260 | 1,290 | 823 | 972 | 1.24 | 810 | 1,520 | 1,335 | 0.850 | 17.8 | 2.06 | 5.35 | 3.16 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |
| **Mass phosphorus, total (mg/s)** | | | | | | | | | | | | | | | |
| Minimum value | 59.3 | 48.7 | 413 | 823 | 480 | 48.7 | 0.555 | 136 | 701 | 0.555 | 0.260 | 3.36 | 0.007 | 1.34 | 0.007 |
| Maximum value | 59.3 | 434 | 3,055 | 2,520 | 3,020 | 3,055 | 3.21 | 1,490 | 2,430 | 2,430 | 366 | 320 | 117 | 365 | 366 |
| Mean value | 59.3 | 177 | 1,505 | 1,480 | 1,335 | 1,205 | 1.77 | 820 | 1,615 | 1,065 | 24.2 | 61.4 | 18.0 | 42.0 | 32.4 |
| Median value | -- | 166 | 1,350 | 1,380 | 1,060 | 1,105 | 1.66 | 798 | 1,505 | 1,375 | 1.25 | 35.2 | 4.46 | 22.7 | 5.44 |
| Number of samples | 1 | 16 | 30 | 17 | 30 | 94 | 8 | 8 | 17 | 33 | 31 | 17 | 28 | 17 | 93 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | | ***Fecal coliform*, instantaneous colonies (x1000)** | | | | | | | | |
| Minimum value | -- | 910 | 9,720 | -- | 2,650 | 910 | -- | -- | 1,645 | 1,645 | 20 | 9,100 | 14 | 7,200 | 14 |
| Maximum value | -- | 21,950 | 192,500 | -- | 303,500 | 303,500 | -- | -- | 113,700 | 113,700 | 1,480 | 9,100 | 2,210 | 7,200 | 9,130 |
| Mean value | -- | 4,930 | 63,680 | -- | 62,000 | 45,200 | -- | -- | 24,100 | 24,100 | 319 | 9100 | 556 | 7200 | 1340 |
| Median value | -- | 1,650 | 44,000 | -- | 8,910 | 9,720 | -- | -- | 11,160 | 11,160 | 140 | -- | 140 | -- | 178 |
| Number of samples | -- | 7 | 8 | -- | 8 | 23 | -- | -- | 8 | 8 | 8 | 1 | 7 | 1 | 17 |
| | | | | | | | ***Escherichia coli*, instantaneous colonies (x1000)** | | | | | | | | |
| Minimum value | 140 | 8 | 69 | 24,890 | 96 | 8 | 98 | 4,035 | 92 | 92 | 2 | 5 | 1 | 4 | 1 |
| Maximum value | 140 | 434,800 | 2,447,000 | 4,221,000 | 122,700 | 4,221,000 | 5,210 | 43,600 | 272,300 | 272,300 | 198,400 | 619,500 | 56,380 | 578,800 | 619,500 |
| Mean value | 140 | 37,200 | 181,950 | 580,100 | 223,200 | 247,300 | 1,435 | 16,100 | 41,450 | 29,000 | 17,720 | 82,500 | 6,145 | 70,460 | 36,100 |
| Median value | -- | 1,630 | 41,990 | 103,620 | 91,970 | 47,870 | 213 | 8,380 | 9,345 | 7,650 | 563 | 14,080 | 858 | 6,330 | 2,745 |
| Number of samples | 1 | 13 | 30 | 17 | 30 | 91 | 4 | 4 | 13 | 21 | 29 | 17 | 28 | 17 | 91 |
| | | | | | | | **Chloride, instantaneous mass (g/s)** | | | | | | | | |
| Minimum value | 14.7 | 5.84 | 58.6 | 486 | 55 | 5.84 | 6.46 | 57.9 | 63.4 | 6.46 | 0.285 | -- | 0.310 | 8.56 | 0.285 |
| Maximum value | 14.7 | 54.9 | 212 | 486 | 270 | 486 | 6.46 | 57.9 | 103 | 6.46 | 5.48 | -- | 10.2 | 8.56 | 10.2 |
| Mean value | 14.7 | 21.4 | 132 | 486 | 148 | 115 | 6.46 | 57.9 | 98.6 | 79.2 | 2.54 | -- | 3.04 | 8.56 | 3.14 |
| Median value | -- | 13.3 | 127 | -- | 123 | 81.2 | -- | -- | 150 | 59.2 | 1.78 | -- | 1.31 | -- | 1.82 |
| Number of samples | 1 | 6 | 6 | 1 | 6 | 20 | 1 | 1 | 4 | 6 | 8 | -- | 6 | 1 | 15 |
| | | | | | | | **Biochemical oxygen demand, instantaneous mass (g/s)** | | | | | | | | |
| Minimum value | -- | <1 | 3.07 | 12.9 | -- | <1 | -- | -- | 1.87 | 1.87 | 0.187 | -- | 0.454 | -- | 0.187 |
| Maximum value | -- | <1 | 3.86 | 46.1 | -- | 46.1 | -- | -- | 3.69 | 3.69 | 1.05 | -- | 1.27 | -- | 1.91 |
| Mean value | -- | <1 | 3.46 | 30.0 | -- | 13.9 | -- | -- | 2.78 | 2.78 | 1.90 | -- | 0.764 | -- | 0.877 |
| Median value | -- | -- | -- | 30.8 | -- | 3.86 | -- | -- | -- | -- | -- | -- | 0.564 | -- | 0.564 |
| Number of samples | -- | 2 | 2 | 3 | -- | 7 | -- | -- | 2 | 2 | 2 | -- | 3 | -- | 5 |

**Table 6.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; --, no data; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | **Chemical oxygen demand, instantaneous mass (g/s)** | | | | | | | | | | | | | | |
| Minimum value | -- | 1.25 | 11.7 | -- | 12.4 | 1.3 | -- | -- | 13.6 | 13.6 | 0.102 | 6.84 | 0.052 | 2.4 | 0.052 |
| Maximum value | -- | 12.5 | 39.8 | -- | 42.0 | 42.0 | -- | -- | 30.3 | 30.3 | 0.674 | 6.84 | 1.06 | 2.4 | 6.84 |
| Mean value | -- | 5.10 | 24.9 | -- | 21.5 | 17.8 | -- | -- | 21.5 | 21.5 | 0.273 | 6.84 | 0.480 | 2.4 | 0.791 |
| Median value | -- | 2.82 | 24.6 | -- | 22.2 | 14.9 | -- | -- | 20.1 | 20.1 | 0.234 | -- | 0.404 | -- | 0.332 |
| Number of samples | -- | 8 | 9 | -- | 10 | 27 | -- | -- | 8 | 8 | 10 | 1 | 8 | 1 | 20 |
| | **Total organic carbon, instantaneous mass (g/s)** | | | | | | | | | | | | | | |
| Minimum value | 0.793 | 0.367 | 4.00 | 5.00 | 5.10 | 0.367 | 0.096 | 0.317 | 4.00 | 0.096 | 0.043 | 0.889 | 0.002 | 0.523 | 0.002 |
| Maximum value | 0.793 | 5.47 | 24.0 | 15.0 | 18.2 | 24 | 0.318 | 3.82 | 8.00 | 8.00 | 0.256 | 2.18 | 1.26 | 1.650 | 2.18 |
| Mean value | 0.793 | 1.76 | 9.94 | 9.20 | 9.50 | 7.40 | 0.208 | 2.15 | 6.38 | 3.89 | 0.114 | 1.29 | 0.360 | 0.981 | 0.437 |
| Median value | -- | 0.810 | 9.00 | 10.0 | 8.24 | 6.58 | 0.190 | 1.98 | 6.00 | 4.00 | 0.084 | 1.02 | 0.167 | 0.693 | 0.182 |
| Number of samples | 1 | 14 | 17 | 5 | 16 | 53 | 7 | 8 | 16 | 31 | 18 | 5 | 15 | 5 | 43 |
| | **Dissolved organic carbon, instantaneous mass (g/s)** | | | | | | | | | | | | | | |
| Minimum value | 0.833 | 0.488 | 4.38 | 7.07 | 3.90 | 0.488 | 0.075 | 0.329 | 2.95 | 0.075 | 0.029 | 0.626 | 0.001 | 1.03 | 0.001 |
| Maximum value | 0.833 | 5.05 | 15.4 | 9.3 | 12.5 | 15.4 | 0.265 | 3.31 | 7.51 | 7.51 | 0.227 | 1.61 | 0.311 | 1.23 | 1.61 |
| Mean value | 0.833 | 1.70 | 8.51 | 8.18 | 7.34 | 5.94 | 0.178 | 2.38 | 5.22 | 3.51 | 0.088 | 1.12 | 0.122 | 1.13 | 0.238 |
| Median value | -- | 0.918 | 8.84 | -- | 6.85 | 5.26 | 0.157 | 2.85 | 5.05 | 3.56 | 0.067 | -- | 0.106 | -- | 0.084 |
| Number of samples | | 12 | 13 | 2 | 13 | 41 | 5 | 5 | 13 | 23 | 15 | 2 | 11 | 2 | 30 |
| | **Suspended sediment mass (g/s)** | | | | | | | | | | | | | | |
| Minimum value | 5.75 | 2.22 | 18.7 | 53.0 | 36.6 | 2.22 | 0.303 | 1.19 | 1.22 | 0.303 | 0.168 | 5.06 | 0.009 | 0.858 | 0.009 |
| Maximum value | 5.75 | 52.5 | 132 | 209 | 238 | 238 | 2.84 | 25.5 | 51.5 | 51.5 | 5.04 | 11.3 | 6.18 | 9.46 | 11.3 |
| Mean value | 5.75 | 14.1 | 55.3 | 99.4 | 88.7 | 59.8 | 1.36 | 11.1 | 30.2 | 19.0 | 1.06 | 6.85 | 1.26 | 5.39 | 2.30 |
| Median value | -- | 5.76 | 42.0 | 85.2 | 72.6 | 46.9 | 1.16 | 6.48 | 31.7 | 18.9 | 0.942 | 5.74 | 0.688 | 6.44 | 1.03 |
| Number of samples | 1 | 15 | 19 | 7 | 19 | 61 | 7 | 7 | 16 | 30 | 19 | 5 | 17 | 6 | 47 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **1,4-Dichlorobenzene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.04 | 0.002 | 0.010 | 0.020 | 0.002 | <0.04 | 0.066 | 0.020 | 0.020 | 0.006 | 0.011 | 0.016 | <0.03 | 0.006 |
| Max value | <0.5 | <0.5 | 0.011 | 0.015 | 0.038 | 0.038 | <0.5 | 0.150 | 0.374 | 0.374 | 0.027 | 0.156 | 0.062 | 0.180 | 0.180 |
| Mean value of detection | -- | -- | 0.006 | 0.013 | 0.027 | 0.020 | -- | 0.105 | 0.098 | 0.102 | 0.015 | 0.035 | 0.035 | 0.089 | 0.056 |
| Median value of detection | -- | -- | 0.006 | 0.013 | 0.028 | 0.020 | -- | 0.102 | 0.031 | 0.093 | 0.013 | 0.017 | 0.029 | 0.090 | 0.038 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 0 | 3 | 3 | 9 | 15 | 0 | 6 | 5 | 11 | 3 | 9 | 12 | 17 | 41 |
| Percent Detection | 0 | 0 | 10 | 17 | 32 | 17 | 0 | 67 | 24 | 30 | 10 | 50 | 44 | 89 | 44 |
| LRL (or LRL range) | 0.5 | (0.04-0.5) | (0.03-0.5) | (0.03-0.5) | 0.03 | (0.03-0.5) | (0.04-0.5) | 0.5 | 0.030 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | 0.03 | (0.03-0.5) |
| **1-Methylnaphthalene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | 0.023 | 0.023 | <0.5 | <0.5 | <0.5 | <0.5 | 0.052 | <0.5 | <0.5 | <0.5 | 0.052 |
| Max value | <0.5 | <0.5 | <0.5 | <0.5 | 0.023 | 0.023 | <0.5 | <0.5 | <0.5 | <0.5 | 0.052 | <0.5 | <0.5 | <0.5 | 0.052 |
| Mean value of detection | -- | -- | -- | -- | 0.023 | 0.023 | -- | -- | -- | -- | 0.052 | -- | -- | -- | 0.052 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Percent Detection | 0 | 0 | 0 | 0 | 17 | 5 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 4 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **2,6-Di-tert-benzoquinone** | | | | | | | | | | | | | | | |
| Minimum value | -- | <0.5 | 0.042 | 0.062 | <0.07 | 0.042 | <0.5 | <0.5 | <0.07 | 0.331 | 0.064 | <0.07 | <0.07 | 0.063 | 0.063 |
| Max value | -- | <0.5 | 0.140 | 0.140 | 0.130 | 0.140 | <0.5 | <0.5 | 0.331 | 0.331 | 0.170 | 0.200 | 0.110 | 0.130 | 0.200 |
| Mean value of detection | -- | -- | 0.091 | 0.101 | 0.105 | 0.099 | -- | -- | 0.331 | 0.331 | 0.117 | 0.127 | 0.095 | 0.097 | 0.114 |
| Median value of detection | -- | -- | -- | -- | -- | 0.105 | -- | -- | -- | -- | -- | 0.120 | -- | -- | 0.110 |
| Number of samples | -- | 2 | 17 | 16 | 16 | 51 | 2 | 3 | 8 | 13 | 15 | 17 | 16 | 18 | 66 |
| Number of detections | | 0 | 2 | 2 | 2 | 6 | 0 | 0 | 1 | 1 | 2 | 5 | 2 | 2 | 11 |
| Percent Detection | -- | 0 | 12 | 13 | 13 | 12 | 0 | 0 | 13 | 8 | 13 | 29 | 13 | 11 | 17 |
| LRL (or LRL range) | -- | 0.5 | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | 0.5 | 0.5 | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **2,6-Di-tert-butylphenol** | | | | | | | | | | | | | | | |
| Minimum value | -- | <0.15 | <0.09 | <0.09 | <0.08 | 0.130 | <0.15 | <0.15 | <0.08 | <0.08 | <0.09 | <0.09 | <0.09 | <0.09 | <0.09 |
| Max value | -- | <0.15 | <0.15 | 0.130 | <0.15 | 0.130 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 | <0.15 |
| Mean value of detection | -- | -- | -- | 0.130 | -- | 0.130 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | -- | 2 | 17 | 16 | 16 | 51 | 2 | 3 | 8 | 13 | 15 | 17 | 16 | 18 | 66 |
| Number of detections | -- | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent Detection | -- | 0 | 0 | 6 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | -- | 0.15 | (0.09-0.15) | (0.08-0.15) | (0.08-0.15) | (0.08-0.15) | 0.15 | 0.15 | (0.08-0.15) | (0.08-0.15) | (0.09-0.15) | (0.09-0.15) | (0.09-0.15) | (0.09-0.15) | (0.09-0.15) |
| **2,6-Dimethylnaphthalene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | 0.007 | 0.020 | 0.014 | 0.007 | <0.5 | <0.5 | 0.027 | 0.027 | 0.011 | 0.013 | 0.027 | 0.026 | 0.011 |
| Max value | <0.5 | <0.5 | 0.030 | 0.032 | 0.430 | 0.430 | <0.5 | <0.5 | 0.032 | 0.032 | 0.011 | 0.130 | 0.080 | 0.230 | 0.230 |
| Mean value of detection | -- | -- | 0.020 | 0.025 | 0.094 | 0.058 | -- | -- | 0.030 | 0.030 | 0.011 | 0.062 | 0.053 | 0.064 | 0.057 |
| Median value of detection | -- | -- | 0.023 | 0.024 | 0.029 | 0.025 | -- | -- | -- | -- | -- | 0.053 | 0.051 | 0.031 | 0.031 |
| Number of samples | 1 | 11 | 25 | 13 | 23 | 73 | 5 | 6 | 15 | 26 | 24 | 13 | 22 | 13 | 72 |
| Number of detections | 0 | 0 | 3 | 3 | 6 | 12 | 0 | 0 | 2 | 2 | 1 | 4 | 3 | 6 | 14 |
| Percent Detection | 0 | 0 | 12 | 23 | 26 | 16 | 0 | 0 | 13 | 8 | 4 | 31 | 14 | 46 | 19 |
| LRL (or LRL range) | 0.5 | 0.5 | (0.04-0.5) | (0.09-0.5) | (0.09-0.5) | (0.04-0.5) | 0.5 | 0.5 | 0.5 | 0.5 | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | (0.09-0.5) | (0.04-0.5) |
| **2-Methylnaphthalene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | 0.020 | 0.020 | <0.5 | <0.5 | <0.5 | <0.5 | 0.059 | <0.5 | <0.5 | <0.5 | 0.059 |
| Max value | <0.5 | <0.5 | <0.5 | <0.5 | 0.020 | 0.020 | <0.5 | <0.5 | <0.5 | <0.5 | 0.059 | <0.5 | <0.5 | <0.5 | 0.059 |
| Mean value of detection | -- | -- | -- | -- | 0.020 | 0.020 | -- | -- | -- | -- | 0.059 | -- | -- | -- | 0.059 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 30 |
| Number of detections | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Percent Detection | 0 | 0 | 0 | 0 | 9 | 5 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 3 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **3-tert-Butyl-4-hydroxyanisole (BHA)** | | | | | | | | | | | | | | | |
| Minimum value | <5 | <0.12 | 0.035 | 0.053 | 0.050 | 0.035 | <0.12 | <0.12 | <0.12 | <0.12 | 0.056 | 0.068 | <0.1 | 0.073 | 0.056 |
| Max value | <5 | <5 | 0.098 | 0.140 | 0.098 | 0.140 | <5 | <5 | <5 | <5 | 0.056 | 0.240 | 0.130 | 0.150 | 0.240 |
| Mean value of detection | -- | -- | 0.078 | 0.097 | 0.077 | 0.083 | -- | -- | -- | -- | 0.056 | 0.129 | 0.120 | 0.106 | 0.112 |
| Median value of detection | -- | -- | -- | -- | 0.084 | 0.084 | -- | -- | -- | -- | -- | 0.105 | -- | 0.084 | 0.110 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 95 |
| Number of detections | 0 | 0 | 2 | 2 | 3 | 7 | 0 | 0 | 0 | 0 | 1 | 4 | 2 | 5 | 9 |
| Percent Detection | 0 | 0 | 7 | 11 | 11 | 8 | 0 | 0 | 0 | 0 | 3 | 22 | 7 | 26 | 9 |
| LRL (or LRL range) | 5 | (0.12-5) | (0.1-5) | (0.1-5) | (0.1-5) | (0.1-5) | (0.12-5) | (0.12-5) | (0.12-5) | (0.12-5) | (0.1-5) | (0.1-5) | (0.1-5) | (0.1-5) | (0.1-5) |
| **3,4-Dichlorophenyl isocyanate** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.160 | 0.120 | 0.160 | 0.085 | 0.085 | 0.035 | 0.055 | 0.068 | 0.035 | 0.069 | -- | 0.044 | -- | 0.044 |
| Max value | <0.5 | 2.70 | 1.700 | 0.160 | 1.200 | 2.70 | 0.035 | 0.160 | 2.400 | 2.40 | 0.078 | -- | 0.400 | -- | 0.400 |
| Mean value of detection | -- | 0.620 | 0.538 | 0.160 | 0.381 | 0.495 | 0.035 | 0.108 | 0.719 | 0.540 | 0.047 | -- | 0.216 | -- | 0.132 |
| Median value of detection | -- | 0.210 | 0.300 | -- | 0.320 | 0.300 | -- | -- | 0.285 | 0.170 | -- | -- | 0.210 | -- | 0.074 |
| Number of samples | 1 | 8 | 10 | 1 | 9 | 29 | 2 | 2 | 8 | 12 | 10 | -- | 8 | -- | 18 |
| Number of detections | 0 | 7 | 9 | 1 | 8 | 25 | 1 | 2 | 8 | 11 | 4 | -- | 4 | -- | 8 |
| Percent Detection | 0 | 88 | 90 | 100 | 89 | 86 | 50 | 100 | 100 | 92 | 40 | -- | 50 | -- | 44 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **3-?-Coprostanol** | | | | | | | | | | | | | | | |
| Minimum value | <2 | <.6 | 0.035 | 0.100 | 0.078 | 0.035 | 1.27 | 0.510 | 0.410 | 0.410 | 0.180 | 0.390 | 0.100 | 0.100 | 0.100 |
| Max value | <2 | <2 | 3.50 | 3.35 | 5.20 | 5.20 | 1.27 | 1.80 | 8.00 | 8.00 | 9.70 | 31.0 | 7.60 | 1.52 | 31.0 |
| Mean value of detection | -- | -- | 1.190 | 0.843 | 1.000 | 1.04 | 1.27 | 1.05 | 3.88 | 3.08 | 1.86 | 6.68 | 1.740 | 0.426 | 2.30 |
| Median value of detection | -- | -- | 0.970 | 0.634 | 0.645 | 0.855 | -- | 0.990 | 4.15 | 2.45 | 0.650 | 3.09 | 0.812 | 0.190 | 0.730 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 0 | 25 | 16 | 19 | 60 | 1 | 7 | 20 | 28 | 11 | 8 | 14 | 14 | 47 |
| Percent Detection | 0 | 0 | 83 | 89 | 68 | 67 | 14 | 78 | 95 | 76 | 38 | 44 | 52 | 74 | 51 |
| LRL (or LRL range) | 2 | (0.6-2) | (0.6-2) | (0.6-2) | (0.6-2) | (0.6-2) | (0.6-2) | 2 | 2 | (0.6-2) | (0.6-2) | (0.6-0.8) | (0.6-2) | (0.6-0.8) | (0.6-2) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **3-Methyl-1H-indole (skatol)** | | | | | | | | | | | | | | | |
| Minimum value | <1 | <1 | 0.021 | <1 | <1 | 0.021 | <1 | 0.058 | 0.018 | 0.018 | <1 | <1 | <1 | <1 | <1 |
| Max value | <1 | <1 | 0.021 | <1 | <1 | 0.021 | <1 | 0.400 | 0.018 | 0.400 | <1 | <1 | <1 | <1 | <1 |
| Mean value of detection | -- | -- | 0.021 | -- | -- | 0.021 | -- | 0.201 | 0.018 | 0.171 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | 0.096 | -- | 0.079 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 5 | 1 | 6 | 0 | 0 | 0 | 0 | 0 |
| Percent Detection | 0 | 0 | 8 | 0 | 0 | 3 | 0 | 83 | 8 | 25 | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **4-Cumylphenol** | | | | | | | | | | | | | | | |
| Minimum value | <1 | <1 | <1 | <1 | 0.078 | 0.078 | <1 | <1 | <1 | <1 | 0.054 | <1 | <1 | <1 | 0.054 |
| Max value | <1 | <1 | <1 | <1 | 0.078 | 0.078 | <1 | <1 | <1 | <1 | 0.054 | <1 | <1 | <1 | 0.054 |
| Mean value of detection | -- | -- | -- | -- | 0.078 | 0.078 | -- | -- | -- | -- | 0.054 | -- | -- | -- | 0.054 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Percent Detection | 0 | 0 | 0 | 0 | 17 | 5 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 4 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **4-Nonylphenol** | | | | | | | | | | | | | | | |
| Minimum value | <5 | 0.281 | 0.390 | 0.350 | 0.400 | 0.281 | <0.70 | 0.530 | 0.520 | 0.520 | 0.396 | <0.5 | 0.451 | 0.400 | 0.396 |
| Max value | <5 | 0.348 | 4.74 | 2.10 | 1.63 | 4.74 | 0.642 | 1.44 | 3.91 | 1.98 | 1.40 | 1.20 | 3.00 | 2.40 | 3.00 |
| Mean value of detection | -- | 0.315 | 1.06 | 1.04 | 0.945 | 0.990 | 0.642 | 0.940 | 1.93 | 1.64 | 0.809 | 0.974 | 1.020 | 1.160 | 1.01 |
| Median value of detection | -- | -- | 0.804 | 0.890 | 0.790 | 0.790 | -- | 0.925 | 1.75 | 1.40 | 0.811 | 0.963 | 0.780 | 0.920 | 0.910 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 2 | 22 | 14 | 20 | 58 | 1 | 6 | 18 | 25 | 10 | 10 | 13 | 15 | 48 |
| Percent Detection | 0 | 15 | 73 | 78 | 71 | 64 | 14 | 67 | 86 | 68 | 37 | 56 | 48 | 79 | 52 |
| LRL (or LRL range) | 5 | 5 | (0.5-5) | (0.5-5) | (0.5-5) | (0.5-5) | 0.7 | 5 | 5 | (0.5-5) | (0.5-5) | (0.5-5) | (0.5-5) | (0.5-5) | (0.5-5) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **4-Octylphenol** | | | | | | | | | | | | | | | |
| Minimum value | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.054 | <1 | <1 | <1 | 0.054 |
| Max value | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.054 | <1 | <1 | <1 | 0.054 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.054 | -- | -- | -- | 0.054 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Percent Detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 4 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **4-tert-octylphenol** | | | | | | | | | | | | | | | |
| Minimum value | <1 | 0.031 | 0.034 | <1 | 0.039 | 0.039 | <1 | <1 | 0.057 | 0.057 | 0.075 | <1 | <1 | <1 | 0.075 |
| Max value | <1 | 0.031 | 0.120 | <1 | 0.120 | 0.120 | <1 | <1 | 0.280 | 0.280 | 0.083 | <1 | <1 | <1 | 0.083 |
| Mean value of detection | -- | 0.060 | 0.082 | -- | 0.080 | 0.080 | -- | -- | 0.165 | 0.165 | 0.079 | -- | -- | -- | 0.079 |
| Median value of detection | -- | -- | 0.093 | -- | -- | 0.091 | -- | -- | 0.150 | 0.150 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 2 | 3 | 0 | 2 | 7 | 0 | 0 | 5 | 5 | 2 | 0 | 0 | 0 | 2 |
| Percent Detection | 0 | 18 | 23 | 0 | 17 | 18 | 0 | 0 | 39 | 21 | 0 | 0 | 0 | 0 | 7 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **5-Methyl-1H-benzotriazole** | | | | | | | | | | | | | | | |
| Minimum value | <2 | 0.102 | <0.1 | 0.178 | 0.291 | <0.1 | 0.176 | 0.612 | 0.220 | 0.176 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Max value | <2 | 0.370 | 0.858 | 0.898 | 1.10 | 1.10 | 0.390 | 3.62 | 1.53 | 3.62 | 0.470 | 0.368 | 1.00 | 0.724 | 1.00 |
| Mean value of detection | -- | 0.195 | 0.518 | 0.381 | 0.492 | 0.432 | 0.265 | 1.23 | 0.706 | 0.765 | 0.326 | 0.273 | 0.525 | 0.439 | 0.390 |
| Median value of detection | -- | 0.113 | 0.472 | 0.301 | 0.334 | 0.359 | 0.248 | 0.745 | 0.509 | 0.560 | 0.406 | 0.340 | 0.482 | 0.445 | 0.411 |
| Number of samples | 1 | 13 | 18 | 7 | 17 | 56 | 7 | 9 | 19 | 35 | 19 | 6 | 16 | 7 | 48 |
| Number of detections | 0 | 3 | 7 | 6 | 8 | 24 | 4 | 6 | 13 | 23 | 6 | 3 | 4 | 4 | 17 |
| Percent Detection | 0 | 23 | 39 | 86 | 47 | 43 | 57 | 67 | 68 | 66 | 32 | 50 | 25 | 57 | 35 |
| LRL (or LRL range) | 2 | 2 | (0.1-2) | 2 | 2 | (0.1-2) | 2 | 2 | 2 | 2 | (0.1-2) | (0.1-2) | (0.1-2) | (0.1-0.15) | (0.1-2) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Acetophenone** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.088 | 0.070 | <0.1 | 0.032 | 0.032 | <0.22 | <0.22 | <0.1 | <0.1 | 0.049 | 0.052 | 0.050 | 0.088 | 0.049 |
| Max value | <0.5 | 0.150 | 0.260 | 0.221 | 0.300 | 0.300 | <0.5 | <0.5 | 0.183 | 0.183 | 0.280 | 0.340 | 0.733 | 0.270 | 0.733 |
| Mean value of detection | -- | 0.119 | 0.158 | 0.190 | 0.149 | 0.156 | -- | -- | 0.162 | 0.162 | 0.162 | 0.163 | 0.345 | 0.167 | 0.235 |
| Median value of detection | -- | -- | 0.150 | 0.210 | 0.140 | 0.150 | -- | -- | 0.160 | 0.161 | 0.130 | 0.150 | 0.290 | 0.155 | 0.160 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 2 | 5 | 3 | 7 | 17 | 0 | 0 | 5 | 5 | 5 | 5 | 9 | 4 | 23 |
| Percent Detection | 0 | 15 | 17 | 17 | 25 | 19 | 0 | 0 | 24 | 14 | 17 | 28 | 33 | 21 | 25 |
| LRL (or LRL range) | 0.5 | (0.22-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.22-0.5) | (0.22-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) |
| **Acetyl-hexamethyl-tetrahydro-naphthalene (AHTN)** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.070 | 0.068 | 0.081 | 0.042 | 0.042 | <0.5 | 0.100 | 0.059 | 0.059 | 0.058 | 0.049 | 0.064 | 0.120 | 0.049 |
| Max value | <0.5 | 0.690 | 0.590 | 0.230 | 0.580 | 0.690 | <0.5 | 1.600 | 0.820 | 1.60 | 0.066 | 0.049 | 0.410 | 0.120 | 0.410 |
| Mean value of detection | -- | 0.221 | 0.231 | 0.156 | 0.158 | 0.200 | -- | 0.708 | 0.438 | 0.524 | 0.062 | 0.049 | 0.237 | 0.120 | 0.128 |
| Median value of detection | -- | 0.155 | 0.170 | -- | 0.084 | 0.140 | -- | 0.695 | 0.460 | 0.460 | -- | -- | -- | -- | 0.066 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 10 | 13 | 2 | 12 | 37 | 0 | 6 | 13 | 19 | 2 | 1 | 2 | 1 | 6 |
| Percent Detection | 0 | 91 | 100 | 100 | 100 | 95 | 0 | 100 | 100 | 79 | 17 | 100 | 18 | 100 | 22 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Anthracene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.06 | 0.020 | 0.011 | 0.014 | 0.011 | <0.06 | <0.06 | <0.06 | 0.130 | 0.022 | 0.012 | 0.024 | 0.011 | 0.011 |
| Max value | <0.5 | <0.5 | 0.024 | 0.019 | 0.087 | 0.087 | <0.5 | 0.130 | <0.5 | 0.130 | 0.038 | 0.064 | 0.130 | 0.034 | 0.130 |
| Mean value of detection | -- | -- | 0.022 | 0.015 | 0.053 | 0.043 | -- | 0.130 | -- | 0.130 | 0.030 | 0.030 | 0.065 | 0.059 | 0.045 |
| Median value of detection | -- | -- | -- | -- | 0.044 | 0.027 | -- | -- | -- | -- | 0.029 | 0.016 | 0.042 | 0.027 | 0.029 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 0 | 2 | 2 | 11 | 15 | 0 | 1 | 0 | 1 | 4 | 5 | 3 | 6 | 18 |
| Percent Detection | 0 | 0 | 7 | 11 | 39 | 17 | 0 | 11 | 0 | 3 | 14 | 28 | 12 | 32 | 19 |
| LRL (or LRL range) | 0.5 | (0.06-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.06-0.5) | (0.06-0.5) | 0.5 | (0.06-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Anthraquinone** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.056 | 0.063 | 0.110 | 0.076 | 0.056 | 0.210 | 0.095 | 0.068 | 0.068 | 0.054 | <0.5 | 0.054 | <0.5 | 0.054 |
| Max value | <0.5 | 0.056 | 0.110 | 0.110 | 0.140 | 0.140 | 0.210 | 0.200 | 0.210 | 0.210 | 0.260 | <0.5 | 0.180 | <0.5 | 0.260 |
| Mean value of detection | -- | 0.056 | 0.064 | 0.110 | 0.076 | 0.072 | 0.210 | 0.148 | 0.124 | 0.139 | 0.088 | -- | 0.106 | -- | 0.096 |
| Median value of detection | -- | -- | 0.640 | -- | 0.076 | 0.075 | -- | -- | 0.096 | 0.110 | 0.079 | -- | 0.094 | -- | 0.081 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 1 | 5 | 1 | 4 | 11 | 1 | 2 | 6 | 9 | 9 | 0 | 7 | 0 | 16 |
| Percent Detection | 0 | 10 | 38 | 50 | 25 | 28 | 20 | 33 | 46 | 38 | 64 | 0 | 60 | 0 | 59 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Atrazine** | | | | | | | | | | | | | | | |
| Minimum value | 0.045 | 0.017 | 0.039 | 0.038 | 0.021 | 0.017 | 0.010 | 0.070 | 0.020 | 0.010 | 0.012 | -- | 0.031 | -- | 0.012 |
| Max value | 0.045 | 1.20 | 0.770 | 0.038 | 0.660 | 1.20 | 0.092 | 0.620 | 0.270 | 0.620 | 0.250 | -- | 0.500 | -- | 0.500 |
| Mean value of detection | 0.045 | 0.223 | 0.189 | 0.038 | 0.157 | 0.177 | 0.051 | 0.345 | 0.125 | 0.150 | 0.095 | -- | 0.079 | -- | 0.088 |
| Median value of detection | -- | 0.057 | 0.100 | -- | 0.092 | 0.087 | -- | -- | 0.100 | 0.091 | 0.070 | -- | 0.089 | -- | 0.078 |
| Number of samples | 1 | 8 | 10 | 1 | 9 | 29 | 2 | 2 | 8 | 12 | 10 | -- | 8 | -- | 18 |
| Number of detections | 1 | 7 | 9 | 1 | 8 | 26 | 2 | 2 | 8 | 12 | 8 | -- | 6 | -- | 14 |
| Percent Detection | 100 | 86 | 90 | 100 | 89 | 90 | 100 | 100 | 100 | 100 | 80 | -- | 75 | -- | 78 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Benzaldehyde** | | | | | | | | | | | | | | | |
| Minimum value | -- | -- | 2.600 | <0.1 | <0.1 | 2.60 | -- | -- | <0.15 | <0.15 | 0.200 | <0.1 | 0.290 | <0.1 | 0.100 |
| Max value | -- | -- | 2.600 | <0.15 | <0.15 | 2.60 | -- | -- | <0.15 | <0.15 | 0.200 | 0.380 | 0.290 | <0.15 | 0.380 |
| Mean value of detection | -- | -- | 2.600 | -- | -- | 2.60 | -- | -- | -- | -- | 0.200 | 0.360 | 0.290 | -- | 0.303 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.315 |
| Number of samples | -- | -- | 13 | 11 | 11 | 35 | -- | -- | 2 | 2 | 10 | 12 | 11 | 12 | 45 |
| Number of detections | -- | -- | 1 | 0 | 0 | 1 | -- | -- | 0 | 0 | 1 | 2 | 1 | 0 | 4 |
| Percent Detection | -- | -- | 8 | 0 | 0 | 3 | -- | -- | 0 | 0 | 10 | 17 | 9 | 0 | 9 |
| LRL (or LRL range) | -- | -- | 0.10 | (0.1-0.15) | (0.1-0.15) | (0.1-0.15) | -- | -- | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | (0.1-0.15) | (0.1-0.15) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | | **Benzo[a]pyrene** | | | | | | | | |
| Minimum value | <0.5 | <0.07 | 0.038 | 0.025 | 0.018 | 0.018 | <0.07 | 0.055 | 0.030 | 0.030 | 0.017 | 0.017 | 0.022 | 0.040 | 0.017 |
| Max value | <0.5 | <0.5 | 0.054 | 0.074 | 0.650 | 0.650 | <0.5 | 0.056 | 0.030 | 0.056 | 0.078 | 0.047 | 0.800 | 0.460 | 0.800 |
| Mean value of detection | -- | -- | 0.046 | 0.042 | 0.109 | 0.086 | -- | 0.056 | 0.030 | 0.047 | 0.066 | 0.051 | 0.157 | 0.250 | 0.106 |
| Median value of detection | -- | -- | -- | 0.035 | 0.043 | 0.040 | -- | -- | -- | 0.055 | 0.059 | 0.024 | 0.038 | -- | 0.047 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 0 | 2 | 4 | 12 | 18 | 0 | 2 | 1 | 3 | 9 | 5 | 7 | 2 | 23 |
| Percent Detection | 0 | 0 | 7 | 22 | 41 | 20 | 0 | 22 | 5 | 8 | 31 | 28 | 26 | 11 | 25 |
| LRL (or LRL range) | 0.5 | (0.07-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.07-0.5) | (0.07-0.5) | 0.5 | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) |
| | | | | | | | **Benzophenone** | | | | | | | | |
| Minimum value | <0.5 | 0.046 | 0.057 | 0.057 | 0.050 | 0.046 | <0.5 | 0.080 | 0.075 | 0.075 | 0.049 | <0.5 | 0.027 | 0.057 | 0.027 |
| Max value | <0.5 | 0.260 | 0.310 | 0.057 | 0.370 | 0.370 | <0.5 | 0.200 | 0.390 | 0.390 | 0.120 | <0.5 | 0.096 | 0.057 | 0.120 |
| Mean value of detection | -- | 0.094 | 0.151 | 0.057 | 0.138 | 0.127 | -- | 0.148 | 0.181 | 0.172 | 0.085 | -- | 0.067 | 0.057 | 0.071 |
| Median value of detection | -- | 0.059 | 0.100 | -- | 0.074 | 0.082 | -- | 0.155 | 0.160 | 0.160 | -- | -- | 0.073 | -- | 0.057 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 7 | 9 | 1 | 7 | 24 | 0 | 4 | 11 | 15 | 2 | 0 | 4 | 1 | 7 |
| Percent Detection | 0 | 64 | 69 | 50 | 58 | 62 | 0 | 67 | 85 | 63 | 14 | 0 | 36 | 100 | 26 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| | | | | | | | **Bis(2-ethylhexyl) adipate** | | | | | | | | |
| Minimum value | -- | <2 | <0.1 | <0.1 | <0.1 | 2.60 | -- | -- | <0.15 | <0.15 | 0.200 | <0.1 | 0.290 | <0.1 | 0.100 |
| Max value | -- | <2 | 2.60 | <0.1 | <0.15 | 2.60 | -- | -- | <0.15 | <0.15 | 0.200 | 0.380 | 0.290 | <0.15 | 0.380 |
| Mean value of detection | -- | -- | 2.60 | -- | -- | 2.60 | -- | -- | -- | -- | 0.200 | 0.360 | 0.290 | -- | 0.303 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.315 |
| Number of samples | -- | 2 | 12 | 3 | 14 | 31 | -- | -- | 2 | 2 | 15 | 4 | 19 | 9 | 47 |
| Number of detections | -- | 0 | 1 | 0 | 0 | 1 | -- | -- | 0 | 0 | 1 | 2 | 1 | 0 | 4 |
| Percent Detection | -- | 0 | 8 | 0 | 0 | 3 | -- | -- | 0 | 0 | 7 | 50 | 5 | 0 | 9 |
| LRL (or LRL range) | -- | 2 | 0.10 | 0.10 | (0.1-0.15) | (0.1-0.15) | -- | -- | 0.15 | 0.15 | (0.1-0.15) | 0.10 | (0.1-0.15) | (0.1-0.15) | (0.1-0.15) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Bis(2-ethylhexyl) phthalate** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 1.40 | <0.5 | <1.5 | <0.5 |
| Max value | <0.5 | 3.60 | 3.83 | <2.5 | <2.5 | 3.83 | 18.0 | <2.5 | 4.12 | 18.0 | 80.0 | 10.2 | 6.00 | 2.50 | 80.0 |
| Mean value of detection | -- | 2.50 | 2.62 | -- | -- | 2.56 | 18.0 | -- | 2.32 | 6.24 | 26.5 | 5.43 | 3.77 | 1.99 | 10.4 |
| Median value of detection | -- | -- | -- | -- | -- | 2.50 | -- | -- | 2.61 | 3.37 | 16.0 | 4.70 | 3.60 | 2.14 | 4.70 |
| Number of samples | 1 | 8 | 24 | 17 | 23 | 73 | 4 | 5 | 14 | 23 | 23 | 17 | 22 | 18 | 80 |
| Number of detections | 0 | 2 | 2 | 0 | 0 | 4 | 1 | 0 | 3 | 4 | 5 | 3 | 6 | 3 | 17 |
| Percent Detection | 0 | 25 | 8 | 0 | 0 | 5 | 25 | 0 | 21 | 17 | 22 | 18 | 27 | 17 | 21 |
| LRL (or LRL range) | 0.5 | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (0.5-2.5) | (1.5-2.5) | (0.5-2.5) | (1.5-2.5) | (0.5-2.5) |
| **Bisphenol A** | | | | | | | | | | | | | | | |
| Minimum value | <1 | 0.096 | 0.067 | 0.049 | 0.069 | 0.049 | 0.092 | 0.060 | 0.093 | 0.060 | 0.026 | 0.065 | 0.058 | 0.036 | 0.026 |
| Max value | <1 | 0.170 | 0.240 | 0.640 | 0.341 | 0.640 | 0.126 | 0.690 | 0.670 | 0.690 | 1.90 | 0.430 | 0.880 | 0.900 | 1.90 |
| Mean value of detection | -- | 0.135 | 0.114 | 0.211 | 0.166 | 0.171 | 0.104 | 0.269 | 0.218 | 0.221 | 0.365 | 0.186 | 0.212 | 0.237 | 0.251 |
| Median value of detection | -- | 0.140 | 0.087 | 0.160 | 0.160 | 0.140 | 0.094 | 0.160 | 0.146 | 0.142 | 0.110 | 0.165 | 0.142 | 0.160 | 0.150 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 3 | 7 | 16 | 23 | 49 | 3 | 8 | 14 | 25 | 14 | 10 | 18 | 17 | 59 |
| Percent Detection | 0 | 25 | 23 | 89 | 82 | 54 | 43 | 89 | 67 | 68 | 48 | 56 | 67 | 89 | 63 |
| LRL (or LRL range) | 1 | (0.9-1) | (0.9-1) | (0.9-1) | (0.9-1) | (0.9-1) | (0.9-1) | 1 | (0.9-1) | (0.9-1) | (0.9-1) | (0.9-1) | (0.9-1) | 0.90 | (0.9-1) |
| **Bromacil** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.036 | 0.049 | 0.036 | 0.048 | 0.036 | 0.200 | <0.5 | 0.200 | 0.200 | 0.038 | 0.058 | 0.210 | <0.5 | 0.038 |
| Max value | <0.5 | 0.058 | 0.210 | 0.036 | 0.210 | 0.210 | 0.200 | <0.5 | 0.200 | 0.200 | 0.890 | 0.058 | 0.330 | <0.5 | 0.890 |
| Mean value of detection | -- | 0.047 | 0.121 | 0.036 | 0.106 | 0.098 | 0.200 | -- | 0.200 | 0.200 | 0.373 | 0.058 | 0.313 | -- | 0.324 |
| Median value of detection | -- | -- | 0.092 | -- | 0.061 | 0.058 | -- | -- | -- | -- | 0.380 | -- | 0.330 | -- | 0.345 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 2 | 5 | 1 | 6 | 14 | 1 | 0 | 1 | 2 | 6 | 1 | 3 | 0 | 10 |
| Percent Detection | 0 | 20 | 38 | 50 | 50 | 36 | 20 | 0 | 8 | 8 | 43 | 100 | 27 | 0 | 37 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Butylated hydroxytoluene (BHT)** | | | | | | | | | | | | | | | |
| Minimum value | -- | <0.11 | <0.08 | <0.08 | <0.08 | <0.08 | <0.11 | <0.11 | <0.08 | 0.116 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 |
| Max value | -- | <0.11 | <0.11 | <0.11 | <0.11 | <0.11 | <0.11 | 0.116 | <0.11 | 0.116 | <0.11 | <0.11 | <0.11 | <0.11 | <-.11 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | 0.116 | -- | 0.116 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | -- | 2 | 17 | 16 | 16 | 51 | 2 | 3 | 8 | 13 | 15 | 17 | 16 | 18 | 66 |
| Number of detections | -- | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Percent Detection | -- | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | -- | 0.11 | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | 0.11 | 0.11 | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) |
| **Caffeine** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.048 | 0.084 | 0.120 | 0.160 | 0.048 | 0.048 | 0.044 | 0.073 | 0.044 | 0.047 | <0.08 | 0.139 | 0.089 | 0.047 |
| Max value | <0.5 | 0.140 | 2.70 | 1.23 | 1.50 | 2.70 | 0.140 | 0.107 | 3.22 | 3.22 | 4.80 | 5.00 | 4.50 | 5.00 | 5.00 |
| Mean value of detection | -- | 0.084 | 0.664 | 0.483 | 0.604 | 0.566 | 0.085 | 0.076 | 1.60 | 1.15 | 0.557 | 1.32 | 1.05 | 1.09 | 0.963 |
| Median value of detection | -- | 0.071 | 0.568 | 0.420 | 0.502 | 0.500 | 0.085 | 0.076 | 1.60 | 0.986 | 0.130 | 0.868 | 0.720 | 0.792 | 0.640 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 5 | 29 | 18 | 28 | 80 | 6 | 3 | 21 | 30 | 27 | 17 | 27 | 19 | 90 |
| Percent Detection | 0 | 38 | 97 | 100 | 100 | 89 | 86 | 33 | 100 | 81 | 93 | 94 | 100 | 100 | 97 |
| LRL (or LRL range) | 0.5 | (0.08-0.5) | 0.5 | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | 0.08 | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) |
| **Camphor** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.040 | 0.040 | 0.014 | <0.5 | 0.012 | <0.5 | 0.012 |
| Max value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.040 | 0.040 | 0.014 | <0.5 | 0.033 | <0.5 | 0.033 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | 0.040 | 0.040 | 0.014 | -- | 0.022 | -- | 0.018 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.014 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 2 | 0 | 4 |
| Percent Detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 4 | 0 | 0 | 18 | 0 | 15 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Carbaryl** | | | | | | | | | | | | | | | |
| Minimum value | <1 | 0.270 | 0.008 | <0.06 | 0.053 | 0.008 | <0.06 | <0.06 | <0.06 | <0.06 | 0.019 | 0.025 | 0.032 | 0.005 | 0.005 |
| Max value | <1 | 0.270 | 0.160 | <1 | 0.220 | 0.220 | <1 | <1 | <1 | <1 | 0.310 | 0.570 | 0.110 | 0.230 | 0.570 |
| Mean value of detection | -- | 0.270 | 0.077 | -- | 0.100 | 0.113 | -- | -- | -- | -- | 0.165 | 0.210 | 0.071 | 0.073 | 0.126 |
| Median value of detection | -- | -- | 0.062 | -- | 0.064 | 0.065 | -- | -- | -- | -- | -- | 0.034 | -- | 0.028 | 0.032 |
| Number of samples | 1 | 12 | 30 | 18 | 28 | 89 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 1 | 3 | 0 | 4 | 8 | 0 | 0 | 0 | 0 | 2 | 3 | 2 | 4 | 11 |
| Percent Detection | 0 | 8 | 10 | 0 | 14 | 9 | 0 | 0 | 0 | 0 | 7 | 17 | 7 | 21 | 12 |
| LRL (or LRL range) | 1 | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) | (0.06-1) |
| **Carbazole** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | 0.014 | <0.5 | 0.021 | 0.014 | 0.140 | <0.5 | <0.5 | 0.140 | 0.100 | <0.5 | 0.057 | <0.5 | 0.057 |
| Max value | <0.5 | <0.5 | 0.014 | <0.5 | 0.500 | 0.500 | 0.140 | <0.5 | <0.5 | 0.140 | 0.300 | <0.5 | 0.500 | <0.5 | 0.500 |
| Mean value of detection | -- | -- | 0.014 | -- | 0.070 | 0.052 | 0.140 | -- | -- | 0.140 | 0.122 | -- | 0.089 | -- | 0.111 |
| Median value of detection | -- | -- | -- | -- | 0.070 | 0.021 | -- | -- | -- | -- | 0.105 | -- | 0.100 | -- | 0.100 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 1 | 0 | 3 | 4 | 1 | 0 | 0 | 1 | 6 | 0 | 3 | 0 | 9 |
| Percent Detection | 0 | 0 | 8 | 0 | 25 | 10 | 20 | 0 | 0 | 4 | 43 | 0 | 27 | 0 | 33 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **cis-Chlordane** | | | | | | | | | | | | | | | |
| Minimum value | -- | <0.04 | <0.04 | 0.006 | 0.003 | 0.008 | <0.04 | <0.04 | <0.04 | <0.04 | 0.008 | 0.005 | 0.029 | 0.004 | 0.004 |
| Max value | -- | <0.04 | <0.04 | 0.006 | 0.020 | 0.046 | <0.04 | <0.04 | <0.04 | <0.04 | 0.046 | 0.130 | 0.056 | 0.042 | 0.130 |
| Mean value of detection | -- | -- | -- | 0.006 | 0.012 | 0.010 | -- | -- | -- | -- | 0.023 | 0.050 | 0.043 | 0.015 | 0.032 |
| Median value of detection | -- | -- | -- | -- | -- | 0.006 | -- | -- | -- | -- | 0.016 | 0.028 | -- | 0.009 | 0.022 |
| Number of samples | -- | 2 | 17 | 16 | 16 | 51 | 2 | 3 | 8 | 13 | 15 | 17 | 16 | 18 | 66 |
| Number of detections | -- | 0 | 0 | 1 | 2 | 3 | 0 | 0 | 0 | 0 | 3 | 6 | 2 | 6 | 17 |
| Percent Detection | -- | 0.0 | 0.0 | 0.06 | 0.13 | 0.06 | 0.0 | 0.0 | 0.0 | 0.0 | 0.20 | 0.35 | 0.13 | 0.33 | 0.26 |
| LRL (or LRL range) | -- | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Chlorpyrifos** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.02 | 0.017 | 0.007 | 0.006 | 0.006 | 0.007 | 0.017 | 0.016 | 0.007 | 0.020 | 0.008 | 0.007 | 0.009 | 0.007 |
| Max value | <0.5 | <0.5 | 0.056 | 0.049 | 0.006 | 0.056 | 0.007 | 0.025 | 0.048 | 0.048 | 0.065 | 0.110 | 0.100 | 0.088 | 0.110 |
| Mean value of detection | -- | -- | 0.037 | 0.028 | 0.006 | 0.027 | 0.007 | 0.021 | 0.032 | 0.023 | 0.043 | 0.038 | 0.053 | 0.028 | 0.039 |
| Median value of detection | -- | -- | -- | -- | -- | 0.017 | -- | 0.022 | -- | 0.020 | -- | 0.029 | 0.053 | 0.013 | 0.020 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 0 | 2 | 2 | 1 | 5 | 1 | 3 | 2 | 6 | 2 | 6 | 4 | 5 | 17 |
| Percent Detection | 0 | 0 | 7 | 11 | 4 | 6 | 14 | 33 | 10 | 16 | 7 | 33 | 15 | 26 | 18 |
| LRL (or LRL range) | 0.5 | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | 0.5 | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) | (0.02-0.5) |
| **Cholesterol** | | | | | | | | | | | | | | | |
| Minimum value | <2 | 0.590 | 0.160 | 0.210 | 0.100 | 0.100 | 0.640 | 0.580 | 0.780 | 0.580 | 0.157 | 0.505 | 0.150 | 0.200 | 0.150 |
| Max value | <2 | 1.90 | 6.40 | 5.05 | 9.50 | 9.50 | 2.60 | 3.80 | 16.0 | 16.0 | 8.30 | 180 | 21.6 | 9.74 | 180 |
| Mean value of detection | -- | 1.06 | 2.36 | 1.80 | 1.90 | 2.01 | 1.59 | 1.76 | 6.20 | 4.57 | 1.88 | 16.55 | 3.82 | 2.53 | 5.26 |
| Median value of detection | -- | 0.875 | 1.91 | 1.30 | 1.25 | 1.45 | 1.56 | 1.70 | 6.22 | 3.60 | 1.26 | 3.20 | 2.64 | 2.00 | 1.80 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 4 | 25 | 14 | 19 | 62 | 4 | 8 | 21 | 33 | 22 | 13 | 22 | 15 | 72 |
| Percent Detection | 0 | 31 | 83 | 78 | 68 | 69 | 57 | 89 | 100 | 89 | 76 | 72 | 81 | 79 | 77 |
| LRL (or LRL range) | 2 | (1.5-2) | (1.5-2) | (1.5-2) | (1-2) | (1-2) | (1.5-2) | 1.5 | (1.5-2) | (1.5-2) | (1-2) | (1-1.5) | (1-2) | (1-1.5) | (1-2) |
| **Codeine** | | | | | | | | | | | | | | | |
| Minimum value | -- | <0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.20 | 0.302 | 0.092 | 0.092 | 0.240 | <0.1 | <0.1 | 0.089 | 0.089 |
| Max value | -- | <0.2 | 0.398 | 0.440 | 0.280 | 0.440 | 0.222 | 0.421 | 0.462 | 0.462 | 0.240 | 0.571 | 0.240 | 1.00 | 1.00 |
| Mean value of detection | -- | -- | 0.273 | 0.283 | 0.201 | 0.259 | 0.222 | 0.372 | 0.343 | 0.340 | 0.240 | 0.336 | 0.185 | 0.426 | 0.320 |
| Median value of detection | -- | -- | 0.248 | 0.285 | 0.162 | 0.240 | -- | 0.394 | 0.420 | 0.394 | -- | -- | -- | 0.190 | 0.215 |
| Number of samples | -- | 2 | 14 | 14 | 15 | 45 | 2 | 3 | 8 | 13 | 13 | 14 | 14 | 15 | 56 |
| Number of detections | -- | 0 | 6 | 4 | 3 | 13 | 1 | 3 | 7 | 11 | 1 | 2 | 2 | 3 | 8 |
| Percent Detection | -- | 0 | 43 | 29 | 20 | 29 | 50 | 100 | 88 | 85 | 8 | 14 | 14 | 20 | 14 |
| LRL (or LRL range) | -- | 0.2 | (0.1-0.2) | (0.1-0.2) | (0.1-0.2) | (0.1-0.2) | 0.2 | 0.2 | 0.1 | (0.1-0.2) | (0.1-0.2) | (0.1-0.2) | (0.1-0.2) | (0.1-0.2) | (0.1-0.2) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Cotinine** | | | | | | | | | | | | | | | |
| Minimum value | <1 | <0.08 | <0.04 | 0.050 | <0.04 | <0.04 | 0.095 | 0.060 | 0.090 | 0.060 | <0.04 | 0.012 | <0.04 | 0.013 | 0.012 |
| Max value | <1 | 0.220 | 0.810 | 0.172 | 0.590 | 0.810 | 0.095 | 0.110 | 0.370 | 0.370 | 0.720 | 0.273 | 0.740 | 0.336 | 0.740 |
| Mean value of detection | -- | 0.190 | 0.189 | 0.112 | 0.178 | 0.173 | 0.095 | 0.085 | 0.153 | 0.140 | 0.278 | 0.123 | 0.236 | 0.704 | 0.210 |
| Median value of detection | -- | -- | 0.120 | 0.114 | 0.108 | 0.120 | -- | -- | 0.131 | 0.124 | 0.180 | 0.084 | 0.160 | 0.700 | 0.150 |
| Number of samples | 1 | 13 | 18 | 7 | 17 | 56 | 7 | 9 | 19 | 35 | 19 | 6 | 16 | 7 | 48 |
| Number of detections | 0 | 2 | 10 | 4 | 8 | 24 | 1 | 2 | 12 | 15 | 5 | 3 | 8 | 4 | 20 |
| Percent Detection | 0 | 15 | 56 | 57 | 47 | 43 | 14 | 22 | 63 | 43 | 26 | 50 | 50 | 57 | 42 |
| LRL (or LRL range) | 1 | (0.08-1) | (0.04-1) | (0.04-1) | (0.04-1) | (0.04-1) | (0.08-1) | (0.08-1) | 1 | (0.08-1) | (0.04-1) | (0.04-0.08) | (0.04-1) | (0.04-0.08) | (0.04-1) |
| **Diazinon** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.010 | 0.004 | 0.011 | 0.010 | 0.004 | 0.020 | 0.068 | 0.012 | 0.012 | 0.011 | 0.029 | 0.013 | 0.020 | 0.011 |
| Max value | <0.5 | 0.140 | 0.144 | 0.180 | 0.172 | 0.180 | 0.060 | 0.580 | 0.550 | 0.600 | 0.391 | 0.391 | 0.350 | 0.346 | 0.391 |
| Mean value of detection | -- | 0.071 | 0.066 | 0.064 | 0.074 | 0.069 | 0.237 | 0.260 | 0.182 | 0.217 | 0.098 | 0.091 | 0.129 | 0.132 | 0.114 |
| Median value of detection | -- | 0.056 | 0.054 | 0.050 | 0.065 | 0.053 | 0.233 | 0.125 | 0.101 | 0.128 | 0.049 | 0.052 | 0.066 | 0.070 | 0.062 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 8 | 22 | 11 | 17 | 58 | 5 | 6 | 10 | 21 | 11 | 12 | 14 | 13 | 50 |
| Percent Detection | 0 | 62 | 73 | 61 | 63 | 64 | 71 | 67 | 48 | 57 | 38 | 67 | 52 | 68 | 54 |
| LRL (or LRL range) | 0.5 | 0.5 | (0.03-0.5) | 0.03 | (0.03-0.5) | (0.03-0.5) | 0.5 | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | 0.03 | (0.03-0.5) | 0.03 | (0.03-0.5) |
| **Dichlorvos** | | | | | | | | | | | | | | | |
| Minimum value | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.190 | <1 | 0.190 | <1 | <1 | <1 | <1 | <1 |
| Max value | <1 | <1 | <1 | <1 | <1 | <1 | <1 | 0.200 | <1 | 0.200 | <1 | <1 | <1 | <1 | <1 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | 0.195 | -- | 0.195 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| Percent Detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | | **Dieldrin** | | | | | | | | |
| Minimum value | -- | <0.08 | <0.08 | <0.08 | 0.011 | 0.011 | <0.08 | <0.08 | <0.08 | <0.08 | 0.018 | 0.010 | 0.030 | 0.012 | 0.010 |
| Max value | -- | <0.08 | <0.08 | <0.08 | 0.011 | 0.011 | <0.08 | <0.08 | <0.08 | <0.08 | 0.420 | 0.300 | 0.210 | 0.150 | 0.420 |
| Mean value of detection | -- | -- | -- | -- | 0.011 | 0.011 | -- | -- | -- | -- | 0.110 | 0.119 | 0.132 | 0.06 | 0.102 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.029 | 0.081 | 0.144 | 0.05 | 0.068 |
| Number of samples | -- | 2 | 17 | 16 | 16 | 51 | 2 | 3 | 8 | 13 | 15 | 17 | 16 | 18 | 66 |
| Number of detections | -- | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 5 | 6 | 4 | 6 | 21 |
| Percent Detection | -- | 0 | 0 | 0 | 6 | 2 | 0 | 0 | 0 | 0 | 33 | 35 | 25 | 33 | 32 |
| LRL (or LRL range) | -- | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| | | | | | | | **Diethylphthalate** | | | | | | | | |
| Minimum value | 1.30 | <0.35 | 0.350 | 0.221 | 0.110 | 0.110 | <0.35 | <0.35 | 0.220 | 0.220 | <0.25 | <0.25 | 0.231 | <0.35 | 0.231 |
| Max value | 1.30 | 1.20 | 0.350 | 0.221 | 0.358 | 1.30 | <0.5 | <0.5 | 0.370 | 0.370 | <0.5 | <0.35 | 0.260 | 0.460 | |
| Mean value of detection | 1.30 | 1.20 | 0.350 | 0.221 | 0.274 | 0.521 | -- | -- | 0.295 | 0.295 | -- | -- | 0.246 | 0.460 | 0.317 |
| Median value of detection | -- | -- | -- | -- | 0.314 | 0.344 | -- | -- | -- | -- | -- | -- | -- | -- | 0.260 |
| Number of samples | 1 | 9 | 14 | 6 | 14 | 44 | 4 | 5 | 13 | 22 | 13 | 5 | 12 | 6 | 36 |
| Number of detections | 1 | 1 | 1 | 1 | 5 | 9 | 0 | 0 | 2 | 2 | 0 | 0 | 2 | 1 | 3 |
| Percent Detection | 100 | 11 | 7 | 17 | 36 | 20 | 0 | 0 | 15 | 9 | 0 | 0 | 17 | 17 | 8 |
| LRL (or LRL range) | 0.35 | (0.35-0.5) | (0.25-0.5) | (0.25-0.5) | (0.25-0.5) | (0.25-0.5) | (0.35-0.5) | (0.35-0.5) | (0.25-0.5) | (0.25-0.5) | (0.25-0.5) | (0.25-0.35) | (0.25-0.5) | (0.25-0.5) | (0.25-0.5) |
| | | | | | | | **d-Limonene** | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.034 | <0.5 | <0.5 | <0.5 | 0.034 |
| Max value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.036 | <0.5 | <0.5 | <0.5 | 0.036 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.035 | -- | -- | -- | 0.035 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| Percent Detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 7 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Fluoranthene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.017 | 0.027 | 0.025 | 0.030 | 0.017 | 0.040 | <0.03 | 0.022 | 0.022 | 0.022 | 0.029 | 0.024 | 0.027 | 0.022 |
| Max value | <0.5 | 0.061 | 0.270 | 0.270 | 1.80 | 1.80 | 0.043 | <0.5 | 0.138 | 0.138 | 0.590 | 0.550 | 3.00 | 1.10 | 3.00 |
| Mean value of detection | -- | 0.035 | 0.074 | 0.085 | 0.248 | 0.138 | 0.042 | -- | 0.052 | 0.051 | 0.128 | 0.137 | 0.257 | 0.141 | 0.168 |
| Median value of detection | -- | 0.036 | 0.048 | 0.064 | 0.100 | 0.064 | -- | -- | 0.044 | 0.430 | 0.079 | 0.071 | 0.077 | 0.070 | 0.073 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 4 | 18 | 14 | 21 | 57 | 2 | 0 | 13 | 15 | 23 | 15 | 21 | 17 | 76 |
| Percent Detection | 0 | 31 | 60 | 78 | 75 | 63 | 29 | 0 | 62 | 41 | 79 | 83 | 78 | 89 | 82 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | 0.5 | (0.03-0.5) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) |
| **Hexahydrohexamethylcyclopentabenzopyran (HHCB)** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.034 | 0.035 | <0.5 | 0.030 | 0.030 | 0.068 | 0.068 | 0.065 | 0.065 | 0.095 | <0.5 | 0.044 | <0.5 | 0.044 |
| Max value | <0.5 | 0.110 | 0.120 | <0.5 | 0.180 | 0.180 | 0.068 | 0.350 | 0.150 | 0.350 | 0.095 | <0.5 | 0.070 | <0.5 | 0.095 |
| Mean value of detection | -- | 0.075 | 0.069 | -- | 0.070 | 0.071 | 0.068 | 0.158 | 0.109 | 0.123 | 0.095 | -- | 0.057 | -- | 0.070 |
| Median value of detection | -- | 0.078 | 0.047 | -- | 0.047 | 0.049 | -- | 0.126 | 0.100 | 0.098 | -- | -- | -- | -- | 0.070 |
| Number of samples | 1 | 11 | 12 | 2 | 12 | 38 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 4 | 7 | 0 | 5 | 16 | 1 | 6 | 11 | 18 | 1 | 0 | 2 | 0 | 3 |
| Percent Detection | 0 | 36 | 55 | 0 | 42 | 42 | 20 | 100 | 85 | 75 | 7 | 0 | 18 | 0 | 11 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Indole** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.023 | <0.5 | <0.5 | <0.5 | 0.023 | <0.5 | 0.020 | <0.5 | 0.020 | 0.028 | <0.5 | <0.5 | <0.5 | 0.028 |
| Max value | <0.5 | 0.023 | <0.5 | <0.5 | <0.5 | 0.023 | <0.5 | 0.024 | <0.5 | 0.024 | 0.028 | <0.5 | <0.5 | <0.5 | 0.028 |
| Mean value of detection | -- | 0.023 | -- | -- | -- | 0.023 | -- | 0.022 | -- | 0.022 | 0.028 | -- | -- | -- | 0.028 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 2 | 1 | 0 | 0 | 0 | 1 |
| Percent Detection | 0 | 9 | 0 | 0 | 0 | 3 | 0 | 33 | 0 | 8 | 7 | 0 | 0 | 0 | 4 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Isoborneol** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | 0.093 | 0.093 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Max value | <0.5 | <0.5 | <0.5 | <0.5 | 0.093 | 0.093 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Mean value of detection | -- | -- | -- | -- | 0.093 | 0.093 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent Detection | 0 | 0 | 0 | 0 | 8 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Isophorone** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.005 | 0.012 | <0.5 | <0.5 | 0.012 | <0.5 | <0.5 | 0.014 | 0.014 | 0.018 | <0.5 | 0.008 | <0.5 | 0.008 |
| Max value | <0.5 | 0.005 | 0.039 | <0.5 | <0.5 | 0.039 | <0.5 | <0.5 | 0.014 | 0.014 | 0.035 | <0.5 | 0.037 | <0.5 | 0.037 |
| Mean value of detection | -- | 0.005 | 0.026 | -- | -- | 0.016 | -- | -- | 0.014 | 0.014 | 0.260 | -- | 0.022 | -- | 0.025 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.027 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 1 | 2 | 0 | 0 | 3 | 0 | 0 | 1 | 1 | 2 | 0 | 2 | 0 | 4 |
| Percent Detection | 0 | 9 | 15 | 0 | 0 | 8 | 0 | 0 | 8 | 4 | 14 | 0 | 18 | 0 | 15 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Isopropylbenzene (cumene)** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Max value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent Detection | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Isoquinoline** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.088 | 0.110 | 0.057 | 0.082 | 0.057 | <0.5 | <0.5 | <0.5 | <0.5 | 0.140 | <0.5 | 0.240 | <0.5 | 0.140 |
| Max value | <0.5 | 0.088 | 0.110 | 0.057 | 0.140 | 0.140 | <0.5 | <0.5 | <0.5 | <0.5 | 0.140 | <0.5 | 0.240 | <0.5 | 0.240 |
| Mean value of detection | -- | 0.088 | 0.110 | 0.057 | 0.111 | 0.095 | -- | -- | -- | -- | 0.140 | -- | 0.240 | -- | 0.190 |
| Median value of detection | -- | -- | -- | -- | | 0.088 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 1 | 1 | 1 | 3 | 6 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 |
| Percent Detection | 0 | 9 | 8 | 50 | 25 | 15 | 0 | 0 | 0 | 0 | 7 | 0 | 9 | 0 | 7 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Lindane** | | | | | | | | | | | | | | | |
| Minimum value | -- | 0.008 | <0.05 | 0.008 | 0.010 | 0.008 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Max value | -- | 0.008 | <0.05 | 0.008 | 0.010 | 0.010 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <.005 | <0.05 | <0.05 |
| Mean value of detection | -- | 0.008 | -- | 0.008 | 0.010 | 0.009 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | 0.008 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | -- | 2 | 17 | 16 | 16 | 51 | 2 | 3 | 8 | 13 | 15 | 17 | 16 | 18 | 66 |
| Number of detections | -- | 1 | 0 | 1 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent Detection | -- | 50 | 0 | 6 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | -- | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| **Menthol** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | 0.220 | <0.5 | 0.210 | 0.210 | <0.5 | <0.5 | 0.180 | 0.180 | 0.160 | <0.5 | 0.190 | <0.5 | 0.160 |
| Max value | <0.5 | <0.5 | 0.220 | <0.5 | 0.290 | 0.290 | <0.5 | <0.5 | 0.320 | 0.320 | 0.160 | <0.5 | 0.190 | <0.5 | 0.190 |
| Mean value of detection | -- | -- | 0.220 | -- | 0.250 | 0.192 | -- | -- | 0.231 | 0.231 | 0.160 | -- | 0.190 | -- | 0.180 |
| Median value of detection | -- | -- | -- | -- | -- | 0.215 | -- | -- | 0.220 | 0.220 | -- | -- | -- | -- | 0.190 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 2 | 0 | 3 | 5 | 0 | 0 | 7 | 7 | 1 | 0 | 2 | 0 | 3 |
| Percent Detection | 0 | 0 | 15 | 0 | 25 | 13 | 0 | 0 | 54 | 29 | 7 | 0 | 18 | 0 | 11 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Metalaxyl** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.073 | <0.5 | <0.5 | 0.049 | 0.049 | <0.5 | <0.5 | <0.5 | <0.5 | 0.240 | <0.5 | 0.100 | <0.5 | 0.240 |
| Max value | <0.5 | 0.073 | <0.5 | <0.5 | 0.053 | 0.053 | <0.5 | <0.5 | <0.5 | <0.5 | 0.240 | <0.5 | 0.100 | <0.5 | 0.240 |
| Mean value of detection | -- | 0.073 | -- | -- | 0.051 | 0.058 | -- | -- | -- | -- | 0.240 | -- | 0.100 | -- | 0.147 |
| Median value of detection | -- | -- | -- | -- | -- | 0.053 | -- | -- | -- | -- | -- | -- | . | -- | 0.100 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 1 | 0 | 0 | 2 | 3 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 3 |
| Percent Detection | 0 | 9 | 0 | 0 | 17 | 8 | 0 | 0 | 0 | 0 | 14 | 0 | 9 | 0 | 11 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Methylsalicylate** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.052 | 0.017 | <0.5 | <0.5 | 0.017 | <0.5 | 0.037 | 0.099 | 0.037 | 0.042 | <0.5 | 0.023 | <0.5 | 0.023 |
| Max value | <0.5 | 0.052 | 0.024 | <0.5 | <0.5 | 0.052 | <0.5 | 0.100 | 0.099 | 0.100 | 0.091 | <0.5 | 0.023 | <0.5 | 0.091 |
| Mean value of detection | -- | 0.052 | 0.024 | -- | -- | 0.033 | -- | 0.079 | 0.099 | 0.084 | 0.091 | -- | 0.023 | -- | 0.068 |
| Median value of detection | -- | -- | -- | -- | -- | 0.030 | -- | 0.099 | -- | 0.099 | -- | -- | -- | -- | 0.042 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 1 | 2 | 0 | 0 | 3 | 0 | 3 | 1 | 4 | 2 | 0 | 1 | 0 | 3 |
| Percent Detection | 0 | 9 | 15 | 0 | 0 | 8 | 0 | 50 | 8 | 17 | 14 | 0 | 9 | 0 | 11 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Metolachlor** | | | | | | | | | | | | | | | |
| Minimum value | 0.006 | 0.007 | 0.010 | 0.012 | 0.010 | 0.006 | 0.004 | 0.029 | 0.023 | 0.004 | 0.012 | 0.055 | 0.019 | 0.038 | 0.012 |
| Max value | 0.006 | 0.360 | 0.240 | 0.028 | 0.200 | 0.360 | 0.045 | 0.270 | 0.200 | 0.270 | 0.150 | 0.055 | 0.063 | 0.038 | 0.150 |
| Mean value of detection | 0.006 | 0.066 | 0.077 | 0.020 | 0.053 | 0.059 | 0.026 | 0.152 | 0.072 | 0.085 | 0.046 | 0.055 | 0.036 | 0.038 | 0.043 |
| Median value of detection | -- | 0.013 | 0.044 | -- | 0.026 | 0.028 | 0.027 | 0.155 | 0.050 | 0.042 | 0.032 | -- | 0.039 | -- | 0.039 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 1 | 7 | 12 | 2 | 11 | 33 | 4 | 6 | 12 | 22 | 9 | 1 | 5 | 1 | 16 |
| Percent Detection | 100 | 64 | 92 | 100 | 92 | 85 | 80 | 100 | 92 | 92 | 64 | 100 | 45 | 100 | 59 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | | **N,N-diethyl-meta-toluamide (DEET)** | | | | | | | | |
| Minimum value | <0.5 | 0.056 | 0.100 | 0.090 | 0.089 | 0.056 | <.08 | 0.051 | 0.083 | 0.051 | 0.040 | 0.034 | 0.028 | 0.045 | 0.028 |
| Max value | <0.5 | 0.240 | 0.900 | 0.24 | 0.360 | 2.00 | 0.127 | 0.430 | 1.70 | 1.70 | 0.320 | 0.370 | 0.370 | 0.260 | 0.370 |
| Mean value of detection | -- | 0.147 | 0.287 | 0.180 | 0.198 | 0.224 | 0.163 | 0.188 | 0.428 | 0.343 | 0.146 | 0.190 | 0.170 | 0.138 | 0.158 |
| Median value of detection | -- | 0.150 | 0.190 | 0.205 | 0.186 | 0.192 | 0.127 | 0.182 | 0.290 | 0.220 | 0.103 | 0.176 | 0.135 | 0.136 | 0.135 |
| Number of samples | 1 | 13 | 18 | 7 | 17 | 56 | 7 | 9 | 19 | 35 | 19 | 6 | 16 | 7 | 48 |
| Number of detections | 0 | 5 | 17 | 6 | 16 | 44 | 3 | 7 | 19 | 29 | 14 | 5 | 13 | 7 | 39 |
| Percent Detection | 0 | 38 | 94 | 86 | 94 | 79 | 43 | 78 | 100 | 83 | 74 | 83 | 81 | 100 | 81 |
| LRL (or LRL range) | 0.5 | (0.08-0.5) | 0.5 | 0.5 | 0.5 | (0.08-0.5) | (0.08-0.5) | 0.5 | 0.5 | (0.08-0.5) | (0.04-0.5) | 0.08 | 0.5 | 0.5 | (0.04-0.5) |
| | | | | | | | **Naphthalene** | | | | | | | | |
| Minimum value | <0.5 | <0.03 | 0.019 | 0.018 | <0.03 | 0.018 | <0.03 | 0.026 | 0.018 | 0.018 | 0.018 | 0.023 | <0.03 | 0.017 | 0.017 |
| Max value | <0.5 | <0.5 | 0.035 | 0.048 | 2.190 | 2.19 | <0.5 | 0.038 | 0.041 | 0.041 | 0.840 | 0.082 | 0.077 | 0.680 | 0.840 |
| Mean value of detection | -- | -- | 0.027 | 0.031 | 0.498 | 0.376 | -- | 0.033 | 0.029 | 0.031 | 0.202 | 0.039 | 0.044 | 0.049 | 0.094 |
| Median value of detection | -- | -- | 0.027 | 0.027 | 0.200 | 0.068 | -- | 0.036 | 0.028 | 0.032 | 0.022 | 0.035 | 0.046 | 0.023 | 0.031 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 0 | 3 | 3 | 17 | 23 | 0 | 3 | 3 | 6 | 7 | 6 | 4 | 5 | 22 |
| Percent Detection | 0 | 0 | 10 | 17 | 61 | 26 | 0 | 33 | 15 | 16 | 24 | 33 | 15 | 26 | 24 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) |
| | | | | | | | **Nonylphenol monoethoxylate** | | | | | | | | |
| Minimum value | <5 | 0.969 | <0.08 | <0.08 | <0.08 | <0.08 | <1 | 0.800 | 0.400 | 0.400 | <0.08 | 0.260 | <0.08 | 0.142 | <0.08 |
| Max value | <5 | 1.06 | 4.74 | 2.00 | 2.35 | 5.00 | 2.50 | 4.27 | 6.34 | 6.34 | 1.40 | 5.40 | 3.90 | 1.87 | 5.40 |
| Mean value of detection | -- | 1.02 | 1.43 | 1.13 | 0.916 | 1.17 | 2.50 | 2.68 | 3.07 | 2.95 | 0.674 | 1.42 | 1.40 | 0.791 | 1.03 |
| Median value of detection | -- | -- | 1.48 | 1.40 | 0.570 | 0.985 | -- | 3.66 | 2.00 | 2.50 | 0.595 | 0.925 | 1.05 | 0.699 | 0.800 |
| Number of samples | 1 | 10 | 27 | 17 | 25 | 80 | 4 | 5 | 16 | 25 | 25 | 17 | 24 | 18 | 84 |
| Number of detections | 0 | 2 | 19 | 11 | 17 | 49 | 1 | 5 | 15 | 21 | 12 | 10 | 10 | 15 | 47 |
| Percent Detection | 0 | 20 | 73 | 65 | 68 | 61 | 25 | 100 | 94 | 84 | 52 | 59 | 43 | 83 | 56 |
| LRL (or LRL range) | 5 | (2-5) | (0.08-5) | (0.08-5) | (0.08-5) | (0.08-5) | (1-5) | 5 | 5 | (1-5) | (0.08-5) | (0.08-1) | (0.08-1) | 1 | (0.08-1) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Nonylphenol diethoxylate** | | | | | | | | | | | | | | | |
| Minimum value | <5 | 1.18 | 0.057 | 0.080 | 0.160 | 0.057 | <1 | 2.60 | 1.40 | 1.10 | 0.142 | 0.100 | 0.171 | 0.172 | 0.100 |
| Max value | <5 | 1.52 | 7.30 | 2.40 | 6.20 | 7.30 | 3.37 | 15.0 | 16.0 | 16.0 | 3.30 | 4.90 | 1.91 | 3.80 | 4.90 |
| Mean value of detection | -- | 1.35 | 2.31 | 1.19 | 1.52 | 1.79 | 3.37 | 8.05 | 6.14 | 6.62 | 1.18 | 1.52 | 1.01 | 0.902 | 1.16 |
| Median value of detection | -- | -- | 1.80 | 1.34 | 0.736 | 1.43 | -- | 7.81 | 5.33 | 5.35 | 0.722 | 0.696 | 0.930 | 0.653 | 0.726 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 2 | 21 | 10 | 16 | 49 | 1 | 9 | 20 | 30 | 9 | 10 | 10 | 9 | 38 |
| Percent Detection | 0 | 15 | 70 | 56 | 57 | 54 | 14 | 100 | 95 | 81 | 33 | 56 | 38 | 47 | 41 |
| LRL (or LRL range) | 5 | 5 | (1-5) | (1-5) | 1 | (1-5) | (1-5) | 5 | 5 | 5 | (1-5) | 1 | (1-5) | 1 | (1-5) |
| **Octylphenol monoethoxylate** | | | | | | | | | | | | | | | |
| Minimum value | <1 | 0.263 | 0.068 | 0.032 | 0.054 | 0.032 | <0.1 | 0.178 | 0.078 | 0.078 | 0.091 | 0.035 | 0.021 | 0.075 | 0.021 |
| Max value | <1 | 0.264 | 0.490 | 0.450 | 1.10 | 1.10 | 0.714 | 0.347 | 1.36 | 1.36 | 0.700 | 0.650 | 0.800 | 0.450 | 0.800 |
| Mean value of detection | -- | 0.264 | 0.309 | 0.195 | 0.310 | 0.280 | 0.714 | 0.252 | 0.452 | 0.433 | 0.315 | 0.282 | 0.297 | 0.160 | 0.275 |
| Median value of detection | -- | -- | 0.320 | 0.151 | 0.265 | 0.263 | -- | 0.232 | 0.398 | 0.357 | 0.225 | 0.220 | 0.260 | 0.102 | 0.220 |
| Number of samples | 1 | 13 | 27 | 16 | 27 | 84 | 7 | 9 | 21 | 37 | 27 | 15 | 25 | 16 | 83 |
| Number of detections | 0 | 2 | 9 | 6 | 11 | 28 | 1 | 3 | 14 | 18 | 10 | 9 | 8 | 6 | 33 |
| Percent Detection | 0 | 15 | 35 | 38 | 41 | 33 | 14 | 33 | 67 | 49 | 32 | 60 | 32 | 38 | 40 |
| LRL (or LRL range) | 1 | 1 | (0.1-1) | (0.1-1) | (0.1-1) | (0.1-1) | (0.1-1) | 1 | 1 | (0.1-1) | (0.1-1) | (0.1-1) | (0.1-1) | (0.1-1) | (0.1-1) |
| **Octylphenol diethoxylate** | | | | | | | | | | | | | | | |
| Minimum value | <1 | <0.2 | 0.014 | 0.010 | 0.027 | 0.010 | 0.149 | <0.2 | 0.072 | 0.072 | 0.021 | 0.035 | 0.008 | 0.033 | 0.008 |
| Max value | <1 | <1 | 0.180 | 0.051 | 0.070 | 1.00 | 0.149 | <1 | 1.80 | 1.80 | 0.200 | 0.072 | 0.800 | 0.740 | 1.00 |
| Mean value of detection | -- | -- | 0.089 | 0.035 | 0.082 | 0.077 | 0.149 | -- | 0.504 | 0.479 | 0.091 | 0.067 | 0.082 | 0.278 | 0.105 |
| Median value of detection | -- | -- | 0.085 | 0.044 | 0.064 | 0.064 | -- | -- | 0.170 | 0.169 | 0.074 | 0.057 | 0.074 | 0.060 | 0.072 |
| Number of samples | 1 | 13 | 27 | 16 | 27 | 84 | 7 | 9 | 21 | 37 | 27 | 15 | 25 | 16 | 83 |
| Number of detections | 0 | 0 | 8 | 3 | 7 | 18 | 1 | 0 | 13 | 14 | 9 | 7 | 6 | 3 | 25 |
| Percent Detection | 0 | 0 | 30 | 19 | 26 | 21 | 14 | 0 | 62 | 38 | 33 | 47 | 24 | 19 | 30 |
| LRL (or LRL range) | 1 | (0.2-1) | (0.2-1) | (0.2-1) | 0.20 | (0.2-1) | (0.2-1) | (0.2-1) | (0.2-1) | (0.2-1) | (0.2-1) | (0.2-1) | (0.2-1) | 0.20 | (0.2-1) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **para-Cresol** | | | | | | | | | | | | | | | |
| Minimum value | <1 | <0.06 | <0.03 | 0.024 | 0.011 | 0.011 | 0.031 | 0.036 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Max value | <1 | 0.330 | <1 | 0.230 | 0.340 | 0.340 | 0.031 | 0.081 | 0.140 | 0.140 | 0.480 | 0.980 | 0.35 | 0.260 | 0.980 |
| Mean value of detection | -- | 0.330 | -- | 0.127 | 0.104 | 0.138 | 0.031 | 0.058 | 0.069 | 0.061 | 0.230 | 0.413 | 0.235 | 0.137 | 0.245 |
| Median value of detection | -- | -- | -- | -- | 0.029 | 0.070 | -- | -- | 0.053 | 0.036 | 0.078 | 0.284 | -- | 0.099 | 0.125 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 1 | 0 | 2 | 5 | 8 | 1 | 2 | 4 | 7 | 5 | 6 | 2 | 7 | 20 |
| Percent Detection | 0 | 8 | 0 | 11 | 18 | 9 | 14 | 22 | 20 | 19 | 17 | 33 | 7 | 37 | 22 |
| LRL (or LRL range) | 1 | (0.06-1) | (0.03-1) | (0.03-1) | (0.03-1) | (0.03-1) | (0.06-1) | (0.06-1) | (0.03-1) | (0.03-1) | (0.03-1) | (0.03-1) | (0.03-1) | (0.03-1) | (0.03-1) |
| **Pentachlorophenol** | | | | | | | | | | | | | | | |
| Minimum value | <2 | 0.043 | 0.027 | <2 | 0.017 | 0.017 | <2 | 0.070 | 0.019 | 0.019 | 0.038 | <2 | 0.023 | 0.280 | 0.023 |
| Max value | <2 | 0.043 | 0.036 | <2 | 0.670 | 0.670 | <2 | 0.070 | 0.019 | 0.070 | 0.660 | <2 | 0.620 | 0.280 | 0.670 |
| Mean value of detection | -- | 0.043 | 0.031 | -- | 0.209 | 0.121 | -- | 0.070 | 0.019 | 0.045 | 0.222 | -- | 0.186 | 0.280 | 0.210 |
| Median value of detection | -- | -- | 0.029 | -- | 0.075 | 0.033 | -- | -- | -- | -- | 0.096 | -- | 0.087 | -- | 0.199 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 1 | 3 | 0 | 5 | 9 | 0 | 1 | 1 | 2 | 4 | 0 | 5 | 1 | 10 |
| Percent Detection | 0 | 9 | 23 | 0 | 42 | 23 | 0 | 17 | 8 | 8 | 29 | 0 | 45 | 100 | 37 |
| LRL (or LRL range) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| **Phenanthrene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.012 | 0.010 | 0.022 | 0.031 | 0.010 | <0.05 | <0.5 | 0.024 | 0.024 | 0.023 | 0.026 | 0.030 | 0.021 | 0.021 |
| Max value | <0.5 | 0.012 | 0.120 | 0.110 | 0.980 | 0.980 | <0.5 | <0.5 | 0.046 | 0.046 | 0.240 | 0.121 | 0.570 | 0.680 | 0.680 |
| Mean value of detection | -- | 0.012 | 0.040 | 0.048 | 0.149 | 0.095 | -- | -- | 0.028 | 0.028 | 0.085 | 0.050 | 0.130 | 0.121 | 0.098 |
| Median value of detection | -- | -- | 0.038 | 0.040 | 0.053 | 0.043 | -- | -- | 0.026 | 0.026 | 0.050 | 0.040 | 0.061 | 0.039 | 0.051 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 1 | 10 | 5 | 17 | 33 | 0 | 0 | 6 | 6 | 16 | 10 | 11 | 9 | 46 |
| Percent Detection | 0 | 8 | 34 | 28 | 61 | 37 | 0 | 0 | 29 | 16 | 55 | 56 | 41 | 47 | 49 |
| LRL (or LRL range) | 0.5 | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | 0.06 | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) | (0.05-0.5) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Phenol** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.224 | <0.08 | <0.08 | <0.08 | <0.08 | 0.210 | 0.210 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 |
| Max value | <0.5 | 0.320 | 1.10 | 1.60 | 0.960 | 1.60 | 0.450 | 0.810 | 0.345 | 0.810 | 2.53 | 5.92 | 1.30 | 0.712 | 5.92 |
| Mean value of detection | -- | 0.256 | 0.542 | 0.750 | 0.517 | 0.513 | 0.315 | 0.429 | 0.260 | 0.325 | 0.518 | 1.014 | 0.437 | 0.403 | 0.623 |
| Median value of detection | -- | 0.240 | 0.370 | 0.351 | 0.330 | 0.320 | 0.285 | 0.347 | 0.254 | 0.260 | 0.180 | 0.160 | 0.285 | 0.365 | 0.195 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 4 | 10 | 3 | 10 | 27 | 3 | 4 | 6 | 13 | 7 | 7 | 6 | 4 | 24 |
| Percent Detection | 0 | 31 | 30 | 17 | 36 | 30 | 43 | 44 | 29 | 35 | 24 | 39 | 22 | 21 | 26 |
| LRL (or LRL range) | 0.5 | (0.45-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.45-0.5) | (0.45-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) |
| **Phthalic anhydride** | | | | | | | | | | | | | | | |
| Minimum value | -- | <0.35 | 0.150 | <0.15 | <0.15 | <0.15 | <0.35 | 0.443 | 0.526 | 0.443 | <0.15 | <0.15 | <0.15 | <0.15 | <0.150 |
| Max value | -- | <0.35 | 0.620 | 0.924 | 1.30 | 1.30 | 0.802 | 0.926 | 1.30 | 1.30 | 1.50 | 1.20 | 1.20 | 2.00 | 2.00 |
| Mean value of detection | -- | -- | 0.521 | 0.498 | 0.656 | 0.565 | 0.802 | 0.674 | 0.894 | 0.831 | 0.852 | 0.705 | 0.741 | 0.761 | 0.756 |
| Median value of detection | -- | -- | 0.550 | 0.480 | 0.520 | 0.520 | -- | 0.653 | 1.01 | 0.864 | 0.580 | 0.860 | 0.648 | 0.719 | 0.690 |
| Number of samples | -- | 2 | 17 | 16 | 16 | 51 | 2 | 3 | 8 | 13 | 15 | 17 | 16 | 18 | 66 |
| Number of detections | -- | 0 | 11 | 9 | 12 | 32 | 1 | 3 | 8 | 12 | 7 | 11 | 11 | 15 | 44 |
| Percent Detection | -- | 0 | 65 | 56 | 75 | 63 | 50 | 100 | 100 | 92 | 47 | 65 | 69 | 83 | 67 |
| LRL (or LRL range) | -- | 0.35 | 0.15 | 0.15 | 0.15 | (0.150-.35) | 0.35 | (0.15-0.35) | (0.15-0.35) | 0.35 | (0.15-0.35) | (0.15-0.35) | (0.15-0.35) | (0.15-0.35) | (0.15-0.35) |
| **Prometon** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.014 | 0.023 | 0.003 | 0.037 | 0.014 | 0.016 | 0.022 | 0.018 | 0.016 | 0.012 | <0.5 | 0.016 | <0.5 | 0.012 |
| Max value | <0.5 | 0.052 | 0.100 | 0.003 | 0.063 | 0.500 | 7.80 | 1.40 | 1.10 | 7.80 | 0.670 | <0.5 | 1.10 | <0.5 | 1.10 |
| Mean value of detection | -- | 0.048 | 0.044 | 0.003 | 0.069 | 0.054 | 1.97 | 0.941 | 0.406 | 1.06 | 0.145 | -- | 0.280 | -- | 0.199 |
| Median value of detection | -- | 0.038 | 0.026 | -- | 0.063 | 0.054 | 0.036 | 1.40 | 0.100 | 0.069 | 0.100 | -- | 0.133 | -- | 0.100 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 4 | 4 | 1 | 7 | 16 | 4 | 3 | 5 | 12 | 9 | 0 | 6 | 0 | 15 |
| Percent Detection | 0 | 36 | 25 | 50 | 58 | 41 | 80 | 50 | 33 | 50 | 58 | 0 | 55 | 0 | 56 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Pyrene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.003 | 0.027 | 0.021 | 0.019 | 0.011 | 0.029 | <.03 | 0.021 | 0.021 | 0.019 | 0.024 | 0.010 | 0.019 | 0.010 |
| Max value | <0.5 | 0.052 | 0.093 | 0.160 | 1.40 | 1.40 | 0.033 | <0.5 | 0.097 | 0.097 | 0.380 | 0.340 | 2.30 | 1.00 | 2.30 |
| Mean value of detection | -- | 0.022 | 0.055 | 0.064 | 0.181 | 0.103 | 0.031 | -- | 0.043 | 0.041 | 0.081 | 0.091 | 0.186 | 0.112 | 0.119 |
| Median value of detection | -- | 0.011 | 0.042 | 0.054 | 0.081 | 0.054 | -- | -- | 0.037 | 0.033 | 0.054 | 0.048 | 0.056 | 0.045 | 0.052 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 3 | 17 | 14 | 21 | 55 | 2 | 0 | 11 | 13 | 19 | 14 | 19 | 16 | 68 |
| Percent Detection | 0 | 23 | 57 | 78 | 75 | 61 | 29 | 0 | 52 | 35 | 66 | 78 | 70 | 84 | 73 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | 0.50 | (0.03-0.5) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) |
| **Sitosterol** | | | | | | | | | | | | | | | |
| Minimum value | <2 | 0.550 | 0.580 | 0.740 | 0.590 | 0.550 | 1.40 | 1.10 | 1.20 | 1.10 | 0.700 | 0.890 | 0.720 | 1.70 | 0.700 |
| Max value | <2 | 2.00 | 2.40 | 2.90 | 5.80 | 5.80 | 2.00 | 1.60 | 6.70 | 6.70 | 2.40 | 0.890 | 2.60 | 1.70 | 2.60 |
| Mean value of detection | -- | 1.36 | 1.34 | 1.82 | 1.84 | 1.53 | 1.77 | 1.40 | 3.04 | 2.49 | 1.07 | 0.890 | 1.60 | 1.70 | 1.32 |
| Median value of detection | -- | 1.60 | 1.09 | 1.82 | 1.20 | 1.30 | 1.90 | 1.45 | 3.40 | 2.00 | 0.960 | -- | 1.70 | -- | 1.10 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 5 | 8 | 2 | 7 | 22 | 3 | 4 | 12 | 19 | 9 | 1 | 8 | 1 | 19 |
| Percent Detection | 0 | 50 | 62 | 100 | 58 | 56 | 60 | 67 | 92 | 79 | 64 | 100 | 73 | 100 | 70 |
| LRL (or LRL range) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Stigmastanol** | | | | | | | | | | | | | | | |
| Minimum value | <2 | <2 | <2 | <2 | <2 | <2 | 1.71 | <2 | 0.540 | 0.540 | <2 | <2 | 0.163 | 0.766 | 0.163 |
| Max value | <2 | <2 | <2 | <2 | <2 | <2 | 1.71 | <2 | 3.27 | 3.27 | <2 | 2.15 | 2.10 | 0.766 | 2.15 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | 1.71 | -- | 1.66 | 1.68 | -- | 2.15 | 1.13 | 0.766 | 1.30 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | 1.18 | 1.45 | -- | -- | -- | -- | 1.43 |
| Number of samples | 1 | 13 | 18 | 7 | 17 | 56 | 7 | 9 | 19 | 35 | 19 | 6 | 16 | 7 | 48 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 3 | 4 | 0 | 1 | 2 | 1 | 4 |
| Percent Detection | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 16 | 11 | 0 | 17 | 13 | 14 | 8 |
| LRL (or LRL range) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Tetrachloroethylene** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.03 | <0.03 | 0.017 | 0.004 | 0.004 | <0.03 | 0.053 | 0.030 | <0.03 | 0.017 | 0.017 | 0.019 | 0.016 | 0.016 |
| Max value | <0.5 | <0.5 | <0.5 | 0.017 | 0.028 | 0.028 | <0.5 | 0.090 | 0.200 | 0.200 | 0.080 | 0.130 | 0.082 | 0.110 | 0.130 |
| Mean value of detection | -- | -- | -- | 0.017 | 0.016 | 0.016 | -- | 0.072 | 0.079 | 0.076 | 0.039 | 0.055 | 0.052 | 0.050 | 0.050 |
| Median value of detection | -- | -- | -- | -- | 0.020 | 0.019 | -- | -- | 0.053 | 0.056 | 0.020 | 0.033 | 0.054 | 0.045 | 0.043 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 0 | 0 | 1 | 4 | 5 | 0 | 2 | 4 | 6 | 3 | 5 | 4 | 9 | 21 |
| Percent Detection | 0 | 0 | 0 | 6 | 14 | 6 | 0 | 22 | 19 | 16 | 10 | 28 | 15 | 47 | 23 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) |
| **Tribromomethane** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.012 | <0.5 | 0.012 |
| Max value | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.750 | <0.5 | 0.750 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.381 | -- | 0.381 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 10 | 13 | 2 | 12 | 38 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| Percent Detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 0 | 7 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| **Tributylphosphate** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.037 | <0.04 | <0.04 | <0.04 | 0.037 | <0.5 | 0.066 | 0.055 | 0.055 | <0.04 | 0.051 | <0.04 | <0.04 | <0.04 |
| Max value | <0.5 | 0.140 | 0.200 | 0.420 | 0.470 | 0.420 | 0.650 | 0.700 | 0.680 | 0.700 | 0.680 | 1.500 | 0.630 | 0.320 | 1.50 |
| Mean value of detection | -- | 0.086 | 0.114 | 0.156 | 0.151 | 0.129 | 0.650 | 0.344 | 0.195 | 0.255 | 0.196 | 0.310 | 0.228 | 0.136 | 0.217 |
| Median value of detection | -- | 0.086 | 0.160 | 0.120 | 0.100 | 0.100 | -- | 0.180 | 0.100 | 0.105 | 0.140 | 0.145 | 0.135 | 0.105 | 0.140 |
| Number of samples | 1 | 11 | 25 | 12 | 23 | 72 | 5 | 6 | 15 | 26 | 24 | 13 | 22 | 12 | 71 |
| Number of detections | 0 | 6 | 20 | 7 | 17 | 50 | 1 | 5 | 14 | 20 | 11 | 10 | 12 | 10 | 43 |
| Percent Detection | 0 | 55 | 80 | 58 | 74 | 69 | 20 | 83 | 93 | 77 | 46 | 77 | 55 | 83 | 61 |
| LRL (or LRL range) | 0.5 | 0.5 | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | 0.5 | 0.5 | 0.5 | 0.5 | (0.04-0.5) | (0.06-0.5) | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | | **Triclosan** | | | | | | | | |
| Minimum value | <1 | 0.051 | 0.120 | 0.049 | 0.056 | 0.049 | <0.05 | 0.120 | 0.086 | <0.5 | 0.029 | 0.032 | 0.056 | <0.04 | 0.029 |
| Max value | <1 | 0.076 | 1.10 | 1.30 | 0.592 | 1.30 | 0.130 | 0.420 | 1.03 | 1.03 | 0.360 | 1.00 | 0.692 | 0.670 | 1.00 |
| Mean value of detection | -- | 0.064 | 0.348 | 0.365 | 0.226 | 0.298 | 0.095 | 0.226 | 0.629 | 0.486 | 0.115 | 0.220 | 0.200 | 0.219 | 0.191 |
| Median value of detection | -- | -- | 0.270 | 0.271 | 0.210 | 0.225 | -- | 0.220 | 0.630 | 0.470 | 0.089 | 0.088 | 0.120 | 0.146 | 0.110 |
| Number of samples | 1 | 13 | 27 | 16 | 27 | 84 | 7 | 9 | 21 | 37 | 27 | 15 | 25 | 16 | 83 |
| Number of detections | 0 | 2 | 25 | 16 | 25 | 68 | 2 | 8 | 20 | 30 | 13 | 14 | 16 | 15 | 58 |
| Percent Detection | 0 | 17 | 93 | 100 | 93 | 81 | 29 | 89 | 95 | 81 | 48 | 93 | 64 | 94 | 70 |
| LRL (or LRL range) | 1 | 1 | 1 | -- | 1 | 1 | (0.05-1) | 1 | 1 | (0.05-1) | (0.04-1) | 1 | 1 | 0.04 | (0.04-1) |
| | | | | | | | **Triethyl citrate** | | | | | | | | |
| Minimum value | <0.5 | 0.024 | 0.026 | 0.110 | 0.054 | 0.024 | <0.5 | 0.120 | 0.062 | 0.062 | 0.051 | <0.5 | 0.056 | <0.5 | 0.051 |
| Max value | <0.5 | 0.170 | 0.250 | 0.110 | 0.280 | 0.280 | <0.5 | 0.630 | 0.530 | 0.630 | 0.160 | <0.5 | 0.110 | <0.5 | 0.160 |
| Mean value of detection | -- | 0.098 | 0.103 | 0.110 | 0.126 | 0.109 | -- | 0.354 | 0.194 | 0.241 | 0.106 | -- | 0.083 | -- | 0.094 |
| Median value of detection | -- | 0.099 | 0.091 | -- | 0.100 | 0.100 | -- | 0.200 | 0.115 | 0.160 | -- | -- | -- | -- | 0.083 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 6 | 13 | 24 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 0 | 4 | 8 | 1 | 5 | 18 | 0 | 5 | 12 | 17 | 2 | 0 | 2 | 0 | 4 |
| Percent Detection | 0 | 36 | 62 | 50 | 42 | 46 | 0 | 83 | 92 | 71 | 14 | 0 | 20 | 0 | 15 |
| LRL (or LRL range) | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| | | | | | | | **Triphenyl phosphate** | | | | | | | | |
| Minimum value | <0.5 | 0.055 | 0.018 | 0.061 | 0.030 | 0.018 | <0.1 | 0.061 | 0.031 | 0.031 | 0.005 | 0.011 | 0.014 | 0.015 | 0.005 |
| Max value | <0.5 | 0.072 | 0.890 | 0.097 | 0.190 | 0.890 | 0.270 | 0.117 | 0.290 | 0.290 | 0.600 | 0.160 | 0.130 | 0.112 | 0.600 |
| Mean value of detection | -- | 0.064 | 0.145 | 0.078 | 0.070 | 0.101 | 0.270 | 0.093 | 0.106 | 0.111 | 0.133 | 0.079 | 0.068 | 0.073 | 0.090 |
| Median value of detection | -- | -- | 0.070 | 0.076 | 0.067 | 0.070 | -- | 0.104 | 0.100 | 0.104 | 0.067 | 0.079 | 0.074 | 0.060 | 0.070 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 2 | 10 | 4 | 9 | 25 | 1 | 5 | 13 | 19 | 8 | 6 | 9 | 5 | 28 |
| Percent Detection | 0 | 15 | 30 | 22 | 32 | 28 | 14 | 56 | 62 | 51 | 28 | 33 | 33 | 26 | 30 |
| LRL (or LRL range) | 0.5 | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | 0.5 | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) |

**Table 7.** Summary of selected organic wastewater compounds in base-flow samples collected between August 1998 and September 2004.—Continued

[All concentrations in units of micrograms per liter from whole-water samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Tris (2-butoxyethyl) phosphate** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.2 | <0.07 | <0.07 | <0.07 | <0.07 | 0.120 | 0.157 | 0.220 | 0.120 | 0.022 | <0.07 | 0.108 | <0.07 | 0.022 |
| Max value | <0.5 | 1.90 | 4.70 | 2.80 | 5.20 | 5.20 | 1.10 | 0.565 | 5.80 | 5.80 | 10.0 | 5.10 | 6.40 | 2.49 | 10.0 |
| Mean value of detection | -- | 0.612 | 1.28 | 0.983 | 1.11 | 1.12 | 0.402 | 0.293 | 1.72 | 1.31 | 1.34 | 1.56 | 1.39 | 1.07 | 1.34 |
| Median value of detection | -- | 0.225 | 0.753 | 0.645 | 0.900 | 0.705 | 0.272 | 0.225 | 1.50 | 1.05 | 0.425 | 1.47 | 0.800 | 0.859 | 0.780 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 4 | 28 | 16 | 27 | 75 | 5 | 4 | 21 | 30 | 22 | 17 | 27 | 18 | 84 |
| Percent Detection | 0 | 31 | 93 | 89 | 96 | 83 | 71 | 44 | 100 | 81 | 76 | 94 | 100 | 95 | 90 |
| LRL (or LRL range) | 0.5 | (0.2-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.2-0.5) | (0.2-0.5) | (0.2-0.5) | (0.2-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) |
| **Tris (2-chloroethyl) phosphate** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.065 | 0.023 | 0.033 | 0.034 | 0.023 | 0.036 | 0.066 | 0.100 | 0.036 | 0.036 | 0.022 | 0.020 | 0.023 | 0.020 |
| Max value | <0.5 | 0.330 | 0.365 | 0.340 | 0.400 | 0.400 | 0.170 | 0.540 | 0.566 | 0.566 | 0.130 | 0.760 | 0.590 | 0.310 | 0.760 |
| Mean value of detection | -- | 0.133 | 0.165 | 0.153 | 0.144 | 0.152 | 0.090 | 0.297 | 0.247 | 0.242 | 0.120 | 0.150 | 0.130 | 0.137 | 0.132 |
| Median value of detection | -- | 0.120 | 0.130 | 0.150 | 0.140 | 0.130 | 0.078 | 0.298 | 0.250 | 0.235 | 0.074 | 0.110 | 0.084 | 0.115 | 0.092 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 11 | 29 | 15 | 27 | 82 | 4 | 9 | 21 | 34 | 18 | 17 | 23 | 18 | 76 |
| Percent Detection | 0 | 85 | 97 | 83 | 96 | 91 | 57 | 100 | 100 | 92 | 62 | 94 | 85 | 95 | 82 |
| LRL (or LRL range) | 0.5 | 0.5 | (0.04-0.5) | (0.04-0.5) | 0.5 | (0.04-0.5) | 0.5 | 0.5 | 0.5 | 0.5 | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) |
| **Tris (dichlorisopropyl) phosphate** | | | | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.051 | 0.078 | 0.087 | 0.052 | 0.051 | 0.056 | 0.160 | <0.1 | 0.056 | 0.056 | 0.081 | 0.041 | 0.078 | 0.041 |
| Max value | <0.5 | 0.400 | 0.460 | 0.180 | 0.530 | 0.530 | 0.520 | 0.410 | 0.590 | 0.590 | 0.300 | 0.081 | 0.240 | 0.150 | 0.300 |
| Mean value of detection | -- | 0.150 | 0.175 | 0.132 | 0.158 | 0.161 | 0.288 | 0.253 | 0.279 | 0.275 | 0.098 | 0.081 | 0.109 | 0.114 | 0.103 |
| Median value of detection | -- | 0.140 | 0.160 | 0.130 | 0.140 | 0.140 | -- | 0.220 | 0.260 | 0.260 | 0.077 | -- | 0.078 | -- | 0.078 |
| Number of samples | 1 | 13 | 30 | 18 | 28 | 90 | 7 | 9 | 21 | 37 | 29 | 18 | 27 | 19 | 93 |
| Number of detections | 0 | 9 | 15 | 3 | 14 | 41 | 2 | 4 | 15 | 21 | 10 | 1 | 8 | 2 | 21 |
| Percent Detection | 0 | 69 | 50 | 17 | 50 | 46 | 29 | 44 | 71 | 57 | 34 | 6 | 30 | 11 | 23 |
| LRL (or LRL range) | 0.5 | (0.1-0.5) | 0.1 | 0.1 | 0.1 | (0.1-0.5) | (0.1-0.5) | (0.1-0.5) | 0.1 | (0.1-0.5) | (0.1-0.5) | 0.1 | (0.1-0.5) | 0.1 | (0.1-0.5) |

**Table 8.** Summary of selected pharmaceutical compounds in base-flow samples collected between May 1999 and August 2004.

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **1,7-dimethylxanthine** | | | | | | | | | | | | | | | |
| Minimum value | 0.022 | <0.018 | 0.005 | 0.069 | 0.014 | 0.005 | <0.019 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | 0.130 | <0.018 |
| Maximum value | 0.022 | 0.151 | 1.52 | 0.718 | 1.28 | 1.52 | <0.019 | 0.141 | 2.65 | 2.65 | 0.216 | 1.90 | 0.93 | 1.59 | 1.90 |
| Mean value of detection | 0.022 | 0.053 | 0.420 | 0.402 | 0.382 | 0.348 | -- | 0.141 | 1.05 | 0.994 | 0.112 | 1.08 | 0.263 | 0.487 | 0.379 |
| Median value of detection | -- | 0.039 | 0.342 | 0.393 | 0.270 | 0.253 | -- | -- | 0.743 | 0.706 | 0.103 | 0.992 | 0.195 | 0.134 | 0.146 |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 1 | 6 | 16 | 7 | 17 | 47 | 0 | 1 | 16 | 17 | 6 | 3 | 9 | 5 | 23 |
| Percent detection | 100 | 46 | 84 | 100 | 100 | 83 | 0 | 13 | 89 | 50 | 33 | 50 | 60 | 100 | 52 |
| LRL | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| **Acetaminophen** | | | | | | | | | | | | | | | |
| Minimum value | <0.009 | <0.009 | <0.009 | 0.041 | <0.009 | <0.009 | 0.006 | <0.009 | 0.005 | 0.005 | 0.002 | <0.009 | 0.008 | 0.003 | 0.002 |
| Maximum value | <0.009 | 0.055 | 0.960 | 1.610 | 1.70 | 1.70 | 0.006 | <0.009 | 1.22 | 1.22 | 0.325 | 10.0 | 0.533 | 0.540 | 10.0 |
| Mean value of detection | -- | 0.055 | 0.227 | 0.506 | 0.284 | 0.295 | 0.006 | -- | 0.630 | 0.593 | 0.076 | 2.08 | 0.138 | 0.277 | 0.377 |
| Median value of detection | -- | -- | 0.181 | 0.419 | 0.087 | 0.170 | -- | -- | 0.639 | 0.583 | 0.036 | 0.035 | 0.031 | 0.284 | 0.035 |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 1 | 16 | 7 | 15 | 39 | 1 | 0 | 16 | 17 | 15 | 5 | 14 | 4 | 38 |
| Percent detection | 0 | 8 | 84 | 100 | 88 | 68 | 14 | 0 | 89 | 50 | 83 | 83 | 93 | 80 | 86 |
| LRL | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 |
| **Caffeine** | | | | | | | | | | | | | | | |
| Minimum value | 0.030 | 0.013 | <0.014 | <0.014 | 0.008 | 0.008 | 0.013 | 0.001 | <0.014 | 0.001 | 0.007 | <0.014 | <0.014 | 0.238 | 0.007 |
| Maximum value | 0.030 | 0.052 | 1.39 | 1.96 | 1.44 | 1.96 | 0.213 | 0.027 | 3.36 | 3.36 | 0.662 | 6.00 | 2.25 | 3.72 | 6.00 |
| Mean value of detection | 0.030 | 0.027 | 0.604 | 0.821 | 0.577 | 0.505 | 0.087 | 0.014 | 1.62 | 1.12 | 0.210 | 2.36 | 0.667 | 1.40 | 0.801 |
| Median value of detection | -- | 0.024 | 0.546 | 0.654 | 0.358 | 0.340 | 0.085 | -- | 1.58 | 0.938 | 0.145 | 1.86 | 0.544 | 1.14 | 0.467 |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 1 | 9 | 18 | 6 | 15 | 49 | 6 | 2 | 17 | 25 | 15 | 5 | 14 | 5 | 39 |
| Percent detection | 100 | 69 | 95 | 86 | 89 | 86 | 86 | 25 | 94 | 75 | 83 | 83 | 93 | 100 | 89 |
| LRL | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 |

**Table 8.** Summary of selected pharmaceutical compounds in base-flow samples collected between May 1999 and August 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Carbamazepine** | | | | | | | | | | | | | | | |
| Minimum value | 0.004 | <0.011 | <0.011 | <0.011 | 0.007 | 0.004 | <0.011 | 0.043 | 0.026 | <0.011 | 0.002 | <0.011 | 0.002 | <0.011 | 0.002 |
| Maximum value | 0.004 | 0.127 | 0.077 | 0.019 | 0.058 | 0.127 | <0.011 | 0.076 | 0.165 | 0.17 | 0.01 | <0.011 | 0.011 | <0.011 | 0.011 |
| Mean value of detection | 0.004 | 0.053 | 0.043 | 0.019 | 0.030 | 0.040 | -- | 0.060 | 0.060 | 0.060 | 0.006 | -- | 0.007 | -- | 0.010 |
| Median value of detection | -- | 0.039 | 0.032 | -- | 0.030 | 0.032 | -- | 0.062 | 0.050 | 0.055 | 0.008 | -- | -- | -- | 0.011 |
| Number of samples | 1 | 11 | 13 | 2 | 12 | 39 | 5 | 5 | 12 | 22 | 14 | 1 | 11 | 1 | 27 |
| Number of detections | 1 | 9 | 12 | 1 | 10 | 33 | 0 | 5 | 12 | 17 | 3 | 0 | 2 | 0 | 5 |
| Percent detection | 100 | 82 | 92 | 50 | 83 | 85 | 0 | 100 | 100 | 76 | 21 | 0 | 18 | 0 | 19 |
| LRL | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 |
| **Cimetidine** | | | | | | | | | | | | | | | |
| Minimum value | <0.007 | 0.002 | 0.004 | 0.006 | 0.004 | 0.002 | <0.007 | <0.007 | 0.006 | 0.006 | 0.002 | <0.007 | 0.004 | <0.007 | 0.002 |
| Maximum value | <0.007 | 0.027 | 0.017 | 0.006 | 0.010 | 0.027 | <0.007 | 0.165 | 0.037 | 0.165 | 0.002 | <0.007 | 0.004 | <0.007 | 0.004 |
| Mean value of detection | -- | 0.010 | 0.010 | 0.006 | 0.007 | 0.009 | -- | 0.083 | 0.015 | 0.046 | 0.002 | -- | 0.004 | -- | 0.003 |
| Median value of detection | -- | 0.009 | 0.009 | -- | 0.006 | 0.007 | -- | 0.085 | 0.010 | 0.024 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 7 | 5 | 1 | 4 | 17 | 0 | 5 | 6 | 11 | 1 | 0 | 1 | 0 | 2 |
| Percent detection | 0 | 54 | 26 | 14 | 22 | 30 | 0 | 63 | 33 | 33 | 6 | 0 | 7 | 0 | 5 |
| LRL | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| **Codeine** | | | | | | | | | | | | | | | |
| Minimum value | <0.024 | 0.001 | 0.004 | <0.024 | 0.003 | 0.001 | <0.024 | <0.024 | 0.019 | 0.019 | <0.024 | <0.024 | <0.024 | 0.008 | 0.008 |
| Maximum value | <0.024 | 0.074 | 0.126 | 0.024 | 0.076 | 0.126 | <0.024 | 0.297 | 0.170 | 0.297 | <0.024 | <0.024 | <0.024 | 0.008 | 0.008 |
| Mean value of detection | -- | 0.020 | 0.042 | 0.024 | 0.032 | 0.033 | -- | 0.223 | 0.075 | 0.124 | <0.024 | <0.024 | <0.024 | 0.008 | 0.008 |
| Median value of detection | -- | 0.009 | 0.037 | -- | 0.020 | 0.022 | -- | 0.239 | 0.071 | 0.091 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 17 | 6 | 16 | 53 | 7 | 8 | 16 | 31 | 17 | 4 | 14 | 4 | 39 |
| Number of detections | 0 | 5 | 9 | 1 | 7 | 22 | 0 | 5 | 10 | 15 | 0 | 0 | 0 | 1 | 1 |
| Percent detection | 0 | 38 | 53 | 17 | 41 | 42 | 0 | 63 | 62 | 47 | 0 | 0 | 0 | 25 | 3 |
| LRL | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 |

**Table 8.** Summary of selected pharmaceutical compounds in base-flow samples collected between May 1999 and August 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Cotinine** | | | | | | | | | | | | | | | |
| Minimum value | 0.009 | 0.010 | 0.016 | 0.042 | 0.001 | 0.001 | 0.005 | 0.013 | 0.018 | 0.005 | 0.002 | <0.023 | 0.011 | <0.023 | 0.002 |
| Maximum value | 0.009 | 0.047 | 0.168 | 0.161 | 0.201 | 0.201 | 0.174 | 0.064 | 0.247 | 0.247 | 0.112 | 0.486 | 0.272 | 0.166 | 0.486 |
| Mean value of detection | 0.009 | 0.023 | 0.078 | 0.080 | 0.085 | 0.070 | 0.047 | 0.034 | 0.119 | 0.084 | 0.048 | 0.197 | 0.108 | 0.128 | 0.095 |
| Median value of detection | -- | 0.022 | 0.079 | 0.096 | 0.075 | 0.068 | 0.025 | 0.033 | 0.120 | 0.062 | 0.054 | 0.156 | 0.092 | 0.140 | 0.072 |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 1 | 9 | 18 | 7 | 17 | 52 | 7 | 7 | 17 | 31 | 17 | 5 | 12 | 3 | 37 |
| Percent detection | 100 | 69 | 95 | 100 | 100 | 91 | 100 | 88 | 94 | 94 | 94 | 83 | 80 | 60 | 84 |
| LRL | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 |
| **Dehdyronifedipine** | | | | | | | | | | | | | | | |
| Minimum value | <0.01 | <0.01 | 0.003 | <0.01 | 0.004 | 0.001 | <0.01 | 0.002 | 0.001 | 0.001 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Maximum value | <0.01 | <0.01 | 0.006 | <0.01 | 0.004 | 0.006 | <0.01 | 0.003 | 0.007 | 0.007 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mean value of detection | -- | -- | 0.005 | -- | 0.004 | 0.004 | -- | 0.002 | 0.004 | 0.003 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | 0.005 | -- | -- | 0.004 | -- | -- | 0.003 | 0.003 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 16 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 0 | 4 | 0 | 1 | 5 | 0 | 2 | 5 | 7 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 21 | 0 | 6 | 9 | 0 | 25 | 28 | 19 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **Diltiazem** | | | | | | | | | | | | | | | |
| Minimum value | <0.012 | 0.003 | 0.004 | 0.012 | 0.004 | 0.003 | <0.012 | <0.012 | 0.002 | 0.002 | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 |
| Maximum value | <0.012 | 0.008 | 0.042 | 0.033 | 0.025 | 0.042 | <0.012 | 0.049 | 0.083 | 0.083 | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 |
| Mean value of detection | -- | 0.006 | 0.013 | 0.022 | 0.014 | 0.014 | -- | 0.030 | 0.021 | 0.024 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | 0.009 | -- | -- | 0.009 | -- | 0.029 | 0.013 | 0.017 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 15 | 55 | 7 | 8 | 18 | 33 | 15 | 6 | 13 | 5 | 39 |
| Number of detections | 0 | 2 | 8 | 2 | 2 | 14 | 0 | 6 | 14 | 20 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 23 | 42 | 29 | 13 | 26 | 0 | 75 | 76 | 59 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |

**Table 8.** Summary of selected pharmaceutical compounds in base-flow samples collected between May 1999 and August 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Diphenhydramine** | | | | | | | | | | | | | | | |
| Minimum value | <0.015 | <0.015 | 0.003 | <0.015 | <0.015 | 0.002 | 0.005 | 0.049 | 0.003 | 0.003 | <0.015 | <0.015 | 0.007 | <0.015 | 0.007 |
| Maximum value | <0.015 | <0.015 | 0.019 | <0.015 | <0.015 | 0.019 | 0.005 | 0.134 | 0.075 | 0.134 | <0.015 | <0.015 | 0.007 | <0.015 | 0.007 |
| Mean value of detection | -- | -- | 0.011 | -- | -- | 0.011 | 0.005 | 0.096 | 0.017 | 0.053 | -- | -- | 0.007 | -- | 0.007 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | 0.099 | 0.009 | 0.049 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 12 | 14 | 3 | 13 | 43 | 6 | 8 | 13 | 27 | 15 | 2 | 12 | 2 | 31 |
| Number of detections | 0 | 0 | 2 | 0 | 0 | 2 | 1 | 8 | 8 | 17 | 0 | 0 | 2 | 0 | 2 |
| Percent detection | 0 | 0 | 14 | 0 | 0 | 5 | 17 | 100 | 62 | 62 | 0 | 0 | 17 | 0 | 6 |
| LRL | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 |
| **Fluoxetine** | | | | | | | | | | | | | | | |
| Minimum value | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 |
| Maximum value | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| LRL | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 |
| **Gemfibrozil** | | | | | | | | | | | | | | | |
| Minimum value | <0.015 | <0.015 | 0.048 | <0.015 | <0.015 | 0.048 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Maximum value | <0.015 | <0.015 | 0.048 | <0.015 | <0.015 | 0.048 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Mean value of detection | -- | -- | 0.048 | -- | -- | 0.048 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 5 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 |

**Table 8.** Summary of selected pharmaceutical compounds in base-flow samples collected between May 1999 and August 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Ibuprofen** | | | | | | | | | | | | | | | |
| Minimum value | <0.018 | 0.037 | 0.074 | 0.099 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 |
| Maximum value | <0.018 | 0.037 | 0.256 | 0.574 | 0.296 | 0.574 | <0.018 | 0.286 | 0.960 | 0.960 | <0.018 | 1.00 | 0.139 | 0.299 | 1.00 |
| Mean value of detection | -- | 0.037 | 0.146 | 0.337 | 0.187 | 0.182 | -- | 0.200 | 0.439 | 0.386 | -- | 1.00 | 0.139 | 0.299 | 0.479 |
| Median value of detection | -- | -- | 0.120 | -- | -- | 0.115 | -- | -- | 0.351 | 0.286 | -- | -- | -- | -- | 0.299 |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 1 | 5 | 2 | 2 | 10 | 0 | 2 | 7 | 9 | 0 | 1 | 1 | 1 | 3 |
| Percent detection | 0 | 8 | 26 | 29 | 11 | 18 | 0 | 25 | 39 | 25 | 0 | 17 | 7 | 20 | 7 |
| LRL | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 |
| **Metformin** | | | | | | | | | | | | | | | |
| Minimum value | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 |
| Maximum value | <0.003 | <0.003 | <0.003 | <0.003 | 0.015 | 0.015 | <0.003 | 0.123 | 0.067 | 0.123 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 |
| Mean value of detection | -- | -- | -- | -- | 0.012 | 0.012 | -- | 0.088 | 0.067 | 0.081 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.067 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 6 | 4 | 0 | 25 | 6 | 0.09 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| **Ranitidine** | | | | | | | | | | | | | | | |
| Minimum value | <0.01 | 0.001 | 0.003 | <0.01 | 0.002 | 0.001 | <0.01 | <0.01 | 0.009 | 0.009 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Maximum value | <0.01 | 0.010 | 0.003 | <0.01 | 0.004 | 0.010 | <0.01 | 0.037 | 0.009 | 0.037 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Mean value of detection | -- | 0.006 | 0.003 | -- | 0.003 | 0.005 | -- | 0.037 | 0.009 | 0.023 | -- | -- | -- | -- | -- |
| Median value of detection | -- | 0.008 | -- | -- | -- | 0.004 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 16 | 56 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 3 | 1 | 0 | 2 | 6 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 23 | 5 | 0 | 12 | 11 | 0 | 13 | 6 | 9 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |

**Table 8.** Summary of selected pharmaceutical compounds in base-flow samples collected between May 1999 and August 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Salbutamol (Albuterol)** | | | | | | | | | | | | | | | |
| Minimum value | <0.029 | <0.029 | 0.007 | 0.006 | 0.003 | 0.003 | <0.029 | 0.005 | 0.010 | 0.005 | <0.029 | <0.029 | <0.029 | <0.029 | <0.03 |
| Maximum value | <0.029 | <0.029 | 0.012 | 0.006 | 0.005 | 0.012 | <0.029 | 0.034 | 0.018 | 0.034 | <0.029 | <0.029 | <0.029 | <0.029 | <0.03 |
| Mean value of detection | -- | -- | 0.009 | 0.006 | 0.004 | 0.006 | -- | 0.017 | 0.014 | 0.016 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | 0.007 | -- | 0.004 | 0.006 | -- | 0.015 | 0.014 | 0.014 | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 0 | 3 | 1 | 3 | 7 | 0 | 4 | 4 | 8 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 16 | 14 | 17 | 12 | 0 | 50 | 22 | 25 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| **Sulfamethoxazole** | | | | | | | | | | | | | | | |
| Minimum value | <0.023 | 0.021 | 0.008 | 0.004 | 0.013 | 0.004 | <0.023 | 0.083 | <0.023 | <0.023 | 0.002 | <0.023 | <0.023 | 0.014 | 0.002 |
| Maximum value | <0.023 | 0.138 | 0.297 | 0.456 | 0.253 | 0.456 | <0.023 | 0.170 | 0.755 | 0.755 | 0.002 | <0.023 | 0.039 | 0.014 | 0.039 |
| Mean value of detection | -- | 0.067 | 0.096 | 0.133 | 0.074 | 0.089 | -- | 0.120 | 0.156 | 0.145 | 0.002 | -- | 0.031 | 0.014 | 0.020 |
| Median value of detection | -- | 0.071 | 0.085 | 0.049 | 0.068 | 0.071 | -- | 0.118 | 0.100 | 0.100 | -- | -- | -- | -- | 0.019 |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 9 | 16 | 6 | 14 | 45 | 0 | 8 | 17 | 25 | 1 | 0 | 2 | 1 | 4 |
| Percent detection | 0 | 69 | 84 | 86 | 72 | 79 | 0 | 100 | 94 | 75 | 6 | 0 | 13 | 20 | 9 |
| LRL | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 |
| **Thiabendazole** | | | | | | | | | | | | | | | |
| Minimum value | <0.011 | 0.007 | <0.011 | <0.011 | <0.011 | 0.007 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 |
| Maximum value | <0.011 | 0.007 | 0.088 | 0.030 | 0.056 | 0.088 | <0.011 | 0.691 | 0.050 | 0.691 | <0.011 | <0.011 | <0.011 | 0.048 | 0.048 |
| Mean value of detection | -- | 0.007 | 0.057 | 0.030 | 0.051 | 0.042 | -- | -- | -- | 0.370 | -- | -- | -- | 0.048 | 0.048 |
| Median value of detection | -- | -- | -- | -- | -- | 0.037 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 10 | 14 | 3 | 13 | 41 | 6 | 7 | 13 | 27 | 15 | 2 | 12 | 2 | 31 |
| Number of detections | 0 | 1 | 2 | 1 | 2 | 6 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 1 | 1 |
| Percent detection | 0 | 10 | 14 | 33 | 15 | 15 | 0 | 13 | 8 | 8 | 0 | 0 | 0 | 50 | 3 |
| LRL | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 |

**Table 8.** Summary of selected pharmaceutical compounds in base-flow samples collected between May 1999 and August 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting level; Data from site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | | Indian Creek | | | | Brush Creek | | | | |
| | 1 | 2 | 7 | 8 | 13 | Basin | 3 | 4 | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Trimethoprim** | | | | | | | | | | | | | | | |
| Minimum value | <0.014 | 0.001 | 0.003 | 0.002 | 0.002 | 0.001 | <0.014 | 0.013 | 0.010 | 0.010 | 0.001 | 0.003 | 0.003 | 0.015 | 0.001 |
| Maximum value | <0.014 | 0.028 | 0.162 | 6.6 | 0.090 | 6.60 | <0.014 | 0.252 | 0.162 | 0.252 | 0.001 | 0.023 | 0.003 | 0.015 | 0.023 |
| Mean value of detection | -- | 0.015 | 0.037 | 1.35 | 0.029 | 0.204 | -- | 0.068 | 0.068 | 0.068 | 0.001 | 0.013 | 0.003 | 0.015 | 0.008 |
| Median value of detection | -- | 0.015 | 0.026 | 0.036 | 0.020 | 0.025 | -- | 0.042 | 0.042 | 0.042 | -- | -- | -- | -- | 0.003 |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 6 | 17 | 5 | 10 | 38 | 0 | 8 | 18 | 26 | 1 | 2 | 2 | 1 | 6 |
| Percent detection | 0 | 46 | 89 | 71 | 56 | 67 | 0 | 100 | 100 | 78 | 6 | 33 | 13 | 20 | 14 |
| LRL | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | .0014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 |
| **Warfarin** | | | | | | | | | | | | | | | |
| Minimum value | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 |
| Maximum value | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 1 | 13 | 19 | 7 | 17 | 57 | 7 | 8 | 18 | 33 | 18 | 6 | 15 | 5 | 44 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.

[ft³/s, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Discharge, mean instantaneous ($ft^3/s$)** | | | | | | | | | | | | |
| Minimum value | 141 | 295 | 134 | 189 | 134 | 169 | 169 | 51 | 50 | 29 | 53 | 29 |
| Maximum value | 3,780 | 5,280 | 1,550 | 2,820 | 5,280 | 12,800 | 12,800 | 1,240 | 685 | 2,240 | 1,060 | 2,240 |
| Mean value | 965 | 1,190 | 610 | 964 | 938 | 2,150 | 2,150 | 308 | 200 | 326 | 266 | 286 |
| Median value | 262 | 764 | 586 | 745 | 648 | 915 | 915 | 215 | 152 | 210 | 132 | 190 |
| Number of samples | 7 | 28 | 25 | 34 | 94 | 14 | 14 | 40 | 26 | 44 | 21 | 131 |
| **Turbidity (NTU)** | | | | | | | | | | | | |
| Minimum value | -- | <1 | -- | 175 | <1 | -- | -- | -- | 8 | 3 | 8 | 3 |
| Maximum value | -- | 1,200 | -- | 730 | 1,200 | -- | -- | -- | 630 | 410 | 330 | 630 |
| Mean value | -- | 310 | -- | 420 | 340 | -- | -- | -- | 132 | 76 | 89 | 94 |
| Median value | -- | 255 | -- | 410 | 300 | -- | -- | -- | 32 | 37 | 41 | 38 |
| Number of samples | -- | 24 | -- | 10 | 34 | -- | -- | -- | 16 | 33 | 18 | 69 |
| LRL | -- | 1 | -- | 1 | 1 | -- | -- | -- | 1 | 1 | -- | 1 |
| **Oxygen, dissolved (mg/L)** | | | | | | | | | | | | |
| Minimum value | -- | 5.75 | -- | 4.21 | 4.21 | -- | -- | -- | 1.05 | 0.30 | 0.40 | 0.30 |
| Maximum value | -- | 9.71 | -- | 9.43 | 9.71 | -- | -- | -- | 8.27 | 8.63 | 7.65 | 8.63 |
| Mean value | -- | 7.30 | -- | 5.88 | 6.84 | -- | -- | -- | 5.23 | 5.42 | 3.32 | 4.90 |
| Median value | -- | 7.17 | -- | 5.67 | 6.72 | -- | -- | -- | 5.74 | 5.53 | 2.85 | 5.34 |
| Number of samples | -- | 25 | -- | 12 | 37 | -- | -- | -- | 23 | 40 | 18 | 81 |
| LRL | -- | 0.2 | -- | 0.2 | 0.2 | -- | -- | -- | 0.2 | 0.2 | 0.2 | 0.2 |
| **pH (standard units)** | | | | | | | | | | | | |
| Minimum value | -- | 7.08 | -- | 6.39 | 6.38 | -- | -- | -- | 7.17 | 6.94 | 6.63 | 6.63 |
| Maximum value | -- | 7.98 | -- | 7.66 | 7.98 | -- | -- | -- | 8.59 | 8.00 | 10.9 | 10.9 |
| Mean value | -- | 7.61 | -- | 7.05 | 7.40 | -- | -- | -- | 7.65 | 7.48 | 7.43 | 7.52 |
| Median value | -- | 7.64 | -- | 7.08 | 7.50 | -- | -- | -- | 7.55 | 7.50 | 7.17 | 7.48 |
| Number of samples | -- | 25 | -- | 16 | 41 | -- | -- | -- | 23 | 40 | 18 | 81 |
| LRL | -- | 0.01 | -- | 0.01 | 0.01 | -- | -- | -- | 0.01 | 0.01 | 0.01 | 0.01 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | **Specific conductance (µS/cm)** | | | | | | |
| Minimum value | 267 | 250 | -- | 396 | 250 | 175 | 175 | 144 | 179 | 162 | 208 | 144 |
| Maximum value | 495 | 700 | -- | 1,160 | 1,160 | 1,580 | 1,580 | 715 | 673 | 817 | 509 | 817 |
| Mean value | 404 | 449 | -- | 578 | 502 | 593 | 592 | 269 | 394 | 369 | 354 | 360 |
| Median value | 442 | 418 | -- | 578 | 483 | 402 | 402 | 197 | 365 | 356 | 332 | 345 |
| Number of samples | 7 | 25 | -- | 26 | 58 | 11 | 11 | 11 | 23 | 40 | 18 | 92 |
| LRL | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | | | | | | **Water temperature (°C)** | | | | | | |
| Minimum value | -- | 12.0 | -- | 11.6 | 11.6 | -- | -- | -- | 16.5 | 15.4 | 16.9 | 15.4 |
| Maximum value | -- | 25.7 | -- | 28.0 | 28.0 | -- | -- | -- | 29.4 | 28.5 | 26.6 | 29.4 |
| Mean value | -- | 19.6 | -- | 21.0 | 20.2 | -- | -- | -- | 20.9 | 20.7 | 21.9 | 21.0 |
| Median value | -- | 20.0 | -- | 21.1 | 20.5 | -- | -- | -- | 20.5 | 19.9 | 22.2 | 20.5 |
| Number of samples | -- | 25 | -- | 16 | 41 | -- | -- | -- | 23 | 40 | 18 | 81 |
| LRL | -- | 0.15 | -- | 0.15 | 0.15 | -- | -- | -- | 0.15 | 0.15 | 0.15 | 0.15 |
| | | | | | | **Chloride, dissolved (mg/L)** | | | | | | |
| Minimum value | 15.0 | 14.4 | 26.5 | 19.6 | 14.4 | 10.2 | 10.2 | 5.4 | 22.1 | <0.2 | 6.8 | <0.2 |
| Maximum value | 47.9 | 68.7 | 112 | 116 | 116 | 350 | 350 | 165 | 127 | 123 | 87.8 | 165 |
| Mean value | 36.2 | 33.7 | 65.5 | 49.5 | 48.7 | 98.7 | 98.7 | 31.0 | 45.8 | 35.1 | 29.3 | 34.9 |
| Median value | 41.4 | 31.1 | 64.9 | 42.4 | 43.1 | 45.3 | 45.3 | 21.6 | 37.7 | 33.0 | 24.0 | 28.8 |
| Number of samples | 7 | 23 | 24 | 34 | 88 | 11 | 11 | 36 | 23 | 39 | 20 | 118 |
| LRL | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| | | | | | | **Ammonia, plus organic nitrogen, total, as N (mg/L)** | | | | | | |
| Minimum value | 1.00 | 0.78 | 0.80 | 1.00 | 0.78 | 1.30 | 1.30 | 0.54 | 0.82 | 0.94 | 0.98 | 0.54 |
| Maximum value | 4.02 | 4.77 | 9.68 | 4.79 | 9.68 | 13.0 | 13.0 | 13.8 | 2.84 | 6.02 | 4.53 | 13.8 |
| Mean value | 2.53 | 2.62 | 3.09 | 2.48 | 2.68 | 3.84 | 3.85 | 3.25 | 1.58 | 2.36 | 1.92 | 2.40 |
| Median value | 2.30 | 2.62 | 2.74 | 2.16 | 2.55 | 2.80 | 2.80 | 2.49 | 1.49 | 2.02 | 1.63 | 1.84 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Ammonia, dissolved, as N (mg/L)** | | | | | | | | | | | | |
| Minimum value | <0.02 | <0.02 | <0.02 | 0.01 | 0.01 | <0.04 | <0.04 | <0.02 | 0.01 | 0.01 | <0.02 | 0.01 |
| Maximum value | 0.14 | 0.23 | 0.44 | 0.62 | 0.62 | 2.28 | 2.28 | 0.41 | 0.65 | 0.67 | 0.65 | 0.67 |
| Mean value | 0.07 | 0.09 | 0.13 | 0.22 | 0.15 | 0.51 | 0.51 | 0.14 | 0.15 | 0.18 | 0.28 | 0.18 |
| Median value | 0.05 | 0.09 | 0.10 | 0.20 | 0.10 | 0.22 | 0.22 | 0.12 | 0.09 | 0.12 | 0.23 | 0.12 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL range | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) | (0.02-0.04) |
| **Organic nitrogen, total, as N (mg/L)** | | | | | | | | | | | | |
| Minimum value | 0.92 | 0.74 | 0.74 | 0.92 | 0.74 | 1.17 | 1.17 | 0.52 | 0.76 | 0.87 | 0.80 | 0.52 |
| Maximum value | 4.00 | 4.66 | 9.48 | 4.67 | 9.48 | 12.5 | 12.5 | 13.5 | 2.7 | 5.80 | 3.88 | 13.5 |
| Mean value | 2.46 | 2.53 | 2.95 | 2.26 | 2.53 | 3.34 | 3.33 | 3.11 | 1.43 | 2.19 | 1.64 | 2.22 |
| Median value | 2.20 | 2.50 | 2.55 | 2.05 | 2.46 | 1.90 | 1.90 | 2.39 | 1.29 | 1.82 | 1.39 | 1.67 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| **Nitrite plus nitrate, dissolved, as N (mg/L)** | | | | | | | | | | | | |
| Minimum value | 0.94 | 0.24 | 1.92 | 0.61 | 0.24 | 1.19 | 1.19 | 0.20 | 0.06 | <0.05 | <0.05 | <0.05 |
| Maximum value | 3.45 | 2.85 | 5.85 | 4.60 | 5.85 | 4.92 | 4.92 | 1.51 | 0.98 | 1.23 | 0.73 | 1.50 |
| Mean value | 1.79 | 1.70 | 3.57 | 2.22 | 2.40 | 2.54 | 2.55 | 0.64 | 0.46 | 0.53 | 0.30 | 0.51 |
| Median value | 1.36 | 1.65 | 3.79 | 2.10 | 2.14 | 1.90 | 1.90 | 0.59 | 0.43 | 0.48 | 0.22 | 0.51 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| **Nitrite, dissolved, as N (mg/L)** | | | | | | | | | | | | |
| Minimum value | 0.03 | 0.03 | 0.04 | 0.04 | 0.03 | 0.02 | 0.02 | 0.02 | 0.01 | <0.01 | <0.01 | <0.01 |
| Maximum value | 0.08 | 0.21 | 0.33 | 0.29 | 0.33 | 0.36 | 0.36 | 0.23 | 0.13 | 0.14 | 0.12 | 0.23 |
| Mean value | 0.04 | 0.07 | 0.10 | 0.09 | 0.09 | 0.13 | 0.13 | 0.05 | 0.06 | 0.06 | 0.04 | 0.05 |
| Median value | 0.03 | 0.06 | 0.07 | 0.07 | 0.07 | 0.08 | 0.08 | 0.04 | 0.06 | 0.05 | 0.03 | 0.04 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL range | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) | (0.01-0.008) |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Nitrate, dissolved, as N (mg/L)** | | | | | | | | | | | | |
| Minimum value | 0.91 | 0.14 | 1.88 | 0.492 | 0.14 | 1.17 | 1.17 | 0.04 | 0.02 | 0.03 | 0.04 | 0.02 |
| Maximum value | 3.44 | 2.81 | 5.80 | 4.52 | 5.80 | 4.67 | 4.67 | 1.46 | 0.85 | 1.16 | 0.69 | 1.47 |
| Mean value | 1.75 | 1.63 | 3.47 | 2.12 | 2.32 | 2.42 | 2.42 | 0.59 | 0.40 | 0.48 | 0.26 | 0.46 |
| Median value | 1.33 | 1.60 | 3.60 | 2.04 | 2.06 | 1.84 | 1.84 | 0.55 | 0.38 | 0.44 | 0.19 | 0.47 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| **Nitrogen, total (mg/L)** | | | | | | | | | | | | |
| Minimum value | 1.99 | 2.80 | 3.15 | 1.61 | 1.61 | 2.99 | 2.99 | 0.956 | 1.10 | 1.25 | 1.05 | 0.96 |
| Maximum value | 5.68 | 6.96 | 12.8 | 8.71 | 12.8 | 17.9 | 17.9 | 14.2 | 3.14 | 6.45 | 4.95 | 14.2 |
| Mean value | 4.33 | 4.32 | 6.66 | 4.70 | 5.09 | 6.40 | 6.40 | 3.90 | 2.04 | 2.90 | 2.22 | 2.91 |
| Median value | 4.95 | 4.11 | 6.64 | 4.46 | 4.91 | 5.72 | 5.72 | 3.08 | 1.96 | 2.52 | 2.24 | 2.40 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| **Nitrate, percent of total N** | | | | | | | | | | | | |
| Minimum value | 18.4 | 3.3 | 23.0 | 14.1 | 3.3 | 17.7 | 17.7 | 0.6 | 1.6 | 1.4 | 1.6 | 0.6 |
| Maximum value | 60.7 | 70.8 | 87.4 | 74.8 | 87.4 | 75.0 | 75.0 | 42.3 | 40.7 | 40.5 | 33.9 | 42.1 |
| Mean value | 40.7 | 38.5 | 53.9 | 44.8 | 45.2 | 41.5 | 41.5 | 20.0 | 19.6 | 18.3 | 11.1 | 17.9 |
| Median value | 45.8 | 39.7 | 55.1 | 47.9 | 47.7 | 42.0 | 42.0 | 16.2 | 18.0 | 17.3 | 7.4 | 15.7 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| **Organic nitrogen, percent of total N** | | | | | | | | | | | | |
| Minimum value | 37.8 | 24.3 | 11.2 | 21.0 | 11.2 | 20.9 | 20.9 | 43.1 | 46.1 | 45.2 | 39.0 | 39.0 |
| Maximum value | 80.6 | 89.1 | 75.0 | 74.1 | 89.1 | 78.8 | 78.8 | 95.2 | 93.3 | 96.3 | 94.4 | 96.3 |
| Mean value | 56.5 | 57.8 | 42.2 | 48.1 | 49.8 | 58.3 | 58.3 | 74.3 | 70.6 | 73.1 | 75.4 | 73.4 |
| Median value | 50.0 | 56.0 | 39.8 | 47.7 | 48.4 | 58.3 | 58.3 | 79.3 | 68.4 | 77.4 | 78.8 | 77.3 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Orthophosphate, dissolved as P (mg/L)** | | | | | | | | | | | | |
| Minimum value | 0.01 | 0.03 | 0.37 | 0.07 | 0.01 | 0.15 | 0.15 | <0.01 | 0.02 | <0.01 | <0.01 | <0.01 |
| Maximum value | 0.52 | 0.60 | 1.40 | 1.00 | 1.40 | 1.19 | 1.19 | 0.15 | 0.15 | 0.13 | 0.16 | 0.16 |
| Mean value | 0.18 | 0.29 | 0.75 | 0.34 | 0.41 | 0.53 | 0.53 | 0.06 | 0.08 | 0.05 | 0.05 | 0.05 |
| Median value | 0.13 | 0.30 | 0.71 | 0.28 | 0.32 | 0.28 | 0.28 | 0.05 | 0.05 | 0.04 | 0.02 | 0.05 |
| Number of samples | 7 | 18 | 16 | 28 | 69 | 12 | 12 | 22 | 8 | 19 | 8 | 57 |
| LRL range | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.010-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) | (0.01-0.02) |
| **Phosphorus, dissolved (mg/L)** | | | | | | | | | | | | |
| Minimum value | 0.11 | 0.07 | 0.33 | 0.07 | 0.07 | 0.18 | 0.18 | 0.37 | 0.04 | 0.01 | 0.04 | 0.01 |
| Maximum value | 0.58 | 0.67 | 1.57 | 1.01 | 1.57 | 1.38 | 0.32 | 0.18 | 0.17 | 0.21 | 0.20 | 0.21 |
| Mean value | 0.21 | 0.32 | 0.79 | 0.38 | 0.46 | 0.61 | 0.61 | 0.09 | 0.09 | 0.08 | 0.10 | 0.09 |
| Median value | 0.16 | 0.28 | 0.81 | 0.33 | 0.37 | 0.32 | 0.32 | 0.08 | 0.07 | 0.08 | 0.08 | 0.08 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL range | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| **Phosphorus, total (mg/L)** | | | | | | | | | | | | |
| Minimum value | 0.23 | 0.43 | 0.33 | 0.24 | 0.23 | 0.37 | 0.37 | 0.10 | 0.08 | 0.10 | 0.15 | 0.08 |
| Maximum value | 1.54 | 2.16 | 5.22 | 2.79 | 5.22 | 6.30 | 6.30 | 4.19 | 0.49 | 1.91 | 1.28 | 4.20 |
| Mean value | 0.95 | 1.08 | 2.12 | 1.23 | 1.39 | 1.66 | 1.66 | 0.83 | 0.29 | 0.52 | 0.39 | 0.542 |
| Median value | 1.12 | 1.07 | 2.03 | 1.24 | 1.24 | 1.40 | 1.40 | 0.64 | 0.28 | 0.37 | 0.28 | 0.373 |
| Number of samples | 7 | 21 | 21 | 32 | 83 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| LRL | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |
| **Dissolved phosphorus, percent of total P** | | | | | | | | | | | | |
| Minimum value | 9.9 | 6.7 | 7.8 | 6.0 | 6.0 | 9.5 | 9.5 | 1.0 | 13.2 | 2.1 | 3.4 | 1.0 |
| Maximum value | 50 | 64.4 | 100 | 80.8 | 100 | 89.0 | 89.0 | 51.4 | 52.4 | 56.6 | 69.9 | 69.9 |
| Mean value | 26.3 | 31.8 | 45.5 | 32.9 | 35.3 | 41.4 | 41.4 | 19.9 | 32.9 | 23.5 | 34.5 | 26.2 |
| Median value | 19.6 | 30.3 | 45.6 | 29.9 | 34.7 | 38.0 | 38.0 | 13.8 | 31.7 | 22.6 | 33.4 | 26.0 |
| Number of samples | 7 | 21 | 21 | 32 | 83 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[ft$^3$/s, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Dissolved organic carbon (mg/L)** | | | | | | | | | | | | |
| Minimum value | 5.30 | 5.40 | -- | 4.90 | 4.90 | 5.00 | 5.00 | 4.70 | -- | 4.50 | -- | 4.50 |
| Maximum value | 7.00 | 43.3 | -- | 66.9 | 66.9 | 8.80 | 8.80 | 9.20 | -- | 9.30 | -- | 9.30 |
| Mean value | 6.14 | 12.3 | -- | 13.4 | 10.8 | 6.50 | 6.50 | 6.74 | -- | 6.62 | -- | 6.70 |
| Median value | 6.10 | 6.35 | -- | 7.00 | 6.50 | 6.17 | 6.20 | 6.50 | -- | 6.30 | -- | 6.40 |
| Number of samples | 7 | 6 | -- | 9 | 22 | 12 | 12 | 13 | -- | 7 | -- | 20 |
| LRL | 0.33 | 0.33 | -- | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | -- | 0.33 | -- | 0.33 |
| **Total organic carbon (mg/L)** | | | | | | | | | | | | |
| Minimum value | 8.9 | 4.6 | 12.80 | 7.8 | 4.6 | 9.6 | 9.6 | 2.1 | 7.8 | 8.1 | 6.4 | 2.1 |
| Maximum value | 39.6 | 49.5 | 125 | 41.9 | 125 | 74.9 | 75 | 125 | 57.2 | 113 | 26.8 | 125 |
| Mean value | 20.4 | 25.4 | 36.9 | 21.5 | 26.6 | 32.2 | 32.1 | 24.7 | 19.3 | 25.8 | 14.0 | 22.3 |
| Median value | 14.5 | 27.2 | 26.8 | 20.2 | 23.8 | 29.2 | 29.2 | 17.0 | 15.3 | 17.2 | 12.0 | 15 |
| Number of samples | 7 | 23 | 23 | 33 | 86 | 12 | 12 | 37 | 24 | 39 | 19 | 119 |
| LRL | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| **Biochemical oxygen demand (mg/L)** | | | | | | | | | | | | |
| Minimum value | 3.6 | 5.4 | 20 | 3.3 | 3.3 | 3.9 | 3.9 | <2 | 16 | 6.6 | 8.5 | <2 |
| Maximum value | 18 | 340 | 240 | 270 | 340 | 36 | 36 | 110 | 95 | 155 | 45 | 155 |
| Mean value | 8.7 | 74 | 66 | 55 | 55 | 11 | 11 | 34 | 50 | 45 | 26 | 38 |
| Median value | 8.3 | 32 | 41 | 29 | 32 | 6.2 | 6.2 | 34 | 36 | 35 | 28 | 34 |
| Number of samples | 6 | 8 | 10 | 17 | 41 | 7 | 7 | 21 | 8 | 18 | 11 | 45 |
| LRL | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| **Chemical oxygen demand (mg/L)** | | | | | | | | | | | | |
| Minimum value | 20 | 20 | 29 | <10 | <10 | 30 | 30 | 20 | 17 | 20 | 22 | 17 |
| Maximum value | 90 | 170 | 230 | 96 | 230 | 140 | 140 | 260 | 230 | 535 | 96 | 535 |
| Mean value | 49 | 75 | 75 | 44 | 61 | 63 | 63 | 74 | 67 | 89 | 44 | 72 |
| Median value | 40 | 66 | 64 | 37 | 51 | 45 | 45 | 63 | 47 | 64 | 41 | 53 |
| Number of samples | 7 | 23 | 23 | 33 | 86 | 12 | 12 | 36 | 23 | 39 | 20 | 119 |
| LRL | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Escherichia coli (col/100 mL)** | | | | | | | | | | | | |
| Minimum value | 5,900 | 4,600 | -- | 4,800 | 4,600 | 740 | 740 | 1,600 | -- | 11,000 | -- | 1,600 |
| Maximum value | 24,000 | 32,500 | -- | 22,000 | 32,500 | 170,000 | 170,000 | 67,000 | -- | 160,000 | -- | 160,000 |
| Mean value | 15,900 | 14,600 | -- | 13,300 | 14,600 | 36,100 | 36,100 | 26,000 | -- | 51,400 | -- | 38,700 |
| Median value | 17,000 | 8,300 | -- | 17,000 | 17,000 | 16,000 | 16,000 | 20,000 | -- | 43,500 | -- | 24,000 |
| Number of samples | 7 | 5 | -- | 7 | 19 | 8 | 8 | 7 | -- | 7 | -- | 14 |
| LRL | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | -- | 1 | -- | 1 |
| **Fecal coliform (col/100 mL)** | | | | | | | | | | | | |
| Minimum value | 4,200 | 13,500 | -- | 5,000 | 4,200 | 22,000 | 22,000 | 41,000 | -- | 48,000 | -- | 41,000 |
| Maximum value | 45,000 | 31,000 | -- | 32,000 | 45,000 | 267,000 | 267,000 | 113,000 | -- | 190,000 | -- | 190,000 |
| Mean value | 20,100 | 22,300 | -- | 18,600 | 19,700 | 97,500 | 97,500 | 71,000 | -- | 106,000 | -- | 91,100 |
| Median value | 18,700 | -- | -- | 16,700 | 16,700 | 50,500 | 50,500 | 59,000 | -- | 93,500 | -- | 74,000 |
| Number of samples | 6 | 2 | -- | 7 | 15 | 4 | 4 | 3 | -- | 4 | -- | 7 |
| LRL | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | -- | 1 | -- | 1 |
| **Suspended sediment (mg/L)** | | | | | | | | | | | | |
| Minimum value | 152 | 222 | 187 | 64 | 64 | 112 | 112 | 54 | 31 | 32 | 25 | 25 |
| Maximum value | 1,940 | 2,910 | 3,920 | 1,380 | 3,920 | 2,300 | 2,300 | 4,710 | 254 | 2,540 | 906 | 4,710 |
| Mean value | 1,070 | 1,095 | 943 | 663 | 892 | 808 | 808 | 723 | 98 | 353 | 150 | 391 |
| Median value | 915 | 885 | 767 | 554 | 764 | 387 | 386 | 328 | 80 | 106 | 57 | 110 |
| Number of samples | 7 | 24 | 23 | 32 | 86 | 14 | 14 | 39 | 24 | 34 | 19 | 116 |
| LRL | 1 | 1 | 1.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Nitrogen, instantaneous mass (mg/s)** | | | | | | | | | | | | |
| Minimum value | 20,800 | 34,600 | 25,700 | 18,800 | 18,800 | 37,400 | 37,400 | 3,420 | 3,070 | 2,230 | 1,550 | 1,550 |
| Maximum value | 541,000 | 588,000 | 563,000 | 263,000 | 588,000 | 2,010,000 | 2,010,000 | 173,000 | 39,900 | 363,000 | 60,800 | 363,000 |
| Mean value | 130,000 | 164,000 | 116,000 | 118,000 | 130,000 | 355,000 | 355,000 | 36,300 | 12,200 | 37,600 | 16,300 | 28,500 |
| Median value | 24,000 | 116,000 | 91,300 | 87,200 | 91,300 | 175,000 | 175,000 | 21,900 | 8,820 | 17,800 | 9,520 | 13,700 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Nitrate, instantaneous mass (mg/s)** | | | | | | | | | | | | |
| Minimum value | 8,990 | 12,800 | 15,200 | 12,000 | 8,990 | 16,800 | 16,800 | 380 | 99 | 100 | 85 | 85 |
| Maximum value | 142,000 | 135,000 | 195,000 | 110,000 | 195,000 | 971,000 | 971,000 | 42,000 | 6,040 | 25,300 | 6,460 | 42,000 |
| Mean value | 34,700 | 52,600 | 57,200 | 48,000 | 50,600 | 14,400 | 144,000 | 6,020 | 2,070 | 4,420 | 2,060 | 4,030 |
| Median value | 12,800 | 42,500 | 46,700 | 38,600 | 40,100 | 52,800 | 52,800 | 2,920 | 1,980 | 2,690 | 820 | 2,510 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| **Organic nitrogen, instantaneous mass (mg/s)** | | | | | | | | | | | | |
| Minimum value | 8,590 | 10,100 | 9,650 | 6,315 | 6,315 | 7,840 | 7,840 | 2,080 | 2,360 | 1,525 | 1,425 | 1,425 |
| Maximum value | 381,000 | 444,000 | 369,000 | 193,000 | 444,000 | 1,001,000 | 1,001,000 | 153,000 | 35,400 | 324,000 | 48,500 | 324,000 |
| Mean value | 91,250 | 105,400 | 55,400 | 61,700 | 74,000 | 198,500 | 198,000 | 28,200 | 8,985 | 31,000 | 10,900 | 22,400 |
| Median value | 12,600 | 59,800 | 33,700 | 46,300 | 46,000 | 86,700 | 86,700 | 17,800 | 5,630 | 12,000 | 5,440 | 9,080 |
| Number of samples | 7 | 23 | 23 | 34 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| **Mass phosphorous, dissolved (mg/s)** | | | | | | | | | | | | |
| Minimum value | 890 | 2,740 | 3,790 | 1,410 | 890 | 3,760 | 3,760 | 53 | 162 | 93 | 74 | 53 |
| Maximum value | 17,100 | 28,500 | 35,100 | 22,500 | 35,100 | 232,200 | 232,200 | 6,340 | 1,460 | 4,560 | 2,260 | 6,340 |
| Mean value | 4,250 | 10,350 | 12,070 | 7,630 | 9,250 | 31,260 | 31,300 | 950 | 482 | 732 | 632 | 731 |
| Median value | 1,500 | 7,850 | 8,420 | 6,730 | 7,440 | 9,200 | 9,200 | 518 | 358 | 517 | 470 | 448 |
| Number of samples | 7 | 21 | 21 | 32 | 87 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |
| **Mass phosphorous, total (mg/s)** | | | | | | | | | | | | |
| Minimum value | 3,140 | 5,330 | 7,250 | 3,340 | 3,140 | 6,630 | 6,630 | 372 | 379 | 278 | 225 | 225 |
| Maximum value | 165,000 | 160,000 | 213,000 | 78,300 | 213,000 | 526,000 | 526,000 | 62,800 | 9,570 | 84,800 | 14,800 | 848,000 |
| Mean value | 35,200 | 40,900 | 37,200 | 31,800 | 35,900 | 93,100 | 93,100 | 7,990 | 1,950 | 8,050 | 3,040 | 5,960 |
| Median value | 4,760 | 28,400 | 25,900 | 25,800 | 26,100 | 37,800 | 37,800 | 4,030 | 1,090 | 2,220 | 1,200 | 1,910 |
| Number of samples | 7 | 21 | 21 | 32 | 81 | 12 | 12 | 36 | 24 | 39 | 20 | 119 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Fecal coliform, instantaneous colonies (x1000)** | | | | | | | | | | | | |
| Minimum value | 1,784 | 94,177 | -- | 6,813 | 1,784 | 119,940 | 119,940 | 14,727 | -- | 57,009 | -- | 14,727 |
| Maximum value | 481,200 | 290,240 | -- | 191,400 | 481,210 | 9,687,110 | 9,687,110 | 398,268 | -- | 715,410 | -- | 715,410 |
| Mean value | 98,608 | 192,209 | -- | 73,390 | 99,320 | 2,695,200 | 2,695,200 | 157,100 | -- | 250,500 | -- | 210,500 |
| Median value | 13,436 | -- | -- | 49,880 | 49,880 | 486,820 | 486,820 | 47,300 | -- | 128,000 | -- | 57,000 |
| Number of samples | 6 | 2 | -- | 7 | 15 | 4 | 4 | 3 | -- | 4 | -- | 7 |
| **Escherichia coli, instantaneous colonies (x1000)** | | | | | | | | | | | | |
| Minimum value | 2,510 | 5,725 | -- | 6,784 | 2,510 | 358 | 358 | 427 | -- | 10,840 | -- | 427 |
| Maximum value | 256,650 | 304,280 | -- | 138,000 | 304,280 | 6,167,820 | 6,167,820 | 236,140 | -- | 373,530 | -- | 373,530 |
| Mean value | 55,524 | 98,520 | -- | 56,190 | 67,090 | 855,130 | 855,130 | 47,600 | -- | 105,000 | -- | 76,300 |
| Median value | 13,356 | 57,900 | -- | 32,420 | 28,060 | 105,960 | 105,960 | 20,100 | -- | 28,500 | -- | 24,000 |
| Number of samples | 7 | 5 | -- | 7 | 19 | 8 | 8 | 7 | -- | 7 | -- | 14 |
| **Chloride, instantaneous mass (g/s)** | | | | | | | | | | | | |
| Minimum value | 165 | 283 | 250 | 232 | 165 | 573 | 573 | 24 | 79 | 13 | 21 | 13 |
| Maximum value | 2,040 | 2,900 | 2,480 | 2,630 | 2,900 | 16,400 | 16,440 | 539 | 738 | 1,540 | 573 | 1,530 |
| Mean value | 618 | 1,090 | 973 | 1,120 | 1,030 | 3,000 | 3,000 | 213 | 258 | 280 | 166 | 236 |
| Median value | 311 | 934 | 800 | 983 | 860 | 1,620 | 1,620 | 196 | 177 | 188 | 104 | 173 |
| Number of samples | 7 | 23 | 24 | 34 | 88 | 11 | 11 | 36 | 23 | 39 | 20 | 118 |
| **Biochemical oxygen demand, instantaneous mass (g/s)** | | | | | | | | | | | | |
| Minimum value | 17 | 495 | 95 | 72 | 17 | 34 | 34 | 13 | 57 | 73 | 21 | 13 |
| Maximum value | 1,015 | 4,350 | 10,550 | 12,700 | 12,700 | 2,475 | 2,475 | 951 | 890 | 1,590 | 1,205 | 1,590 |
| Mean value | 238 | 1,650 | 1,525 | 1,410 | 1,310 | 787 | 787 | 254 | 217 | 468 | 236 | 312 |
| Median value | 65.3 | 1,200 | 650 | 446 | 506 | 322 | 322 | 135 | 124 | 193 | 90 | 133 |
| Number of samples | 6 | 8 | 10 | 17 | 41 | 7 | 7 | 21 | 8 | 18 | 11 | 45 |

**Table 11.** Summary of physical properties, nutrients, bacteria, and selected chemical compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[$ft^3/s$, cubic feet per second; LRL, laboratory reporting level; NTU, nephelometric turbidity unit; --, no data; <, less than; mg/L, milligrams per liter; µS/cm, microsiemens per centimeter at 25 degrees Celsius; °C, degrees Celsius; N, nitrogen; P, phosphorus; col/100 mL, colonies per 100 milliliters; mg/s, milligrams per second; g, grams; g/s, grams per second; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Chemical oxygen demand, instantaneous mass (g/s)** | | | | | | | | | | | | |
| Minimum value | 160 | 434 | 299 | 123 | 123 | 194 | 194 | 44 | 59 | 99 | 39 | 39 |
| Maximum value | 7,485 | 7,550 | 2,810 | 3,610 | 7,550 | 10,900 | 10,900 | 2,310 | 1,563 | 5,700 | 1,160 | 5,700 |
| Mean value | 1,870 | 2,680 | 1,080 | 1,195 | 1,620 | 3,480 | 3,480 | 636 | 425 | 820 | 318 | 603 |
| Median value | 273 | 2,120 | 888 | 861 | 1,010 | 2,340 | 2,340 | 475 | 181 | 392 | 155 | 314 |
| Number of samples | 7 | 23 | 23 | 33 | 86 | 12 | 12 | 37 | 23 | 39 | 20 | 133 |
| **Total organic carbon, instantaneous mass (g/s)** | | | | | | | | | | | | |
| Minimum value | 57.9 | 155 | 104 | 43.8 | 43.8 | 54.0 | 54.0 | 9.00 | 27.1 | 30.7 | 13.5 | 9.00 |
| Maximum value | 3,614 | 2,990 | 4,230 | 1,940 | 4,230 | 9,540 | 9,540 | 1,620 | 382 | 1,965 | 387 | 1,965 |
| Mean value | 862 | 872 | 628 | 585 | 696 | 1,960 | 1,960 | 226 | 114 | 277 | 100 | 200 |
| Median value | 105 | 593 | 428 | 505 | 493 | 1,234 | 1,235 | 128 | 61 | 94 | 51 | 87 |
| Number of samples | 7 | 23 | 23 | 33 | 86 | 12 | 12 | 37 | 24 | 39 | 19 | 119 |
| **Dissolved organic carbon, instantaneous mass (g/s)** | | | | | | | | | | | | |
| Minimum value | 22.5 | 137 | -- | 37.6 | 22.5 | 37.7 | 37.7 | 14.2 | -- | 52.7 | -- | 14.2 |
| Maximum value | 652 | 644 | -- | 748 | 748 | 3,050 | 3,050 | 183 | -- | 285 | -- | 285 |
| Mean value | 166 | 363 | -- | 276 | 265 | 478 | 478 | 62 | -- | 147 | -- | 92 |
| Median value | 42 | 343 | -- | 264 | 219 | 220 | 220 | 47 | -- | 97 | -- | 61 |
| Number of samples | 7 | 6 | -- | 9 | 22 | 12 | 12 | 13 | -- | 7 | -- | 20 |
| **Suspended sediment mass (g/s)** | | | | | | | | | | | | |
| Minimum value | 2,075 | 2,590 | 2,740 | 359 | 359 | 542 | 542 | 129 | 74 | 150 | 37 | 37 |
| Maximum value | 207,500 | 152,100 | 32,400 | 59,300 | 207,500 | 205,700 | 205,700 | 78,300 | 4,930 | 160,800 | 11,000 | 160,800 |
| Mean value | 45,650 | 42,200 | 14,860 | 20,020 | 26,915 | 51,000 | 51,030 | 7,540 | 719 | 9,260 | 1,360 | 5,620 |
| Median value | 5,370 | 22,460 | 15,460 | 13,010 | 16,150 | 17,850 | 17,850 | 1,830 | 346 | 741 | 180 | 704 |
| Number of samples | 7 | 24 | 23 | 32 | 86 | 14 | 12 | 39 | 24 | 34 | 20 | 116 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **1,4-Dichlorobenzene** | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.018 | 0.008 | 0.016 | 0.008 | <0.5 | <0.5 | 0.016 | 0.011 | 0.013 | 0.028 | 0.011 |
| Max value | <0.5 | 0.018 | 0.040 | 0.119 | 0.119 | <0.5 | <0.5 | 0.045 | 0.051 | 0.077 | 0.283 | 0.283 |
| Mean value of detection | -- | 0.018 | 0.013 | 0.054 | 0.041 | -- | -- | 0.033 | 0.030 | 0.035 | 0.083 | 0.055 |
| Median value of detection | -- | -- | 0.012 | 0.046 | 0.035 | -- | -- | 0.038 | 0.027 | 0.037 | 0.060 | 0.043 |
| Number of samples | 4 | 21 | 25 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 1 | 3 | 20 | 29 | 0 | 0 | 3 | 3 | 15 | 16 | 37 |
| Percent detection | 0 | 5 | 36 | 71 | 39 | 0 | 0 | 10 | 12 | 43 | 80 | 33 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | (0.03-0.04) | (0.03-0.5) | (0.03-0.5) | 0.5 | 0.5 | (0.03-0.5) | (0.03-0.04) | (0.03-0.5) | 0.03 | (0.03-0.5) |
| **1-Methylnaphthalene** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | 0.038 | -- | 0.038 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | 0.038 | -- | 0.038 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.038 | -- | 0.038 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 2 | 7 | 4 | 4 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 1 | -- | 1 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 33 | -- | 10 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **2,6-Di-tert-benzoquinone** | | | | | | | | | | | | |
| Minimum value | -- | <0.07 | 0.046 | <0.07 | 0.046 | -- | -- | <0.07 | <0.07 | <0.07 | <0.07 | <0.07 |
| Max value | -- | 0.485 | 0.337 | 1.33 | 1.33 | -- | -- | 0.490 | 0.327 | 0.924 | 0.484 | 0.924 |
| Mean value of detection | -- | 0.259 | 0.151 | 0.560 | 0.348 | -- | -- | 0.199 | 0.214 | 0.345 | 0.331 | 0.259 |
| Median value of detection | -- | 0.237 | 0.115 | 0.368 | 0.237 | -- | -- | 0.160 | 0.226 | 0.184 | 0.381 | 0.186 |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 24 | 25 | 32 | 20 | 101 |
| Number of detections | -- | 6 | 7 | 9 | 22 | -- | -- | 11 | 11 | 11 | 3 | 36 |
| Percent detection | -- | 30 | 32 | 38 | 33 | -- | -- | 46 | 44 | 34 | 15 | 36 |
| LRL (or LRL range) | -- | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | -- | -- | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **2,6-Di-tert-butylphenol** | | | | | | | | | | | | |
| Minimum value | -- | <0.08 | <0.08 | <0.08 | <0.08 | -- | -- | <0.08 | 0.003 | <0.08 | <0.08 | 0.003 |
| Max value | -- | <0.15 | <0.15 | <0.15 | <0.15 | -- | -- | <0.15 | 0.003 | <0.15 | <0.15 | 0.003 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | 0.003 | -- | -- | 0.003 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 24 | 25 | 32 | 20 | 101 |
| Number of detections | -- | 0 | 0 | 0 | 0 | -- | -- | 0 | 1 | 0 | 0 | 1 |
| Percent detection | -- | 0 | 0 | 0 | 0 | -- | -- | 0 | 4 | 0 | 0 | 1 |
| LRL (or LRL range) | -- | (0.08-0.15) | (0.08-0.15) | (0.08-0.15) | (0.08-0.15) | -- | -- | (0.08-0.15) | (0.09-0.15) | (0.08-0.15) | (0.08-0.15) | (0.08-0.15) |
| **2,6-Dimethylnaphthalene** | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.025 | 0.024 | 0.022 | 0.022 | <0.5 | <0.5 | 0.014 | 0.018 | 0.020 | 0.011 | 0.011 |
| Max value | <0.5 | 0.032 | 0.026 | 0.031 | 0.090 | <0.5 | <0.5 | 0.206 | 0.092 | 0.064 | 0.038 | 0.206 |
| Mean value of detection | -- | 0.029 | 0.025 | 0.027 | 0.027 | -- | -- | 0.074 | 0.036 | 0.042 | 0.024 | 0.049 |
| Median value of detection | -- | -- | -- | 0.029 | 0.026 | -- | -- | 0.042 | 0.032 | 0.039 | 0.018 | 0.034 |
| Number of samples | 4 | 7 | 3 | 8 | 22 | 7 | 7 | 20 | 15 | 21 | 11 | 67 |
| Number of detections | 0 | 2 | 2 | 3 | 7 | 0 | 0 | 10 | 7 | 7 | 5 | 29 |
| Percent detection | 0 | 29 | 67 | 38 | 32 | 0 | 0 | 50 | 47 | 33 | 45 | 43 |
| LRL (or LRL range) | 0.5 | (0.09-.5) | 0.09 | (0.09-0.5) | (0.09-0.5) | 0.5 | 0.5 | (0.09-05) | 0.09 | (0.09-0.5) | 0.09 | (0.09-0.5) |
| **2-Methylnaphthalene** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | 0.054 | -- | 0.038 | -- | 0.038 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | 0.054 | -- | 0.038 | -- | 0.054 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | 0.054 | -- | 0.038 | -- | 0.046 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 1 | -- | 1 | -- | 2 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 14 | -- | 33 | -- | 20 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **3-tert-Butyl-4-hydroxyanisole (BHA)** | | | | | | | | | | | | |
| Minimum value | <5 | <0.1 | <0.1 | <0.1 | <0.1 | <5 | <5 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Max value | <5 | <5 | <.12 | <5 | <5 | <5 | <5 | <5 | <0.12 | <5 | <0.12 | <5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | 5 | (0.1-5) | (0.1-0.12) | (0.1-5) | (0.1-5) | 5 | 5 | (0.1-5) | (0.1-0.12) | (0.1-5) | (0.1-0.12) | (0.1-5) |
| **3,4-Dichlorophenyl isocyanate** | | | | | | | | | | | | |
| Minimum value | -- | -- | -- | 0.820 | 0.820 | 0.580 | 0.580 | 0.024 | -- | -- | -- | 0.024 |
| Max value | -- | -- | -- | 1.60 | 1.60 | 2.40 | 2.40 | 0.300 | -- | -- | -- | 0.300 |
| Mean value of detection | -- | -- | -- | 1.21 | 1.21 | 1.20 | 1.20 | 0.097 | -- | -- | -- | 0.097 |
| Median value of detection | -- | -- | -- | -- | -- | 0.910 | 0.910 | 0.032 | -- | -- | -- | 0.032 |
| Number of samples | -- | -- | -- | 2 | 2 | 4 | 4 | 5 | -- | -- | -- | 5 |
| Number of detections | -- | -- | -- | 2 | 2 | 4 | 4 | 4 | -- | -- | -- | 4 |
| Percent detection | -- | -- | -- | 100 | 100 | 100 | 100 | 80 | -- | -- | -- | 80 |
| LRL (or LRL range) | -- | -- | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | -- | -- | 0.5 |
| **3-?-Coprostanol** | | | | | | | | | | | | |
| Minimum value | <2 | 0.091 | 0.210 | 0.110 | 0.091 | 0.680 | 0.680 | 0.340 | 0.205 | 0.380 | 0.320 | 0.205 |
| Max value | <2 | 1.12 | 2.01 | 3.42 | 2.01 | 5.60 | 5.60 | 3.67 | 6.63 | 11.5 | 1.99 | 11.5 |
| Mean value of detection | -- | 0.683 | 0.869 | 0.868 | 0.828 | 1.87 | 1.87 | 1.10 | 1.29 | 3.10 | 0.992 | 1.846 |
| Median value of detection | -- | 0.729 | 0.650 | 0.820 | 0.740 | 0.890 | 0.890 | 0.842 | 0.820 | 2.59 | 0.640 | 1.100 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 8 | 12 | 17 | 37 | 5 | 5 | 17 | 21 | 31 | 17 | 86 |
| Percent detection | 0 | 38 | 55 | 61 | 49 | 71 | 71 | 55 | 84 | 89 | 85 | 77 |
| LRL (or LRL range) | 2 | (0.6-2) | 0.6 | (0.6-2) | (0.6-2) | 2 | 2 | (0.6-2) | 0.6 | (0.6-2) | 0.6 | (0.6-2) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **3-Methyl-1H-indole (skatol)** | | | | | | | | | | | | |
| Minimum value | <1 | <1 | -- | <1 | <1 | <1 | <1 | <1 | -- | 0.044 | -- | 0.044 |
| Max value | <1 | <1 | -- | <1 | <1 | <1 | <1 | <1 | -- | 0.110 | -- | 1.000 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | 0.077 | -- | 0.077 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 2 | -- | 2 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 67 | -- | 20 |
| LRL (or LRL range) | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | -- | 1 | -- | 1 |
| **4-Cumylphenol** | | | | | | | | | | | | |
| Minimum value | <1 | <1 | -- | <1 | <1 | <1 | <1 | <1 | -- | <1 | -- | <1 |
| Max value | <1 | <1 | -- | <1 | <1 | <1 | <1 | <1 | -- | <1 | -- | <1 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | -- | 1 | -- | 1 |
| **4-Nonylphenol** | | | | | | | | | | | | |
| Minimum value | <5 | <0.5 | 0.339 | <0.5 | 0.339 | 0.340 | 0.340 | 0.226 | 0.380 | 0.543 | 0.869 | 0.226 |
| Max value | <5 | 3.42 | 2.20 | 2.60 | 3.42 | 2.70 | 2.70 | 2.83 | 4.32 | 6.14 | 4.20 | 6.14 |
| Mean value of detection | -- | 1.24 | 0.957 | 1.19 | 1.12 | 0.970 | 0.970 | 1.656 | 1.51 | 2.24 | 1.69 | 1.82 |
| Median value of detection | -- | 1.09 | 0.969 | 1.13 | 1.04 | 0.735 | 0.735 | 1.595 | 1.32 | 2.07 | 1.38 | 1.60 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 14 | 19 | 24 | 57 | 6 | 6 | 26 | 24 | 34 | 20 | 104 |
| Percent detection | -- | 67 | 86 | 86 | 76 | 86 | 86 | 84 | 96 | 97 | 1 | 94 |
| LRL (or LRL range) | 5 | (0.5-5) | (0.5-5) | (0.5-5) | (0.5-5) | 5 | 5 | 5 | 0.5 | 5 | 5 | (0.5-5) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **4-Octylphenol** | | | | | | | | | | | | |
| Minimum value | <1 | <1 | -- | <1 | <1 | <1 | <1 | <1 | -- | <1 | -- | <1 |
| Max value | <1 | <1 | -- | <1 | <1 | <1 | <1 | <1 | -- | <1 | -- | <1 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | -- | 1 | -- | 1 |
| **4-tert-octylphenol** | | | | | | | | | | | | |
| Minimum value | 0.140 | <1 | -- | 0.140 | 0.140 | 0.120 | 0.120 | 0.120 | -- | 0.150 | -- | 0.120 |
| Max value | 0.200 | <1 | -- | 0.170 | 0.200 | 0.190 | 0.190 | 0.340 | -- | 0.500 | -- | 0.500 |
| Mean value of detection | 0.170 | -- | -- | 0.155 | 0.163 | 0.180 | 0.180 | 0.198 | -- | 0.283 | -- | 0.227 |
| Median value of detection | -- | -- | -- | -- | 0.155 | 0.175 | 0.175 | 0.175 | -- | 0.200 | -- | 0.200 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 2 | 0 | -- | 2 | 4 | 4 | 4 | 6 | -- | 3 | -- | 9 |
| Percent detection | 50 | 0 | -- | 50 | 44 | 57 | 57 | 86 | -- | 100 | -- | 90 |
| LRL (or LRL range) | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | -- | 1 | -- | 1 |
| **5-Methyl-1H-benzotriazole** | | | | | | | | | | | | |
| Minimum value | <2 | <0.1 | <0.1 | <0.1 | <0.1 | 0.420 | 0.420 | <01 | <0.1 | <0.1 | <0.1 | <0.1 |
| Max value | <2 | 1.29 | 1.06 | 1.49 | 1.49 | 0.450 | 0.450 | 1.30 | 1.02 | 1.52 | 0.982 | 1.52 |
| Mean value of detection | -- | 0.501 | 0.556 | 0.685 | 0.590 | 0.435 | 0.435 | 0.633 | 0.572 | 0.680 | 0.565 | 0.620 |
| Median value of detection | -- | 0.433 | 0.452 | 0.708 | 0.468 | -- | -- | 0.596 | 0.547 | 0.621 | 0.537 | 0.594 |
| Number of samples | 4 | 15 | 19 | 24 | 62 | 7 | 7 | 18 | 10 | 17 | 9 | 54 |
| Number of detections | 0 | 10 | 16 | 15 | 41 | 2 | 2 | 9 | 8 | 12 | 8 | 37 |
| Percent detection | 0 | 67 | 84 | 63 | 66 | 29 | 29 | 50 | 80 | 71 | 89 | 69 |
| LRL (or LRL range) | 2 | (0.1-2) | 0.1 | (0.1-2) | (0.1-2) | 2 | 2 | (0.1-2) | 0.1 | (0.1-2) | 0.1 | (0.1-2) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Acetophenone** | | | | | | | | | | | | |
| Minimum value | 0.055 | <0.03 | <0.03 | <0.03 | <0.03 | 0.100 | 0.100 | <0.03 | <0.03 | <0.03 | <0.03 | <0.03 |
| Max value | 0.220 | 0.357 | 0.221 | 0.322 | 0.357 | 0.290 | 0.290 | 0.682 | 0.363 | 0.577 | 0.363 | 0.682 |
| Mean value of detection | 0.145 | 0.224 | 0.130 | 0.169 | 0.172 | 0.220 | 0.220 | 0.365 | 0.255 | 0.359 | 0.363 | 0.342 |
| Median value of detection | 0.160 | 0.266 | 0.102 | 0.105 | 0.105 | 0.270 | 0.270 | 0.382 | 0.282 | 0.387 | -- | 0.353 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 3 | 5 | 4 | 5 | 17 | 3 | 3 | 20 | 9 | 18 | 1 | 48 |
| Percent detection | 75 | 24 | 18 | 18 | 23 | 43 | 43 | 65 | 36 | 51 | 5 | 43 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | (0.03-0.22) | (0.03-0.5) | (0.03-0.5) | 0.5 | 0.5 | (0.03-0.5) | (0.03-0.22) | (0.03-0.5) | (0.03-0.22) | (0.03-0.5) |
| **Acetyl-hexamethyl-tetrahydro-naphthalene (AHTN)** | | | | | | | | | | | | |
| Minimum value | 0.049 | <0.5 | -- | 0.078 | 0.049 | 0.034 | 0.034 | 0.079 | -- | 0.094 | -- | 0.079 |
| Max value | 0.061 | <0.5 | -- | 0.160 | 0.160 | 0.460 | 0.460 | 0.140 | -- | 0.094 | -- | 0.140 |
| Mean value of detection | 0.054 | -- | -- | 0.045 | 0.048 | 0.102 | 0.102 | 0.110 | -- | 0.094 | -- | 0.104 |
| Median value of detection | 0.051 | -- | -- | 0.039 | 0.051 | 0.034 | 0.034 | -- | -- | -- | -- | 0.094 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 3 | 0 | -- | 4 | 7 | 7 | 7 | 2 | -- | 1 | -- | 3 |
| Percent detection | 75 | 0 | -- | 100 | 78 | 100 | 100 | 29 | -- | 33 | -- | 30 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Anthracene** | | | | | | | | | | | | |
| Minimum value | 0.020 | 0.019 | 0.019 | 0.024 | 0.019 | 0.022 | 0.022 | 0.026 | 0.029 | 0.022 | 0.026 | 0.022 |
| Max value | 0.021 | 0.328 | 0.125 | 0.120 | 0.328 | 0.170 | 0.170 | 2.510 | 0.792 | 0.460 | 0.052 | 2.510 |
| Mean value of detection | 0.021 | 0.089 | 0.043 | 0.060 | 0.062 | 0.088 | 0.088 | 0.364 | 0.117 | 0.121 | 0.042 | 0.200 |
| Median value of detection | -- | 0.068 | 0.038 | 0.052 | 0.048 | 0.080 | 0.080 | 0.170 | 0.073 | 0.093 | 0.044 | 0.093 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 2 | 18 | 18 | 20 | 58 | 4 | 4 | 31 | 21 | 30 | 6 | 88 |
| Percent detection | 50 | 86 | 82 | 71 | 77 | 57 | 57 | 100 | 84 | 86 | 30 | 79 |
| LRL (or LRL range) | 0.5 | (0.05-0.5) | 0.05 | 0.05 | (0.05-0.5) | 0.5 | 0.5 | 0.05 | 0.05 | 0.05 | (0.05-0.06) | (0.05-0.06) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Anthraquinone** | | | | | | | | | | | | |
| Minimum value | 0.095 | 0.099 | -- | 0.160 | 0.095 | 0.160 | 0.160 | 0.160 | -- | 0.310 | -- | 0.160 |
| Max value | 0.240 | 0.099 | -- | 0.190 | 0.240 | 1.10 | 1.10 | 0.820 | -- | 0.990 | -- | 0.990 |
| Mean value of detection | 0.178 | 0.099 | -- | 0.180 | 0.169 | 0.655 | 0.655 | 0.499 | -- | 0.727 | -- | 0.567 |
| Median value of detection | 0.200 | -- | -- | 0.185 | 0.185 | 0.750 | 0.750 | 0.510 | -- | 0.880 | -- | 0.515 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 3 | 1 | -- | 4 | 8 | 6 | 6 | 7 | -- | 3 | -- | 10 |
| Percent detection | 75 | 100 | -- | 100 | 89 | 86 | 86 | 100 | -- | 100 | -- | 100 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Atrazine** | | | | | | | | | | | | |
| Minimum value | -- | -- | -- | 0.022 | 0.022 | 0.050 | 0.050 | <0.5 | -- | -- | -- | <0.5 |
| Max value | -- | -- | -- | 0.044 | 0.044 | 0.075 | 0.075 | <0.5 | -- | -- | -- | <0.5 |
| Mean value of detection | -- | -- | -- | 0.033 | 0.033 | 0.064 | 0.064 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | 0.066 | 0.066 | -- | -- | -- | -- | -- |
| Number of samples | -- | -- | -- | 2 | 2 | 4 | 4 | 5 | -- | -- | -- | 5 |
| Number of detections | -- | -- | -- | 2 | 2 | 3 | 3 | 0 | -- | -- | -- | 0 |
| Percent detection | -- | -- | -- | 100 | 100 | 75 | 75 | 0 | -- | -- | -- | 0 |
| LRL (or LRL range) | -- | -- | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | -- | -- | 0.5 |
| **Benzaldehyde** | | | | | | | | | | | | |
| Minimum value | -- | <0.15 | <0.15 | <0.15 | <0.15 | -- | -- | <0.10 | <0.10 | <0.10 | <0.10 | <0.10 |
| Max value | -- | <0.15 | <0.15 | <0.15 | <0.15 | -- | -- | 0.177 | <0.15 | <0.15 | <0.15 | 0.177 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | 0.150 | -- | -- | -- | 0.150 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | 0.144 | -- | -- | -- | 0.144 |
| Number of samples | -- | 6 | 3 | 4 | 13 | -- | -- | 13 | 15 | 18 | 11 | 57 |
| Number of detections | -- | 0 | 0 | 0 | 0 | -- | -- | 5 | 0 | 0 | 0 | 5 |
| Percent detection | -- | 0 | 0 | 0 | 0 | -- | -- | 38 | 0 | 0 | 0 | 9 |
| LRL (or LRL range) | -- | 0.15 | 0.15 | 0.15 | 0.15 | -- | -- | (0.1-0.15) | (0.1-0.15) | (0.1-0.15) | (0.1-0.15) | (0.1-0.15) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | **Benzo[a]pyrene** | | | | | | |
| Minimum value | 0.079 | <0.05 | 0.056 | 0.050 | <0.05 | 0.150 | 0.150 | 0.018 | 0.048 | 0.089 | 0.032 | 0.018 |
| Max value | 0.083 | 0.580 | 0.379 | 0.442 | 0.580 | 1.200 | 1.200 | 5.760 | 0.752 | 2.000 | 0.650 | 5.760 |
| Mean value of detection | 0.081 | 0.233 | 0.138 | 0.144 | 0.164 | 0.493 | 0.493 | 1.072 | 0.216 | 0.404 | 0.210 | 0.553 |
| Median value of detection | -- | 0.204 | 0.118 | 0.102 | 0.122 | 0.340 | 0.340 | 0.732 | 0.142 | 0.282 | 0.059 | 0.310 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 2 | 19 | 22 | 26 | 69 | 7 | 7 | 31 | 23 | 35 | 9 | 98 |
| Percent detection | 50 | 90 | 100 | 93 | 92 | 100 | 100 | 100 | 92 | 100 | 45 | 88 |
| LRL (or LRL range) | 0.5 | (0.05-0.5) | 0.5 | 0.5 | (0.05-00.5) | 0.5 | 0.5 | 0.5 | 0.05 | 0.5 | (0.05-0.07) | (0.05-0.07) |
| | | | | | | **Benzophenone** | | | | | | |
| Minimum value | -- | -- | -- | 0.084 | 0.084 | 0.140 | 0.140 | 0.052 | -- | -- | -- | 0.052 |
| Max value | -- | -- | -- | 0.150 | 1.150 | 0.200 | 0.200 | 0.110 | -- | -- | -- | 0.110 |
| Mean value of detection | -- | -- | -- | 0.117 | 0.117 | 0.160 | 0.160 | 0.077 | -- | -- | -- | 0.077 |
| Median value of detection | -- | -- | -- | -- | -- | 0.150 | 0.150 | 0.061 | -- | -- | -- | 0.061 |
| Number of samples | -- | -- | -- | 2 | 2 | 4 | 4 | 5 | -- | -- | -- | 5 |
| Number of detections | -- | -- | -- | 2 | 2 | 4 | 4 | | -- | -- | -- | 5 |
| Percent detection | -- | -- | -- | 100 | 100 | 100 | 100 | 100 | -- | -- | -- | 100 |
| LRL (or LRL range) | -- | -- | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | -- | -- | 0.5 |
| | | | | | | **Bis(2-ethylhexyl) adipate** | | | | | | |
| Minimum value | -- | <0.9 | 2.70 | <1.5 | <0.9 | -- | -- | 0<.9 | <0.9 | <0.9 | <0.9 | <0.9 |
| Max value | -- | 13.0 | 2.70 | 6.90 | 13.0 | -- | -- | 5.90 | 6.50 | 4.90 | 4.90 | 6.50 |
| Mean value of detection | -- | 5.78 | 2.70 | 4.58 | 4.99 | -- | -- | 5.00 | 5.75 | 4.27 | 3.62 | 4.56 |
| Median value of detection | -- | 2.40 | -- | 4.55 | 2.70 | -- | -- | 4.60 | -- | 4.40 | 4.00 | 4.60 |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 24 | 25 | 32 | 20 | 101 |
| Number of detections | -- | 5 | 1 | 4 | 10 | -- | -- | 3 | 2 | 3 | 3 | 11 |
| Percent detection | -- | 25 | 5 | 17 | 15 | -- | -- | 13 | 8 | 9 | 15 | 11 |
| LRL (or LRL range) | -- | (0.9-2) | (0.9-2) | (1.5-2) | (0.9-2) | -- | -- | (0.9-2) | (0.9-2) | (0.9-2) | (0.9-2) | (0.9-2) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Bis(2-ethylhexyl) phthalate** | | | | | | | | | | | | |
| Minimum value | -- | 1.40 | <1.5 | 1.40 | 1.40 | <0.5 | <0.5 | 0.340 | 1.30 | 1.40 | <1.5 | 0.340 |
| Max value | -- | 90.0 | 15.6 | 3.30 | 90.0 | <0.5 | <0.5 | 6.95 | 8.50 | 3.77 | 17.5 | 17.5 |
| Mean value of detection | -- | 18.0 | 8.84 | 2.40 | 11.1 | -- | -- | 3.17 | 4.07 | 2.35 | 7.11 | 3.64 |
| Median value of detection | -- | 6.85 | -- | 2.40 | 3.00 | -- | -- | 2.70 | 3.06 | 2.07 | 2.12 | 2.68 |
| Number of samples | -- | 20 | 22 | 26 | 68 | 2 | 2 | 29 | 25 | 32 | 20 | 106 |
| Number of detections | -- | 7 | 2 | 5 | 14 | 0 | 0 | 10 | 5 | 6 | 3 | 24 |
| Percent detection | -- | 35 | 9 | 19 | 21 | 0 | 0 | 34 | 20 | 19 | 15 | 23 |
| LRL (or LRL range) | -- | (0.5-1.5) | (0.5-1.5) | (0.5-1.5) | (0.5-1.5) | 0.5 | 0.5 | (0.5-1.5) | (0.5-1.5) | (0.5-1.5) | (0.5-1.5) | (0.5-1.5) |
| **Bisphenol A** | | | | | | | | | | | | |
| Minimum value | 0.130 | 0.078 | 0.089 | 0.096 | 0.078 | 0.040 | 0.040 | 0.100 | 0.121 | 0.091 | 0.078 | 0.078 |
| Max value | 0.130 | 0.407 | 0.488 | 0.438 | 0.438 | 0.401 | 0.401 | 0.756 | 0.622 | 0.807 | 0.405 | 0.807 |
| Mean value of detection | 0.130 | 0.207 | 0.202 | 0.297 | 0.281 | 0.152 | 0.152 | 0.312 | 0.345 | 0.371 | 0.221 | 0.322 |
| Median value of detection | -- | 0.173 | 0.172 | 0.223 | 0.193 | 0.160 | 0.160 | 0.266 | 0.350 | 0.354 | 0.200 | 0.317 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 1 | 19 | 22 | 26 | 68 | 6 | 6 | 31 | 25 | 35 | 20 | 111 |
| Percent detection | 25 | 90 | 100 | 93 | 91 | 86 | 86 | 100 | 100 | 100 | 100 | 100 |
| LRL (or LRL range) | 1 | (0.09-1) | (0.09-1) | 1 | (0.09-1) | 1 | 1 | (0.09-1) | (0.09-1) | (0.09-1) | (0.09-1) | (0.09-1) |
| **Bromacil** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | 0.380 | 0.380 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | 0.870 | <0.5 | -- | <0.5 | 0.870 | 0.400 | 0.400 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | 0.695 | -- | -- | -- | 0.695 | 0.390 | 0.390 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 2 | 0 | -- | 0 | 2 | 2 | 2 | 0 | -- | 0 | -- | 0 |
| Percent detection | 50 | 0 | -- | 0 | 22 | 29 | 29 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | **Butylated hydroxytoluene (BHT)** | | | | | | |
| Minimum value | -- | <0.08 | <0.08 | 0.083 | 0.083 | -- | -- | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 |
| Max value | -- | <0.11 | <0.11 | 0.083 | 0.083 | -- | -- | 0.087 | <0.11 | <0.11 | <0.11 | 0.087 |
| Mean value of detection | -- | -- | -- | 0.083 | 0.083 | -- | -- | 0.087 | -- | -- | -- | 0.087 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 24 | 25 | 32 | 20 | 101 |
| Number of detections | -- | 0 | 0 | 2 | 1 | -- | -- | 1 | 0 | 0 | 0 | 1 |
| Percent detection | -- | 0 | 0 | 4 | 2 | -- | -- | 0 | 0 | 0 | 0 | 0 |
| LRL (or LRL range) | -- | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | -- | -- | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) | (0.08-0.11) |
| | | | | | | **Caffeine** | | | | | | |
| Minimum value | 0.035 | 0.043 | 0.203 | 0.160 | 0.035 | 0.087 | 0.087 | 0.200 | 0.300 | 0.310 | 0.280 | 0.200 |
| Max value | 0.130 | 1.12 | 1.18 | 1.25 | 1.25 | 0.800 | 0.800 | 2.00 | 2.58 | 3.30 | 1.91 | 3.30 |
| Mean value of detection | 0.081 | 0.396 | 0.602 | 0.646 | 0.543 | 0.507 | 0.507 | 0.762 | 1.10 | 1.37 | 1.02 | 1.08 |
| Median value of detection | 0.078 | 0.350 | 0.512 | 0.645 | 0.488 | 0.590 | 0.590 | 0.704 | 0.989 | 1.20 | 1.07 | 0.990 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 3 | 19 | 22 | 28 | 72 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Percent detection | 75 | 90 | 100 | 100 | 96 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| LRL (or LRL range) | 0.5 | (0.08-0.5) | 0.08 | (0.08-0.5) | (0.08-0.5) | 0.5 | (0.08-0.5) | (0.08-0.5) | 0.08 | (0.08-0.5) | 0.08 | (0.08-0.5) |
| | | | | | | **Camphor** | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Carbaryl** | | | | | | | | | | | | |
| Minimum value | 0.160 | 0.042 | 0.028 | 0.017 | 0.017 | 0.150 | 0.150 | 0.035 | <0.06 | 0.040 | <0.06 | 0.035 |
| Max value | 0.160 | 0.354 | 0.328 | 0.292 | 0.292 | 0.150 | 0.150 | 1.19 | 1.06 | 1.88 | 0.261 | 1.88 |
| Mean value of detection | 0.160 | 0.147 | 0.127 | 0.081 | 0.113 | 0.150 | 0.150 | 0.388 | 0.392 | 0.362 | 0.131 | 0.350 |
| Median value of detection | -- | 0.114 | 0.082 | 0.055 | 0.082 | -- | -- | 0.333 | 0.305 | 0.239 | 0.088 | 0.271 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 1 | 10 | 11 | 17 | 39 | 1 | 1 | 23 | 18 | 26 | 9 | 76 |
| Percent detection | 25 | 48 | 50 | 61 | 52 | 14 | 14 | 74 | 72 | 74 | 45 | 68 |
| LRL (or LRL range) | 1 | (0.06-1) | 0.06 | (0.06-1) | (0.06-1) | 1 | 1 | (0.06-1) | 0.06 | (0.06-1) | 0.06 | (0.06-1) |
| **Carbazole** | | | | | | | | | | | | |
| Minimum value | 0.019 | <0.5 | -- | 0.034 | 0.019 | 0.031 | 0.031 | 0.026 | -- | 0.100 | -- | 0.026 |
| Max value | 0.069 | <0.5 | -- | 0.084 | 0.084 | 0.480 | 0.480 | 0.480 | -- | 0.480 | -- | 0.480 |
| Mean value of detection | 0.042 | -- | -- | 0.061 | 0.052 | 0.210 | 0.210 | 0.217 | -- | 0.300 | -- | 0.244 |
| Median value of detection | 0.037 | -- | -- | 0.066 | 0.052 | 0.200 | 0.200 | 0.200 | -- | 0.320 | -- | 0.210 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 3 | 0 | -- | 3 | 6 | 7 | 7 | 6 | -- | 3 | -- | 9 |
| Percent detection | 75 | 0 | -- | 75 | 67 | 100 | 100 | 86 | -- | 100 | -- | 90 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **cis-Chlordane** | | | | | | | | | | | | |
| Minimum value | -- | 0.012 | 0.004 | 0.002 | 0.002 | -- | -- | 0.009 | 0.005 | 0.004 | 0.010 | 0.004 |
| Max value | -- | 0.030 | 0.009 | 0.006 | 0.040 | -- | -- | 0.057 | 0.021 | 0.029 | 0.018 | 0.057 |
| Mean value of detection | -- | 0.021 | 0.006 | 0.004 | 0.008 | -- | -- | 0.030 | 0.010 | 0.016 | 0.013 | 0.020 |
| Median value of detection | -- | -- | 0.005 | 0.005 | 0.005 | -- | -- | 0.026 | 0.007 | 0.015 | 0.011 | 0.016 |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 24 | 25 | 32 | 20 | 101 |
| Number of detections | -- | 2 | 5 | 4 | 12 | -- | -- | 15 | 6 | 17 | 4 | 42 |
| Percent detection | -- | 10 | 23 | 21 | 18 | -- | -- | 63 | 24 | 53 | 20 | 42 |
| LRL (or LRL range) | -- | 0.04 | 0.04 | 0.04 | 0.04 | -- | -- | 0.04 | 0.04 | 0.04 | 0.04 | 0.04 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Chlorpyrifos** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.02 | <0.02 | <0.02 | <0.02 | <0.5 | <0.5 | 0.015 | 0.013 | 0.018 | <0.02 | 0.013 |
| Max value | <0.5 | 0.078 | <0.02 | 0.062 | 0.078 | <0.5 | <0.5 | 0.076 | 0.154 | 0.340 | 0.045 | 0.340 |
| Mean value of detection | -- | 0.076 | -- | 0.062 | 0.071 | -- | -- | 0.062 | 0.047 | 0.086 | 0.035 | 0.068 |
| Median value of detection | -- | -- | -- | -- | 0.074 | -- | -- | 0.067 | 0.061 | 0.073 | -- | 0.066 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 2 | 0 | 1 | 3 | 0 | 0 | 9 | 5 | 15 | 2 | 32 |
| Percent detection | 0 | 10 | 0 | 4 | 4 | 0 | 0 | 29 | 20 | 43 | 20 | 30 |
| LRL (or LRL range) | 0.5 | (0.02-0.5) | 0.02 | (0.02-0.5) | (0.02-0.5) | 0.5 | 0.5 | (0.02-0.5) | 0.02 | (0.02-0.5) | 0.02 | (0.02-0.5) |
| **Cholesterol** | | | | | | | | | | | | |
| Minimum value | 0.620 | 0.130 | 0.710 | <0.15 | 0.130 | 0.810 | 0.810 | 0.930 | 1.06 | <1.5 | <1.5 | 1.06 |
| Max value | 1.30 | 2.80 | 3.62 | 3.08 | 3.62 | 14.0 | 14.0 | 5.78 | 12.5 | 11.1 | 8.29 | 12.5 |
| Mean value of detection | 0.870 | 1.71 | 1.83 | 1.60 | 1.63 | 3.32 | 3.32 | 2.40 | 3.58 | 5.11 | 3.80 | 3.82 |
| Median value of detection | 0.690 | 1.67 | 1.28 | 1.70 | 1.37 | 1.80 | 1.80 | 2.20 | 2.73 | 4.48 | 2.99 | 3.22 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 3 | 10 | 11 | 19 | 43 | 7 | 7 | 25 | 22 | 32 | 17 | 96 |
| Percent detection | 75 | 48 | 50 | 68 | 57 | 100 | 100 | 81 | 88 | 91 | 85 | 86 |
| LRL (or LRL range) | 2 | 1 | 1.5 | (1.5-2) | (1.5-2) | 2 | 2 | (1.5-2) | 1.5 | 1.5 | 1.5 | (1.5-2) |
| **Codeine** | | | | | | | | | | | | |
| Minimum value | 0.063 | 0.124 | 0.338 | <0.10 | 0.063 | 0.027 | 0.027 | <0.10 | 0.087 | 0.060 | <0.10 | 0.060 |
| Max value | 0.140 | 0.124 | 0.338 | <0.5 | 0.338 | 0.059 | 0.059 | 0.140 | 0.260 | 0.096 | <0.2 | 0.260 |
| Mean value of detection | 0.108 | 0.124 | 0.338 | -- | 0.157 | 0.043 | 0.043 | 0.130 | 0.199 | 0.078 | -- | 0.152 |
| Median value of detection | 0.120 | -- | -- | -- | -- | -- | -- | -- | 0.225 | -- | -- | 0.130 |
| Number of samples | 4 | 21 | 22 | 26 | 73 | 3 | 3 | 26 | 25 | 35 | 20 | 106 |
| Number of detections | 3 | 1 | 1 | 0 | 4 | 2 | 2 | 2 | 4 | 2 | 0 | 8 |
| Percent detection | 75 | 5 | 5 | 0 | 7 | 67 | 67 | 8 | 16 | 6 | 0 | 8 |
| LRL (or LRL range) | 0.5 | (0.1-0.5) | (0.1-0.2) | (0.1-0.5) | (0.1-0.5) | 0.5 | 0.5 | (0.1-0.2) | (0.1-0.2) | (0.1-0.5) | (0.1-0.2) | (0.1-0.5) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Cotinine** | | | | | | | | | | | | |
| Minimum value | <1 | 0.038 | 0.025 | 0.037 | 0.025 | <1 | <1 | <0.04 | <0.04 | <0.04 | 0.044 | <0.04 |
| Max value | <1 | 0.177 | 0.204 | 0.206 | 0.206 | <1 | <1 | 0.279 | 0.214 | 0.256 | 0.232 | 0.280 |
| Mean value of detection | -- | 0.078 | 0.085 | 0.101 | 0.089 | -- | -- | 0.181 | 0.120 | 0.145 | 0.135 | 0.144 |
| Median value of detection | -- | 0.065 | 0.074 | 0.076 | 0.073 | -- | -- | 0.165 | 0.126 | 0.151 | 0.090 | 0.144 |
| Number of samples | 4 | 15 | 19 | 24 | 62 | 7 | 7 | 18 | 10 | 17 | 9 | 54 |
| Number of detections | 0 | 8 | 13 | 14 | 35 | 0 | 0 | 7 | 8 | 12 | 9 | 36 |
| Percent detection | 0 | 53 | 68 | 58 | 56 | 0 | 0 | 39 | 80 | 71 | 100 | 67 |
| LRL (or LRL range) | 1 | (0.04-1) | (0.04-0.08) | (0.04-1) | (0.04-1) | 1 | 1 | (0.04-1) | 0.04 | (0.04-1) | 0.04 | (0.04-1) |
| **Diazinon** | | | | | | | | | | | | |
| Minimum value | 0.100 | 0.025 | 0.018 | <.03 | 0.018 | 0.038 | 0.038 | 0.026 | <0.03 | 0.028 | <0.03 | 0.026 |
| Max value | 0.100 | 0.607 | 0.222 | 0.297 | 0.607 | 0.065 | 0.065 | 1.21 | 0.843 | 0.621 | 0.551 | 1.21 |
| Mean value of detection | 0.100 | 0.196 | 0.086 | 0.113 | 0.128 | 0.052 | 0.052 | 0.317 | 0.220 | 0.267 | 0.216 | 0.261 |
| Median value of detection | -- | 0.141 | 0.077 | 0.094 | 0.098 | -- | -- | 0.250 | 0.154 | 0.260 | 0.160 | 0.200 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 1 | 16 | 18 | 18 | 53 | 2 | 2 | 27 | 22 | 31 | 18 | 98 |
| Percent detection | 25 | 76 | 82 | 64 | 71 | 29 | 29 | 87 | 88 | 89 | 90 | 88 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | 0.03 | (0.03-0.5) | (0.03-0.5) | 0.5 | 0.5 | 0.5 | 0.03 | (0.03-0.5) | 0.03 | (0.03-0.5) |
| **Dichlorvos** | | | | | | | | | | | | |
| Minimum value | <1 | <1 | -- | <1 | <1 | 0.093 | 0.093 | 0.095 | -- | <1 | -- | 0.095 |
| Max value | <1 | <1 | -- | <1 | <1 | 0.290 | 0.290 | 0.130 | -- | <1 | -- | 0.130 |
| Mean value of detection | -- | -- | -- | -- | -- | 0.188 | 0.188 | 0.113 | -- | -- | -- | 0.113 |
| Median value of detection | -- | -- | -- | -- | -- | 0.185 | 0.185 | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 4 | 4 | 2 | -- | 0 | -- | 2 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 57 | 57 | 29 | -- | 0 | -- | 20 |
| LRL (or LRL range) | 1 | 1 | -- | 1 | 1 | 1 | 1 | 1 | -- | 1 | -- | 1 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Dieldrin** | | | | | | | | | | | | |
| Minimum value | -- | <0.08 | <0.08 | <0.08 | <0.08 | -- | -- | 0.013 | 0.006 | 0.012 | 0.014 | 0.006 |
| Max value | -- | <0.08 | <0.08 | <0.08 | <0.08 | -- | -- | 0.064 | 0.061 | 0.047 | 0.014 | 0.061 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | 0.031 | 0.030 | 0.028 | 0.014 | 0.029 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | 0.021 | 0.027 | 0.026 | -- | 0.021 |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 24 | 25 | 32 | 20 | 101 |
| Number of detections | -- | 0 | 0 | 0 | 0 | -- | -- | 7 | 4 | 4 | 1 | 16 |
| Percent detection | -- | 0 | 0 | 0 | 0 | -- | -- | 29 | 16 | 13 | 5 | 16 |
| LRL (or LRL range) | -- | 0.08 | 0.08 | 0.08 | 0.08 | -- | -- | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| **Diethylphthalate** | | | | | | | | | | | | |
| Minimum value | -- | <0.25 | 0.154 | <0.25 | 0.154 | 0.310 | 0.310 | 0.225 | 0.218 | 0.160 | <0.25 | 0.160 |
| Max value | -- | 0.430 | 0.237 | 1.38 | 1.38 | 0.330 | 0.330 | 17.0 | 0.473 | 0.661 | 0.478 | 17.0 |
| Mean value of detection | -- | 0.311 | 0.200 | 0.680 | 0.500 | 0.320 | 0.320 | 2.823 | 0.386 | 0.408 | 0.371 | 0.960 |
| Median value of detection | -- | 0.293 | 0.205 | 0.612 | 0.427 | -- | -- | 0.369 | 0.392 | 0.438 | 0.351 | 0.397 |
| Number of samples | -- | 14 | 19 | 22 | 55 | 4 | 4 | 16 | 10 | 14 | 9 | 49 |
| Number of detections | -- | 7 | 4 | 14 | 25 | 2 | 2 | 7 | 6 | 11 | 6 | 30 |
| Percent detection | -- | 50 | 21 | 64 | 45 | 50 | 50 | 44 | 60 | 79 | 67 | 61 |
| LRL (or LRL range) | -- | 0.25 | (0.25-0.35) | (0.25-0.5) | (0.25-0.5) | 0.5 | 0.5 | (0.25-0.5) | (0.25-0.35) | 0.35 | (0.25-0.35) | (0.25-0.5) |
| **d-Limonene** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Fluoranthene** | | | | | | | | | | | | |
| Minimum value | 0.084 | 0.038 | 0.210 | 0.140 | 0.038 | 0.500 | 0.500 | 0.120 | 0.072 | 0.351 | <0.030 | <0.030 |
| Max value | 0.210 | 1.99 | 1.61 | 0.690 | 1.99 | 2.90 | 2.90 | 7.38 | 1.92 | 5.20 | 1.20 | 7.38 |
| Mean value of detection | 0.156 | 0.690 | 0.480 | 0.402 | 0.492 | 1.35 | 1.35 | 2.24 | 0.621 | 1.15 | 0.307 | 1.21 |
| Median value of detection | 0.165 | 0.640 | 0.379 | 0.405 | 0.407 | 0.750 | 0.750 | 1.70 | 0.473 | 0.866 | 0.211 | 0.862 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 17 | 108 |
| Percent detection | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 85 | 97 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | 0.5 | 0.5 | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) | (0.03-0.5) |
| **Hexahydrohexamethylcyclopentabenzopyran (HHCB)** | | | | | | | | | | | | |
| Minimum value | 0.029 | <0.5 | -- | <0.5 | 0.029 | 0.041 | 0.041 | 0.053 | -- | 0.062 | -- | 0.053 |
| Max value | 0.032 | <0.5 | -- | <0.5 | 0.032 | 0.130 | 0.130 | 0.053 | -- | 0.062 | -- | 0.500 |
| Mean value of detection | 0.031 | -- | -- | -- | 0.031 | 0.071 | 0.071 | 0.053 | -- | 0.062 | -- | 0.058 |
| Median value of detection | -- | -- | -- | -- | -- | 0.063 | 0.063 | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 2 | 0 | -- | 0 | 2 | 5 | 5 | 1 | -- | 1 | -- | 2 |
| Percent detection | 50 | 0 | -- | 0 | 22 | 71 | 71 | 14 | -- | 33 | -- | 20 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Indole** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | 0.088 | 0.088 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | 0.088 | 0.088 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | 0.088 | 0.088 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 1 | 1 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 14 | 14 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Isoborneol** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Isophorone** | | | | | | | | | | | | |
| Minimum value | 0.048 | <0.5 | -- | <0.5 | 0.048 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | 0.048 | <0.5 | -- | <0.5 | 0.048 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | 0.048 | -- | -- | -- | 0.048 | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 1 | 0 | -- | 0 | 1 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 25 | 0 | -- | 0 | 11 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Isopropylbenzene (cumene)** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Isoquinoline** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | 0.085 | 0.085 | 0.062 | 0.062 | 0.057 | -- | <0.5 | -- | 0.057 |
| Max value | <0.5 | <0.5 | -- | 0.085 | 0.085 | 0.160 | 0.160 | 0.140 | -- | <0.5 | -- | 0.140 |
| Mean value of detection | -- | -- | -- | 0.085 | 0.085 | 0.111 | 0.111 | 0.099 | -- | -- | -- | 0.099 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 1 | 1 | 2 | 2 | 2 | -- | 0 | -- | 2 |
| Percent detection | 0 | 0 | -- | 25 | 11 | 29 | 29 | 29 | -- | 0 | -- | 20 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Lindane** | | | | | | | | | | | | |
| Minimum value | -- | 0.016 | <0.05 | 0.021 | <0.05 | -- | -- | <0.05 | 0.280 | <0.05 | <0.05 | 0.280 |
| Max value | -- | 0.210 | <0.05 | 0.021 | 0.210 | -- | -- | <0.05 | 0.280 | <0.05 | <0.05 | 0.280 |
| Mean value of detection | -- | 0.113 | -- | 0.021 | 0.082 | -- | -- | -- | 0.280 | -- | -- | 0.280 |
| Median value of detection | -- | -- | -- | -- | 0.021 | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 17 | 19 | 21 | 14 | 71 |
| Number of detections | -- | 2 | 0 | 1 | 3 | -- | -- | 0 | 1 | 0 | 0 | 1 |
| Percent detection | -- | 10 | 0 | 4 | 5 | -- | -- | 0 | 5 | 0 | 0 | 1 |
| LRL (or LRL range) | -- | 0.05 | 0.05 | 0.05 | 0.5 | -- | -- | 0.05 | 0.05 | 0.05 | 0.05 | 0.5 |
| **Menthol** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | 0.110 | 0.110 | 0.089 | 0.089 | 0.083 | -- | <0.5 | -- | 0.083 |
| Max value | <0.5 | <0.5 | -- | 0.120 | 0.120 | 0.089 | 0.089 | 0.110 | -- | <0.5 | -- | 0.110 |
| Mean value of detection | -- | -- | -- | 0.115 | 0.115 | 0.089 | 0.089 | 0.097 | -- | -- | -- | 0.097 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 2 | 2 | 1 | 1 | 2 | -- | 0 | -- | 2 |
| Percent detection | 0 | 0 | -- | 50 | 22 | 14 | 14 | 29 | -- | 0 | -- | 20 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Metalaxyl** | | | | | | | | | | | | |
| Minimum value | -- | -- | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | <0.5 |
| Max value | -- | -- | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | -- | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | -- | -- | -- | 2 | 2 | 4 | 4 | 5 | -- | -- | -- | 5 |
| Number of detections | -- | -- | -- | 0 | 0 | 0 | 0 | 0 | -- | -- | -- | 0 |
| Percent detection | -- | -- | -- | 0 | 0 | 0 | 0 | 0 | -- | -- | -- | 0 |
| LRL (or LRL range) | -- | -- | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | -- | -- | 0.5 |
| **Methylsalicylate** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Metolachlor** | | | | | | | | | | | | |
| Minimum value | 0.085 | 0.046 | -- | 0.027 | 0.027 | 0.027 | 0.027 | 0.016 | -- | <0.5 | -- | 0.016 |
| Max value | 0.085 | 0.046 | -- | 0.071 | 0.085 | 0.076 | 0.076 | 0.070 | -- | <0.5 | -- | 0.500 |
| Mean value of detection | 0.085 | 0.046 | -- | 0.045 | 0.052 | 0.052 | 0.052 | 0.043 | -- | -- | -- | 0.043 |
| Median value of detection | -- | -- | -- | 0.042 | 0.050 | 0.057 | 0.057 | 0.043 | -- | -- | -- | 0.043 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 1 | 1 | -- | 4 | 6 | 6 | 6 | 4 | -- | 0 | -- | 4 |
| Percent detection | 25 | 100 | -- | 100 | 67 | 86 | 86 | 57 | -- | 0 | -- | 40 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **N,N-diethyl-meta-toluamide (DEET)** | | | | | | | | | | | | |
| Minimum value | 0.140 | 0.044 | 0.077 | 0.083 | 0.044 | 0.080 | 0.080 | 0.179 | 0.104 | 0.948 | 0.139 | 0.104 |
| Max value | 0.230 | 1.47 | 0.435 | 1.20 | 1.47 | 0.270 | 0.270 | 1.50 | 0.586 | 4.76 | 0.449 | 4.760 |
| Mean value of detection | 0.198 | 0.709 | 0.242 | 0.464 | 0.438 | 0.187 | 0.187 | 0.698 | 0.267 | 2.05 | 0.206 | 0.962 |
| Median value of detection | 0.210 | 0.708 | 0.241 | 0.306 | 0.303 | 0.200 | 0.200 | 0.623 | 0.180 | 2.03 | 0.181 | 0.593 |
| Number of samples | 4 | 15 | 19 | 24 | 62 | 7 | 7 | 18 | 10 | 17 | 9 | 54 |
| Number of detections | 4 | 15 | 19 | 24 | 62 | 7 | 7 | 18 | 10 | 17 | 9 | 54 |
| Percent detection | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| LRL (or LRL range) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) | (0.5-2) |
| **Naphthalene** | | | | | | | | | | | | |
| Minimum value | <0.5 | 0.019 | <.02 | 0.016 | 0.016 | 0.052 | 0.052 | 0.028 | 0.016 | 0.022 | 0.019 | 0.016 |
| Max value | <0.5 | 0.130 | 0.046 | 0.072 | 0.130 | 0.052 | 0.052 | 1.09 | 0.753 | 0.130 | 0.022 | 1.09 |
| Mean value of detection | -- | 0.051 | 0.032 | 0.036 | 0.039 | 0.052 | 0.052 | 0.201 | 0.115 | 0.049 | 0.021 | 0.118 |
| Median value of detection | -- | 0.036 | 0.030 | 0.031 | 0.031 | -- | -- | 0.073 | 0.035 | 0.040 | 0.022 | 0.043 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 7 | 4 | 16 | 27 | 1 | 1 | 20 | 9 | 18 | 4 | 51 |
| Percent detection | 0 | 33 | 18 | 57 | 36 | 14 | 14 | 65 | 36 | 51 | 20 | 46 |
| LRL (or LRL range) | 0.5 | (0.02-0.5) | (0.02-.03) | (0.025-0.5) | (0.02-0.5) | 0.5 | 0.5 | (0.03-0.5) | (0.025-0.03) | (0.025-0.5) | (0.02-0.03) | (0.025-0.5) |
| **Nonylphenol monoethoxylate** | | | | | | | | | | | | |
| Minimum value | -- | 0.042 | 0.364 | 0.411 | 0.040 | 0.520 | 0.520 | 0.120 | 0.160 | 0.520 | 0.480 | 0.120 |
| Max value | -- | 2.12 | 2.35 | 2.21 | 2.35 | 2.00 | 2.00 | 2.66 | 3.73 | 4.65 | 1.54 | 4.65 |
| Mean value of detection | -- | 1.04 | 1.13 | 1.04 | 1.07 | 1.09 | 1.09 | 1.30 | 1.27 | 1.56 | 0.892 | 1.33 |
| Median value of detection | -- | 1.03 | 1.15 | 0.935 | 1.07 | 0.910 | 0.910 | 1.37 | 1.17 | 1.28 | 0.806 | 1.19 |
| Number of samples | -- | 20 | 22 | 26 | 68 | 4 | 4 | 29 | 25 | 32 | 20 | 106 |
| Number of detections | -- | 15 | 15 | 20 | 50 | 4 | 4 | 10 | 13 | 29 | 13 | 65 |
| Percent detection | -- | 75 | 68 | 77 | 74 | 100 | 100 | 34 | 52 | 91 | 65 | 61 |
| LRL (or LRL range) | -- | (0.8-1) | (0.8-1) | (1-5) | (0.8-5) | 1 | 1 | (0.8-5) | (0.8-1) | 1 | (0.8-1) | (0.8-5) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Nonylphenol diethoxylate** | | | | | | | | | | | | |
| Minimum value | <5 | 0.450 | 0.749 | 0.309 | 0.309 | 1.50 | 1.50 | 0.937 | 0.654 | 0.280 | 0.180 | 0.180 |
| Max value | <5 | 2.52 | 2.74 | 2.6 | 2.74 | 3.50 | 3.50 | 3.08 | 2.60 | 3.54 | 1.39 | 3.54 |
| Mean value of detection | -- | 1.63 | 1.62 | 1.43 | 1.55 | 2.78 | 2.78 | 1.76 | 1.36 | 1.51 | 0.704 | 1.41 |
| Median value of detection | -- | 1.88 | 1.32 | 1.40 | 1.45 | 3.05 | 3.05 | 1.40 | 1.29 | 1.50 | 0.641 | 1.30 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 6 | 5 | 7 | 18 | 4 | 4 | 9 | 10 | 24 | 7 | 50 |
| Percent detection | 0 | 29 | 23 | 25 | 24 | 57 | 57 | 29 | 40 | 69 | 35 | 45 |
| LRL (or LRL range) | 5 | 1 | (1-1.1) | (1-5) | (1-5) | 5 | 5 | 1 | (1-1.1) | (1-5) | (1-1.1) | (1-5) |
| **Octylphenol monoethoxylate** | | | | | | | | | | | | |
| Minimum value | <1 | 0.071 | 0.052 | 0.056 | 0.052 | 0.370 | 0.370 | <0.1 | <0.1 | <0.1 | 0.096 | 0.096 |
| Max value | <1 | 0.608 | 0.530 | 0.980 | 0.980 | 0.370 | 0.370 | 2.65 | 1.55 | 1.51 | 0.454 | 2.650 |
| Mean value of detection | -- | 0.291 | 0.190 | 0.250 | 0.245 | 0.370 | 0.370 | 1.10 | 0.872 | 0.733 | 0.199 | 0.797 |
| Median value of detection | -- | 0.218 | 0.148 | 0.134 | 0.158 | -- | -- | 0.860 | 0.820 | 0.673 | 0.136 | 0.650 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 8 | 8 | 12 | 28 | 1 | 1 | 17 | 15 | 22 | 8 | 62 |
| Percent detection | 0 | 38 | 36 | 43 | 37 | 14 | 14 | 55 | 60 | 63 | 40 | 56 |
| LRL (or LRL range) | 1 | 0.1 | (0.1-0.12) | (0.01-1) | (0.1-1) | 1 | 1 | (0.1-1) | (0.1-0.12) | (0.1-1) | (0.1-0.12) | (0.1-1) |
| **Octylphenol diethoxylate** | | | | | | | | | | | | |
| Minimum value | <1 | 0.019 | 0.014 | 0.022 | 0.014 | 0.130 | 0.130 | 0.087 | 0.046 | 0.062 | 0.054 | 0.046 |
| Max value | <1 | 0.115 | 0.094 | 0.150 | 0.660 | 0.130 | 0.130 | 0.319 | 0.598 | 0.410 | 0.137 | 0.598 |
| Mean value of detection | -- | 0.075 | 0.043 | 0.068 | 0.057 | 0.130 | 0.130 | 0.173 | 0.189 | 0.151 | 0.095 | 0.158 |
| Median value of detection | -- | 0.091 | 0.038 | 0.031 | 0.038 | -- | -- | 0.130 | 0.140 | 0.110 | 0.087 | 0.120 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 3 | 6 | 3 | 12 | 1 | 1 | 11 | 15 | 17 | 8 | 51 |
| Percent detection | 0 | 14 | 27 | 11 | 16 | 14 | 14 | 35 | 60 | 49 | 40 | 46 |
| LRL (or LRL range) | 1 | 0.2 | 0.2 | (0.2-1) | (0.2-1) | 1 | 1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **para-Cresol** | | | | | | | | | | | | |
| Minimum value | <1 | 0.018 | 0.019 | 0.023 | 0.018 | <1 | <1 | 0.017 | 0.028 | 0.016 | <0.03 | 0.016 |
| Max value | <1 | 0.260 | 0.064 | 0.086 | 0.177 | <1 | <1 | 0.957 | 0.410 | 0.333 | 0.470 | 0.957 |
| Mean value of detection | -- | 0.084 | 0.028 | 0.040 | 0.047 | -- | -- | 0.273 | 0.138 | 0.167 | 0.209 | 0.204 |
| Median value of detection | -- | 0.050 | 0.021 | 0.030 | 0.029 | -- | -- | 0.171 | 0.081 | 0.114 | 0.250 | 0.123 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 5 | 7 | 7 | 19 | 0 | 0 | 19 | 12 | 16 | 7 | 54 |
| Percent detection | 0 | 24 | 32 | 25 | 25 | 0 | 0 | 61 | 48 | 46 | 35 | 49 |
| LRL (or LRL range) | 1 | (0.03-1) | (0.03-0.15) | (0.03-1) | (0.03-1) | 1 | 1 | (0.03-1) | (0.03-0.15) | (0.03-1) | (0.03-0.15) | (0.03-0.15) |
| **Pentachlorophenol** | | | | | | | | | | | | |
| Minimum value | 0.520 | <2 | -- | 0.066 | 0.066 | 0.051 | 0.051 | 0.078 | -- | 0.760 | -- | 0.078 |
| Max value | 0.560 | <2 | -- | 0.069 | 0.560 | 0.540 | 0.540 | 0.770 | -- | 0.780 | -- | 0.780 |
| Mean value of detection | 0.540 | -- | -- | 0.068 | 0.304 | 0.313 | 0.313 | 0.254 | -- | 0.770 | -- | 0.401 |
| Median value of detection | -- | -- | -- | -- | 0.295 | 0.330 | 0.330 | 0.084 | -- | -- | -- | 0.260 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 2 | 0 | -- | 2 | 4 | 4 | 4 | 5 | -- | 2 | -- | 7 |
| Percent detection | 50 | 0 | -- | 50 | 44 | 57 | 57 | 71 | -- | 67 | -- | 70 |
| LRL (or LRL range) | 2 | 2 | -- | 2 | 2 | 2 | 2 | 2 | -- | 2 | -- | 2 |
| **Phenanthrene** | | | | | | | | | | | | |
| Minimum value | 0.062 | 0.040 | <.06 | 0.049 | 0.040 | 0.160 | 0.160 | 0.054 | 0.028 | 0.072 | 0.023 | 0.023 |
| Max value | 0.079 | 0.790 | 0.641 | 0.260 | 0.790 | 1.60 | 1.60 | 7.45 | 2.06 | 2.40 | 0.390 | 7.45 |
| Mean value of detection | 0.069 | 0.291 | 0.171 | 0.137 | 0.185 | 0.564 | 0.564 | 1.338 | 0.307 | 0.425 | 0.135 | 0.659 |
| Median value of detection | 0.067 | 0.233 | 0.114 | 0.135 | 0.145 | 0.290 | 0.290 | 0.703 | 0.232 | 0.304 | 0.054 | 0.341 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 4 | 20 | 21 | 28 | 73 | 7 | 7 | 31 | 23 | 35 | 9 | 98 |
| Percent detection | 100 | 95 | 95 | 100 | 97 | 100 | 100 | 100 | 92 | 100 | 45 | 88 |
| LRL (or LRL range) | 0.05 | (0.05-0.06) | 0.06 | (0.05-0.06) | (0.05-0.06) | 0.05 | 0.05 | (0.05-0.06) | 0.06 | (0.05-0.06) | 0.06 | 0.05 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Phenol** | | | | | | | | | | | | |
| Minimum value | 0.260 | <0.08 | <0.08 | <0.08 | <0.08 | <0.5 | <0.5 | <0.08 | <0.08 | <0.08 | <0.08 | <0.08 |
| Max value | 0.260 | 0.402 | 0.954 | 1.35 | 1.35 | 0.500 | 0.500 | 0.730 | 2.13 | 0.766 | 0.722 | 2.13 |
| Mean value of detection | 0.260 | 0.294 | 0.535 | 0.518 | 0.447 | 0.500 | 0.500 | 0.416 | 0.659 | 0.460 | 0.455 | 0.479 |
| Median value of detection | -- | 0.305 | 0.456 | 0.395 | 0.357 | -- | -- | 0.332 | 0.474 | 0.415 | 0.405 | 0.388 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 1 | 9 | 8 | 12 | 30 | 1 | 1 | 14 | 7 | 12 | 6 | 39 |
| Percent detection | 25 | 43 | 36 | 43 | 40 | 14 | 14 | 45 | 28 | 34 | 30 | 35 |
| LRL (or LRL range) | 0.5 | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | 0.5 | 0.5 | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) | (0.08-0.5) |
| **Phthalic anhydride** | | | | | | | | | | | | |
| Minimum value | -- | <0.2 | 0.340 | <0.2 | <0.2 | -- | -- | <0.35 | <0.15 | 0.439 | 0.280 | <0.15 |
| Max value | -- | 3.33 | 2.15 | 4.65 | 5.65 | -- | -- | 4.90 | 3.00 | 3.28 | 2.72 | 4.90 |
| Mean value of detection | -- | 1.09 | 1.04 | 1.10 | 1.08 | -- | -- | 1.41 | 1.39 | 1.36 | 1.05 | 1.31 |
| Median value of detection | -- | 0.810 | 1.07 | 0.970 | 0.924 | -- | -- | 1.30 | 1.17 | 1.27 | 0.867 | 1.20 |
| Number of samples | -- | 20 | 22 | 24 | 66 | -- | -- | 24 | 25 | 32 | 20 | 101 |
| Number of detections | -- | 17 | 21 | 22 | 60 | -- | -- | 23 | 24 | 32 | 20 | 99 |
| Percent detection | -- | 85 | 95 | 92 | 91 | -- | -- | 96 | 96 | 100 | 100 | 98 |
| LRL (or LRL range) | -- | (0.2-0.35) | (0.2-0.35) | (0.2-0.35) | (0.2-0.35) | -- | -- | (0.2-0.35) | (0.2-0.35) | (0.2-0.35) | (0.2-0.35) | (0.2-0.35) |
| **Prometon** | | | | | | | | | | | | |
| Minimum value | 0.063 | <0.5 | -- | 0.063 | 0.063 | 0.072 | 0.072 | 0.078 | -- | 0.100 | -- | 0.078 |
| Max value | 0.180 | <0.5 | -- | 0.063 | 0.180 | 0.072 | 0.072 | 0.094 | -- | 0.140 | -- | 0.140 |
| Mean value of detection | 0.122 | -- | -- | 0.063 | 0.102 | 0.072 | 0.072 | 0.086 | -- | 0.120 | -- | 0.103 |
| Median value of detection | -- | -- | -- | -- | 0.063 | -- | -- | -- | -- | -- | -- | 0.097 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 2 | 0 | -- | 1 | 3 | 1 | 1 | 2 | -- | 2 | -- | 4 |
| Percent detection | 50 | 0 | -- | 25 | 33 | 14 | 14 | 29 | -- | 67 | -- | 40 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Pyrene** | | | | | | | | | | | | |
| Minimum value | 0.079 | 0.026 | 0.168 | 0.100 | Blue River | 0.330 | Indian Creek | 0.068 | 0.055 | 0.240 | <0.03 | Brush Creek |
| Max value | 0.150 | 1.56 | 1.28 | 0.600 | 1.56 | 1.90 | 1.90 | 5.54 | 1.57 | 3.60 | 0.780 | 5.54 |
| Mean value of detection | 0.111 | 0.547 | 0.391 | 0.325 | 0.395 | 0.886 | 0.886 | 1.742 | 0.478 | 0.859 | 0.259 | 0.949 |
| Median value of detection | 0.108 | 0.486 | 0.300 | 0.325 | 0.330 | 0.500 | 0.500 | 1.200 | 0.353 | 0.647 | 0.142 | 0.670 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 14 | 105 |
| Percent detection | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 70 | 95 |
| LRL (or LRL range) | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| **Sitosterol** | | | | | | | | | | | | |
| Minimum value | 0.960 | <2 | -- | 1.60 | 0.960 | 0.760 | 0.760 | 1.00 | -- | 4.20 | -- | 1.00 |
| Max value | 1.10 | <2 | -- | 1.90 | 1.90 | 8.10 | 8.10 | 6.90 | -- | 4.80 | -- | 6.90 |
| Mean value of detection | 1.03 | -- | -- | 1.75 | 1.39 | 2.81 | 2.81 | 2.54 | -- | 4.50 | -- | 3.28 |
| Median value of detection | -- | -- | -- | -- | 1.35 | 1.70 | 1.70 | 1.40 | -- | 4.50 | -- | 3.15 |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 2 | 0 | -- | 2 | 4 | 5 | 5 | 5 | -- | 3 | -- | 8 |
| Percent detection | 50 | 0 | -- | 50 | 44 | 71 | 71 | 71 | -- | 100 | -- | 80 |
| LRL (or LRL range) | 2 | 2 | -- | 2 | 2 | 2 | 2 | 2 | -- | 2 | -- | 2 |
| **Stigmastanol** | | | | | | | | | | | | |
| Minimum value | <2 | <2 | <2 | 0.880 | 0.880 | <2 | <2 | 0.845 | <2 | 0.828 | 1.01 | 0.828 |
| Max value | <2 | <2 | <2 | 0.880 | 0.880 | <2 | <2 | 1.42 | <2 | 2.21 | 1.01 | 2.21 |
| Mean value of detection | -- | -- | -- | 0.880 | 0.880 | -- | -- | 1.13 | -- | 1.41 | 1.01 | 1.29 |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | 1.01 | -- | 1.01 |
| Number of samples | 4 | 15 | 19 | 24 | 62 | 7 | 7 | 18 | 10 | 17 | 9 | 54 |
| Number of detections | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 2 | 1 | 8 |
| Percent detection | 0 | 0 | 0 | 4 | 2 | 0 | 0 | 11 | 0 | 29 | 11 | 15 |
| LRL (or LRL range) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Tetrachloroethylene** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.03 | 0.026 | 0.029 | 0.026 | <0.5 | <0.5 | 0.021 | 0.021 | 0.019 | <0.03 | 0.019 |
| Max value | <0.5 | 0.120 | 0.066 | 0.029 | 0.500 | <0.5 | <0.5 | 1.00 | 0.359 | 1.30 | 0.130 | 1.30 |
| Mean value of detection | -- | 0.082 | 0.049 | 0.029 | 0.060 | -- | -- | 0.157 | 0.095 | 0.186 | 0.085 | 0.136 |
| Median value of detection | -- | 0.071 | 0.055 | -- | 0.056 | -- | -- | 0.052 | 0.058 | 0.035 | 0.071 | 0.056 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 0 | 3 | 3 | 1 | 7 | 0 | 0 | 15 | 17 | 13 | 6 | 51 |
| Percent detection | 0 | 14 | 14 | 4 | 9 | 0 | 0 | 48 | 68 | 37 | 30 | 46 |
| LRL (or LRL range) | 0.5 | (0.03-0.5) | 0.03 | (0.03-0.5) | (0.03-0.5) | 0.5 | 0.5 | (0.03-0.5) | 0.03 | (0.03-0.5) | 0.03 | (0.03-0.5) |
| **Tribromomethane** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 0 | 0 | 0 | 0 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Tributylphosphate** | | | | | | | | | | | | |
| Minimum value | 0.160 | <0.06 | 0.100 | 0.086 | <0.06 | 0.056 | 0.056 | <0.04 | <0.06 | <0.04 | <0.04 | <0.04 |
| Max value | 0.160 | 0.130 | 0.200 | 0.100 | 0.200 | 0.092 | 0.092 | 0.280 | 0.403 | 0.569 | 0.282 | 0.569 |
| Mean value of detection | 0.160 | 0.105 | 0.157 | 0.093 | 0.129 | 0.079 | 0.079 | 0.136 | 0.207 | 0.293 | 0.151 | 0.202 |
| Median value of detection | -- | 0.096 | 0.170 | -- | 0.115 | 0.084 | 0.084 | 0.130 | 0.180 | 0.257 | 0.140 | 0.160 |
| Number of samples | 4 | 7 | 3 | 4 | 18 | 7 | 7 | 20 | 15 | 21 | 11 | 67 |
| Number of detections | 2 | 3 | 3 | 2 | 10 | 4 | 4 | 17 | 13 | 17 | 10 | 57 |
| Percent detection | 50 | 43 | 100 | 50 | 56 | 57 | 57 | 85 | 87 | 81 | 91 | 85 |
| LRL (or LRL range) | 0.5 | (0.06-0.5) | (0.06-0.5) | 0.5 | (0.06-0.5) | 0.5 | 0.5 | (0.04-0.5) | 0.06 | (0.04-0.5) | 0.04 | (0.04-0.5) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| **Triclosan** | | | | | | | | | | | | |
| Minimum value | 0.045 | <0.04 | 0.070 | 0.149 | <0.04 | 0.084 | 0.084 | 0.041 | 0.057 | 0.120 | 0.058 | 0.041 |
| Max value | 0.045 | 0.461 | 0.578 | 0.591 | 0.591 | 0.510 | 0.510 | 0.255 | 0.513 | 0.618 | 0.527 | 0.618 |
| Mean value of detection | 0.045 | 0.211 | 0.267 | 0.298 | 0.260 | 0.259 | 0.259 | 0.125 | 0.254 | 0.313 | 0.273 | 0.249 |
| Median value of detection | -- | 0.200 | 0.228 | 0.262 | 0.228 | 0.230 | 0.230 | 0.140 | 0.156 | 0.242 | 0.249 | 0.196 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 1 | 19 | 22 | 26 | 68 | 5 | 5 | 23 | 25 | 34 | 20 | 102 |
| Percent detection | 25 | 90 | 100 | 93 | 91 | 71 | 71 | 74 | 100 | 97 | 100 | 92 |
| LRL (or LRL range) | 1 | (0.04-1) | (0.04-1) | 1 | (0.04-1) | 1 | 1 | (0.05-1) | (0.05-1) | 1 | (0.05-1) | (0.05-1) |
| **Triethyl citrate** | | | | | | | | | | | | |
| Minimum value | <0.5 | <0.5 | -- | 0.063 | 0.063 | 0.027 | 0.027 | <0.5 | -- | <0.5 | -- | <0.5 |
| Max value | <0.5 | <0.5 | -- | 0.063 | 0.063 | 0.170 | 0.170 | <0.5 | -- | <0.5 | -- | <0.5 |
| Mean value of detection | -- | -- | -- | 0.063 | 0.063 | 0.118 | 0.118 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | 0.150 | 0.150 | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | -- | 4 | 9 | 7 | 7 | 7 | -- | 3 | -- | 10 |
| Number of detections | 0 | 0 | -- | 1 | 1 | 5 | 5 | 0 | -- | 0 | -- | 0 |
| Percent detection | 0 | 0 | -- | 25 | 11 | 71 | 71 | 0 | -- | 0 | -- | 0 |
| LRL (or LRL range) | 0.5 | 0.5 | -- | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | -- | 0.5 | -- | 0.5 |
| **Triphenyl phosphate** | | | | | | | | | | | | |
| Minimum value | 0.018 | 0.019 | 0.018 | 0.027 | 0.018 | 0.014 | 0.014 | 0.061 | 0.049 | 0.023 | 0.062 | 0.023 |
| Max value | 0.063 | 0.093 | 0.070 | 0.154 | 0.154 | 0.032 | 0.032 | 0.169 | 0.184 | 0.143 | 0.146 | 0.184 |
| Mean value of detection | 0.041 | 0.057 | 0.043 | 0.062 | 0.053 | 0.023 | 0.023 | 0.097 | 0.108 | 0.087 | 0.105 | 0.097 |
| Median value of detection | -- | 0.069 | 0.041 | 0.055 | 0.050 | -- | -- | 0.089 | 0.100 | 0.084 | 0.098 | 0.094 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 2 | 8 | 12 | 15 | 37 | 2 | 2 | 16 | 10 | 15 | 5 | 46 |
| Percent detection | 50 | 38 | 55 | 54 | 49 | 29 | 29 | 52 | 40 | 43 | 25 | 41 |
| LRL (or LRL range) | 0.5 | (0.1-0.5) | 0.1 | (0.1-0.5) | (0.1-0.5) | 0.5 | 0.5 | 0.1 | 0.1 | (0.1-0.5) | 0.1 | (0.1-0.5) |

**Table 12.** Summary of selected organic wastewater compounds in stormflow samples collected between May 1999 and June 2004.—Continued

[All concentrations in units of micrograms per liter; <, less than; --, no data; LRL, laboratory reporting level; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | | Indian Creek | | Brush Creek | | | | |
| | 2 | 7 | 8 | 13 | Basin | 6 | Basin | 9 | 10 | 11 | 12 | Basin |
| | | | | | | Tris (2-butoxyethyl) phosphate | | | | | | |
| Minimum value | 0.230 | <0.07 | 0.270 | <0.07 | <0.07 | 0.200 | 0.200 | 0.261 | 0.400 | 0.440 | 0.322 | 0.261 |
| Max value | 0.300 | 1.99 | 1.82 | 1.63 | 1.99 | 1.80 | 1.80 | 7.79 | 2.45 | 4.90 | 2.17 | 7.79 |
| Mean value of detection | 0.265 | 0.742 | 0.856 | 0.811 | 0.792 | 1.04 | 1.04 | 1.29 | 1.22 | 1.61 | 1.32 | 1.38 |
| Median value of detection | -- | 0.647 | 0.736 | 0.795 | 0.673 | 1.00 | 1.00 | 0.840 | 1.10 | 1.40 | 1.43 | 1.18 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 2 | 16 | 22 | 23 | 63 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Percent detection | 50 | 76 | 100 | 82 | 84 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| LRL (or LRL range) | 0.5 | (0.07-0.5) | 0.07 | (0.07-0.5) | (0.07-0.5) | 0.5 | 0.5 | (0.07-0.5) | 0.07 | (0.07-0.5) | (0.07-0.5) | (0.07-0.5) |
| | | | | | | Tris (2-chloroethyl) phosphate | | | | | | |
| Minimum value | 0.042 | 0.038 | 0.074 | 0.087 | 0.038 | 0.038 | 0.038 | 0.037 | 0.069 | 0.084 | 0.062 | 0.037 |
| Max value | 0.170 | 0.332 | 0.340 | 0.331 | 0.340 | 0.220 | 0.220 | 0.302 | 0.230 | 0.296 | 0.210 | 0.302 |
| Mean value of detection | 0.124 | 0.177 | 0.175 | 0.180 | 0.175 | 0.144 | 0.144 | 0.138 | 0.152 | 0.186 | 0.149 | 0.159 |
| Median value of detection | 0.160 | 0.153 | 0.160 | 0.168 | 0.159 | 0.140 | 0.140 | 0.130 | 0.150 | 0.186 | 0.157 | 0.153 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 3 | 19 | 22 | 26 | 70 | 7 | 7 | 30 | 25 | 35 | 20 | 110 |
| Percent detection | 75 | 90 | 100 | 93 | 93 | 100 | 100 | 97 | 100 | 100 | 100 | 99 |
| LRL (or LRL range) | 0.5 | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | 0.5 | 0.5 | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | (0.04-0.5) | 0.5 |
| | | | | | | Tris (dichlorisopropyl) phosphate | | | | | | |
| Minimum value | 0.026 | <0.1 | <0.10 | 0.093 | 0.026 | 0.035 | 0.035 | 0.060 | <0.1 | 0.052 | <0.10 | 0.052 |
| Max value | 0.170 | <0.5 | 0.164 | 0.120 | 0.340 | 0.500 | 0.500 | 0.072 | <0.1 | 0.052 | <0.10 | 0.072 |
| Mean value of detection | 0.095 | -- | 0.164 | 0.107 | 0.111 | 0.151 | 0.151 | 0.066 | -- | 0.052 | -- | 0.063 |
| Median value of detection | 0.090 | -- | -- | -- | 0.107 | 0.140 | 0.140 | 0.066 | -- | -- | -- | 0.063 |
| Number of samples | 4 | 21 | 22 | 28 | 75 | 7 | 7 | 31 | 25 | 35 | 20 | 111 |
| Number of detections | 3 | 0 | 1 | 2 | 6 | 6 | 6 | 3 | 0 | 1 | 0 | 4 |
| Percent detection | 75 | 0 | 5 | 7 | 8 | 86 | 86 | 10 | 0 | 3 | 0 | 4 |
| LRL (or LRL range) | 0.5 | (0.1-0.5) | 0.1 | (0.1-0.5) | (0.1-0.5) | 0.5 | 0.5 | (0.1-0.5) | 0.1 | (0.1-0.5) | 0.1 | (0.1-0.5) |

**Table 13.** Summary of selected pharmaceutical compounds in stormflow samples collected between May 2000 and June 2004.

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting limit; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | Indian Creek | | Brush Creek | | |
| | 2 | 7 | 13 | Basin | 6 | Basin | 9 | 11 | Basin |
| **1,7-dimethylxanthine** | | | | | | | | | |
| Minimum value | <0.019 | <0.019 | 0.170 | <0.019 | <0.019 | <0.019 | <0.019 | <0019 | <0.019 |
| Maximum value | <0.019 | <0.019 | 0.446 | 0.446 | 0.300 | 0.300 | 1.300 | 1.300 | 1.300 |
| Mean value of detection | -- | -- | 0.308 | 0.308 | 0.233 | 0.233 | 0.564 | 0.680 | 0.610 |
| Median value of detection | -- | -- | -- | -- | 0.283 | 0.283 | 0.202 | -- | 0.202 |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 2 | 2 | 3 | 3 | 3 | 2 | 5 |
| Percent detection | 0 | 0 | 50 | 22 | 43 | 43 | 38 | 67 | 46 |
| LRL | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| **Acetaminophen** | | | | | | | | | |
| Minimum value | 0.005 | 0.011 | 0.100 | 0.005 | 0.034 | 0.034 | 0.059 | 0.109 | 0.059 |
| Maximum value | 1.70 | 0.011 | 0.346 | 1.70 | 0.325 | 0.325 | 1.150 | 0.640 | 1.150 |
| Mean value of detection | 0.434 | 0.011 | 0.17 | 0.272 | 0.098 | 0.098 | 0.351 | 0.317 | 0.341 |
| Median value of detection | 0.016 | -- | 0.13 | 0.100 | 0.058 | 0.058 | 0.088 | 0.201 | 0.109 |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Percent detection | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| LRL | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 | 0.009 |
| **Caffeine** | | | | | | | | | |
| Minimum value | <0.014 | 0.027 | 0.150 | <0.014 | 0.058 | 0.058 | 0.324 | 0.142 | 0.142 |
| Maximum value | 0.074 | 0.027 | 0.713 | 0.713 | 0.585 | 0.585 | 0.619 | 0.710 | 0.710 |
| Mean value of detection | 0.042 | 0.027 | 0.426 | 0.235 | 0.358 | 0.358 | 0.470 | 0.373 | 0.444 |
| Median value of detection | 0.042 | -- | 0.420 | 0.112 | 0.453 | 0.453 | 0.463 | 0.268 | 0.436 |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 3 | 1 | 4 | 8 | 7 | 7 | 8 | 3 | 11 |
| Percent detection | 75 | 100 | 100 | 89 | 100 | 100 | 100 | 100 | 100 |
| LRL | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 |
| **Carbamazepine** | | | | | | | | | |
| Minimum value | 0.007 | <0.011 | 0.037 | 0.007 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 |
| Maximum value | 0.008 | <0.011 | 0.037 | 0.037 | 0.037 | 0.037 | <0.011 | <0.011 | <0.011 |
| Mean value of detection | 0.007 | -- | 0.037 | 0.017 | 0.032 | 0.032 | -- | -- | -- |
| Median value of detection | -- | -- | -- | 0.008 | 0.030 | 0.030 | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 2 | 0 | 2 | 4 | 3 | 3 | 0 | 0 | 0 |
| Percent detection | 50 | 0 | 50 | 44 | 50 | 43 | 0 | 0 | 0 |
| LRL | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 |

**Table 13.** Summary of selected pharmaceutical compounds in stormflow samples collected between May 2000 and June 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting limit; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | Indian Creek | | Brush Creek | | |
| | 2 | 7 | 13 | Basin | 6 | Basin | 9 | 11 | Basin |
| **Cimetidine** | | | | | | | | | |
| Minimum value | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 | <0.007 |
| Maximum value | <0.007 | <0.007 | 0.011 | 0.011 | 0.024 | 0.024 | <0.007 | <0.007 | <0.007 |
| Mean value of detection | -- | -- | 0.011 | 0.011 | 0.020 | 0.020 | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | 0.024 | 0.024 | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 1 | 1 | 3 | 3 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 25 | 11 | 43 | 43 | 0 | 0 | 0 |
| LRL | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 | 0.007 |
| **Codeine** | | | | | | | | | |
| Minimum value | <0.024 | <0.024 | <0.024 | <0.024 | <0.024 | 0.006 | 0.009 | <0.024 | 0.009 |
| Maximum value | <0.024 | <0.024 | 0.031 | 0.031 | 0.051 | 0.121 | 0.009 | <0.024 | 0.009 |
| Mean value of detection | -- | -- | 0.031 | 0.031 | 0.045 | 0.067 | 0.009 | -- | 0.009 |
| Median value of detection | -- | -- | -- | -- | 0.047 | 0.073 | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 1 | 1 | 4 | 4 | 1 | 0 | 1 |
| Percent detection | 0 | 0 | 25 | 11 | 57 | 57 | 13 | 0 | 9 |
| LRL | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 |
| **Cotinine** | | | | | | | | | |
| Minimum value | 0.007 | 0.005 | 0.011 | 0.007 | 0.006 | 0.006 | 0.028 | 0.034 | 0.028 |
| Maximum value | 0.034 | 0.005 | 0.092 | 0.092 | 0.121 | 0.121 | 0.177 | 0.103 | 0.177 |
| Mean value of detection | 0.018 | 0.005 | 0.033 | 0.034 | 0.068 | 0.068 | 0.075 | 0.063 | 0.072 |
| Median value of detection | 0.015 | -- | 0.015 | 0.023 | 0.073 | 0.073 | 0.060 | 0.053 | 0.060 |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Percent detection | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| LRL | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 |
| **Dehdyronifedipine** | | | | | | | | | |
| Minimum value | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Maximum value | <0.001 | <0.001 | 0.010 | 0.010 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Mean value of detection | -- | -- | 0.010 | 0.010 | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 25 | 11 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |

**Table 13.** Summary of selected pharmaceutical compounds in stormflow samples collected between May 2000 and June 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting limit; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | Indian Creek | | Brush Creek | | |
| | 2 | 7 | 13 | Basin | 6 | Basin | 9 | 11 | Basin |
| | | | | **Diltiazem** | | | | | |
| Minimum value | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 | <0.012 |
| Maximum value | <0.012 | <0.012 | <0.012 | <0.012 | 0.013 | 0.013 | <0.012 | <0.012 | <0.012 |
| Mean value of detection | -- | -- | -- | -- | 0.013 | 0.013 | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 14 | 14 | 0 | 0 | 0 |
| LRL | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 | 0.012 |
| | | | | **Diphenhydramine** | | | | | |
| Minimum value | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Maximum value | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 |
| | | | | **Fluoxetine** | | | | | |
| Minimum value | <0.018 | <0.018 | <0.018 | <00.018 | 0.016 | 0.016 | <0.018 | <0.018 | <0.018 |
| Maximum value | 0.08 | <0.018 | <0.018 | 0.08 | 0.050 | 0.050 | 0.050 | <0.018 | 0.050 |
| Mean value of detection | 0.080 | -- | -- | 0.080 | 0.027 | 0.027 | 0.050 | -- | 0.050 |
| Median value of detection | -- | -- | -- | -- | 0.017 | 0.017 | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 1 | 0 | 0 | 1 | 3 | 3 | 1 | 0 | 1 |
| Percent detection | 25 | 0 | 0 | 11 | 43 | 43 | 13 | 0 | 9 |
| LRL | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 |
| | | | | **Gemfibrozil** | | | | | |
| Minimum value | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Maximum value | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 | <0.015 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 | 0.015 |

**Table 13.** Summary of selected pharmaceutical compounds in stormflow samples collected between May 2000 and June 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting limit; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | Indian Creek | | Brush Creek | | |
| | 2 | 7 | 13 | Basin | 6 | Basin | 9 | 11 | Basin |
| **Ibuprofen** | | | | | | | | | |
| Minimum value | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 |
| Maximum value | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 | <0.018 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 | 0.018 |
| **Metformin** | | | | | | | | | |
| Minimum value | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 | <0.003 |
| Maximum value | <0.003 | <0.003 | 0.062 | 0.062 | 0.049 | 0.049 | <0.003 | <0.003 | <0.003 |
| Mean value of detection | -- | -- | 0.062 | 0.062 | 0.049 | 0.049 | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 25 | 11 | 14 | 14 | 0 | 0 | 0 |
| LRL | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| **Ranitidine** | | | | | | | | | |
| Minimum value | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Maximum value | <0.01 | <0.01 | <0.010 | <0.01 | 0.014 | 0.014 | <0.01 | <0.01 | <0.01 |
| Mean value of detection | -- | -- | -- | -- | 0.014 | 0.014 | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 14 | 14 | 0 | 0 | 0 |
| LRL | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| **Salbuterol/Albuterol** | | | | | | | | | |
| Minimum value | <0.029 | <0.029 | 0.005 | 0.005 | 0.008 | 0.008 | <0.029 | <0.029 | <0.029 |
| Maximum value | <0.029 | <0.029 | 0.005 | 0.005 | 0.008 | 0.008 | <0.029 | <0.029 | <0.029 |
| Mean value of detection | -- | -- | 0.005 | 0.005 | 0.008 | 0.008 | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 50 | 11 | 14 | 14 | 0 | 0 | 0 |
| LRL | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |

**Table 13.** Summary of selected pharmaceutical compounds in stormflow samples collected between May 2000 and June 2004.—Continued

[All concentrations in units of micrograms per liter from filtered samples; <, less than; --, no data; LRL, laboratory reporting limit; Data for site 13 includes data from sites 13 and 14]

| | Stream and site number | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Blue River | | | | Indian Creek | | Brush Creek | | |
| | 2 | 7 | 13 | Basin | 6 | Basin | 9 | 11 | Basin |
| **Sulfamethoxazole** | | | | | | | | | |
| Minimum value | <0.023 | <0.023 | <0.023 | <0.023 | <0.023 | <0.023 | <0.023 | <0.023 | <0.023 |
| Maximum value | <0.023 | <0.023 | 0.074 | 0.074 | 0.093 | 0.093 | <0.023 | <0.023 | <0.023 |
| Mean value of detection | -- | -- | 0.074 | 0.074 | 0.066 | 0.066 | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 1 | 1 | 2 | 2 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 25 | 11 | 29 | 29 | 0 | 0 | 0 |
| LRL | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 | 0.023 |
| **Thibendazole** | | | | | | | | | |
| Minimum value | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 |
| Maximum value | <0.011 | <0.011 | <0.011 | <0.11 | <0.011 | <0.011 | <0.011 | <0.011 | <0.011 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 | 0.011 |
| **Trimethoprim** | | | | | | | | | |
| Minimum value | <0.014 | <0.014 | <0.014 | <0.014 | 0.012 | 0.012 | <0.014 | <0.014 | <0.014 |
| Maximum value | <0.014 | <0.014 | 0.022 | 0.022 | 0.049 | 0.048 | 0.001 | <.014 | 0.001 |
| Mean value of detection | -- | -- | 0.022 | 0.022 | 0.031 | 0.031 | 0.001 | -- | 0.001 |
| Median value of detection | -- | -- | -- | | 0.031 | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 1 | 1 | 3 | 3 | 1 | 0 | 1 |
| Percent detection | 0 | 0 | 25 | 11 | 43 | 43 | 13 | 0 | 9 |
| LRL | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 | 0.014 |
| **Warfarin** | | | | | | | | | |
| Minimum value | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 |
| Maximum value | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 | <0.006 |
| Mean value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Median value of detection | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Number of samples | 4 | 1 | 4 | 9 | 7 | 7 | 8 | 3 | 11 |
| Number of detections | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percent detection | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| LRL | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 | 0.006 |


USGS

Wilkison and others—Water Quality in the Blue River Basin, Kansas City Metropolitan Area, Missouri and Kansas, July 1998 to October 2004—USGS/SIR 2006–5147