

Prepared in cooperation with the Ottawa River Coalition

Streamflow and Water-Quality Characteristics of the Ottawa River and Selected Tributaries in Allen, Hardin, and Putnam Counties, Ohio

Open-File Report 03-215



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



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By Kimberly Shaffer

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CONVERSION FACTORS, DATUM, AND ABBREVIATIONS

Multiply	Ву	To obtain
mile (mi)	1.609	kilometer
square mile (mi2)	2.590	square kilometer
cubic foot per second (ft ³ /s)	0.02832	cubic meter per second

Temperature is given in degrees Celsius (°C), which can be converted to degrees Fahrenheit (°F) by use of the following equation: $^{\circ}F = 1.8(^{\circ}C) + 32$

Vertical coordinate information is referenced to the National Geodetic Vertical Datum of 1929 (NGVD of 1929).

Abbreviated water-quality units used in this report: Chemical concentrations and water temperature are given in metric units. Chemical concentration is given in milligrams per liter (mg/L) or micrograms per liter ($\mu g/L$). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For concentrations less than 7,000 mg/L, the numerical value is approximately the same as for concentrations in parts per million.

Specific conductance of water is expressed in microsiemens per centimeter at 25 degrees Celsius (μ S/cm). This unit is equivalent to micromhos per centimeter at 25 degrees Celsius (μ mho/cm), formerly used by the U.S. Geological Survey.

Other abbreviations used in this report:

EWI Equal width increment
MCL Maximum Contaminant Level
ORC Ottawa River Coalition

USEPA U.S. Environmental Protection Agency

USGS U.S. Geological Survey

Streamflow and Water-Quality Characteristics of the Ottawa River and Selected Tributaries in Allen, Hardin, and Putnam Counties, Ohio

by Kimberly Shaffer

Abstract

Streamflow and water-quality measurements were made on the Ottawa River and selected tributaries between 1999 to 2002. Ten sets of streamflow measurements were made at an index station on the Auglaize River at Fort Jennings (station 04186500) and at 19 other sites along the Ottawa River and selected tributaries. These data were collected to relate daily mean streamflow at the Auglaize River at Fort Jennings and the instantaneous streamflow at each of the other 19 sites.

Two sets of water-quality samples were collected and 4 or 5 dissolved-oxygen measurements were made at the 19 sites. Water samples were collected during periods of potential stress on the aquatic communities, once during low flow and once during a runoff event that occurred after recent land application of pesticides. The first set of water-quality samples was analyzed for groups of nutrients, major ions and trace elements, and physical properties, whereas the second set was analyzed for nutrients, pesticides, and physical properties.

With regard to nutrients and physical properties, median values of specific conductance, pH, dissolved oxygen, alkalinity, and orthophosphate were higher during low flow than during the runoff event. In contrast, the median concentrations of total phosphorus, ammonia nitrogen, nitrite plus nitrate nitrogen, and ammonia plus organic nitrogen were higher during the runoff event than during low flow. Orthophosphate, total phosphorus, and dissolved-oxygen concentrations all had wider ranges during the low-flow sampling than the runoff-event sampling.

Of the 25 major ions and trace elements analyzed for, 15 were detected in all 18 samples, and 10 were detected infrequently or not detected at all. The runoff samples were analyzed for 48 pesticides, 18 of which were detected in one or more samples and 30 of which were not detected. Of the 18 pesticides detected, 13 were detected in 5 or more samples. Five pesticides—acetochlor, atrazine, deethylatrazine, metolachlor, and simazine—were detected in all the samples.

Introduction

The water quality of the Ottawa River and its tributaries is an issue of concern for the Ottawa River Coalition (ORC). Of particular concern are periods of water-quality stress on aquatic life. These periods tend to occur during the spring, after agricultural nutrient and pesticide application elevated, and during the summer, when water temperatures are at maximum and streamflows and dissolved-oxygen concentrations are at minimum. At these periods, point and nonpoint sources of nutrients, major ions and trace elements, and pesticides would likely be at elevated concentrations. Nonpoint sources of nutrients, pesticides, and major ions and trace elements include sources such as the natural weathering of soil and rocks; failing septic systems; application of pesticides and fertilizers to crops, lawns, and golf courses; atmospheric deposition; and pet and livestock waste. Point sources of nutrients and major ions and trace elements include sources such as effluent (discharges) from municipal and industrial wastewater facilities.

The ORC has pursued various measures to understand and protect the Ottawa River, including educational and public-awareness activites and a water-quality assessment of the watershed. In 1995, the ORC began collecting

water-quality data at 20 sites to determine physical properties and chemical concentrations in stream water throughout the watershed but did not make concurrent streamflow measurements.

Although the chemical-concentration data collected are useful, information on chemical loads (computed by multiplying chemical concentrations and streamflow) is needed for watershed-management plan development. In order to obtain streamflow data and otherwise augment the available water-quality data for the watershed, the U.S. Geological Survey (USGS), in cooperation with the ORC, did a three-year streamflow and water-quality study, with emphasis on collecting information for periods of potential stress on aquatic life. This report presents streamflow and water-quality data for the Ottawa River and its tributaries collected during that study.

Description of study area

The study area includes the Ottawa River and selected tributaries in Hardin, Allen, and Putnam Counties, all in western Ohio (fig. 1). The index station, Auglaize River near Fort Jennings, is in southern Putnam County. The primary land use varies throughout the watershed. The upstream and downstream parts of the Ottawa River Basin are mostly agricultural. The central part of the watershed, including Lima, is urban—mainly residential and industrial, interspersed with golf courses, commercial areas, and agricultural areas.

Acknowledgments

The author acknowledges and thanks the Ottawa River Coalition—especially Beth Seibert, Coordinator—for the planning and implementation of this project.

Methods of study

Streamflow and water-quality data were collected at 19 sites along the Ottawa River and its tributaries (fig. 1). The streamflow-gaging station Auglaize River near Fort Jennings (station 04186500) was used as an index station to provide a long-term source of reference for the streamflow-data.

Site selection

The 19 sites used in this study were selected primarily for proximity to the 20 sites where the ORC had collected data in previous years. Eighteen of the sites are either at or near the 20 ORC sites. The remaining site, the Ottawa River at State Route 117, was selected because a study done by the Ohio Environmental Protection Agency (1996) showed a

dissolved-oxygen sag at this site. Each site was selected so that streamflow measurements and representative water-quality samples could coincide. Nine sites were on tributaries to the Ottawa River and were as near as possible to the mouth of the tributary (usually at the first bridge upstream from the mouth). The 10 remaining sites were on the Ottawa River.

The index station used during this study, Auglaize River near Fort Jennings (USGS station number 04186500), was chosen because it and the Ottawa River Watershed are geographically close and have similar drainage areas (332 mi² and 372 mi², respectively), similar land use, and similar climate characteristics. The Auglaize River near Fort Jennings streamflow-gaging station operated from August 1921 to December 1935 and has operated continuously since October 1940, including the time period during which the ORC collected data. The station is in the Maumee River Basin at a latitude of 40°56′55″ and a longitude of 84°15′58″. The station is 200 ft upstream from the U.S. Highway 224 bridge, 6 mi upstream from the mouth of the Ottawa River, 7.3 mi downstream from Jennings Creek, and 3.5 mi northeast of Fort Jennings.

Streamflow measurements

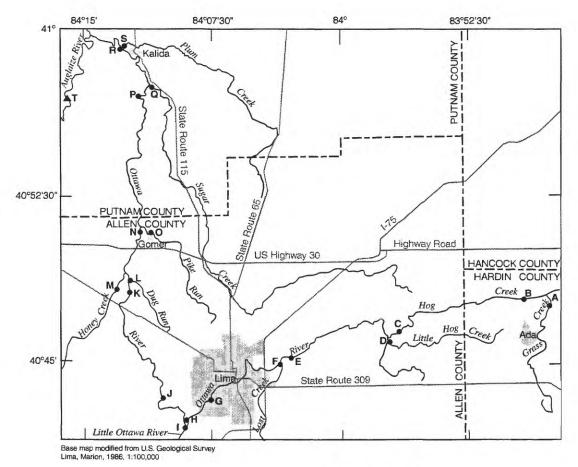
Streamflow measurements determine the volume of water that passes a cross section of a stream in a given time (reported in units of cubic feet per second) and were made by means of standard USGS procedures (Rantz and others, 1982). These measurements were used to depict relations between instantaneous streamflow at a selected site and the daily mean streamflow at the index station.

Streamflow measurements were made periodically at the 19 sites and the index station starting in the fall of 1999 and continuing until the summer of 2002, for a total of 10 sets. Each of the 10 sets of streamflow measurements was made over a period of 2-3 days during nonwinter months when flow was low, except for one set associated with a runoff event.

Water-quality field and laboratory analyses

Water-quality sampling was done twice, once in summer 2000 and once in spring 2001. The first sampling round (summer of 2000) measured nutrients and 25 major ions and trace elements during low flow, when effluent (discharges) from point sources would likely be at its highest proportion of streamflow. The second sampling round (spring of 2001) measured nutrients and 48 pesticides during a springtime runoff event after most crops were planted and most pesticides were applied. Two of the 10 sets of streamflow measurements coincided with the sample collection and field measurements.

Field analyses. Alkalinity, water temperature, pH, specific conductance, dissolved oxygen, air temperature,



EXPLANATION



INDEX STATION

T Auglaize River at Ft. Jennings (04186500)

SITE LOCATION

- A Grass Creek near Ada B Hog Creek near Ada
- Hog Creek at Lafayette
- D Little Hog Creek at Lafayette
 E Ottawa River at Metzger Road at Lima
- Lost Creek near Lima
- G Ottawa River at Lima
- H Ottawa River at Shawnee Road near Lima
- I Little Ottawa River near Lima
- J Ottawa River at State Route 117 near Lima
- K Ottawa River near Elida
- Dug Run near Elida
- Honey Run near Elida
- Ottawa River at Gomer
- O Pike Run at Gomer
- Ottawa River near Kalida
- Q Sugar Creek near Kalida
- Ottawa River at Kalida
- S Plum Creek at Kalida

Figure 1. Location of study area and sites.

and atmospheric pressure were measured in the field during both sampling trips. A four-parameter water-quality meter was used for field analysis of water temperature, pH, specific conductance, and dissolved oxygen. The meter was calibrated with standard solutions before each day's use. A separate thermometer was used to measure air temperature, and an aneroid barometer was used to measure atmospheric pressure (Shelton, 1994). Alkalinity (reported in milligrams per liter as CaCO₃) was determined by means of the incremental titration method (Shelton, 1994).

Additional dissolved-oxygen measurements were made during separate site visits, once during the first set of streamflow measurements and twice thereafter during 4-hour periods in the morning so as to reduce the effects of photosynthesis and varied atmospheric pressure. One of the two latter measurement rounds coincided with one of the days of the runoff sampling; therefore, one or two dissolved-oxygen measurements might be tabulated for that day.

Laboratory analyses. Water samples analyzed for nutrients and pesticides or major ions and trace elements were collected, composited, filtered if necessary, bottled, and chemically preserved if necessary by means of methods described by Shelton (1994). Before samples were collected, water-quality equipment was cleaned and field rinsed with native water. Samples were then collected by means of the equal-width-increment (EWI) sampling where possible or by dip sampling where EWI sampling was not possible (Shelton, 1994). After any necessary filtration and chemical preservation, water samples were immediately chilled and shipped on ice to the USGS National Water Quality Laboratory in Arvada, Colorado, for analysis.

Quality-control and quality-assurance practices

Quality-control practices (blank and replicate samples) were used to assess bias, precision, and variability in the collection, handling, and analysis of water-quality samples. Replicate samples, a set of samples that are collected, handled onsite, shipped, and analyzed in an identical manner so that the samples are thought to be identical in composition (Francy and others, 1998), were used to measure variability and precision characteristics associated with the sampling and analytical procedures. Blank samples, which are samples of constituent-free water that undergo the same handling, transportation, and analytical procedures that a stream-water sample does (Francy and others, 1998), were used to identify and assess sources of contamination and bias. For the two sampling rounds, blank samples and replicate samples were collected by each crew (appendix A1 and A2). The results of the blank samples were examined to ensure that there was no contamination or bias from the sample collection, processing, transportation and/or handling procedures. Additionally, the results from the replicate samples were examined to better understand the precision and variability of the samples.

Quality-assurance practices ensured that the data were representative and complete. To ensure that samples were representative of the actual environmental conditions, samples were collected from locations typical of the site; approved sampling, analytical, preservation and transportation (holding times) methods and equipment were used applying standard USGS methods (Francy and others, 1998). To ensure that data sets were complete, the data were examined for missing values and departures from expected ranges of values (Francy and others, 1998).

Relation between streamflow at index station and synoptic sites

Instantaneous streamflows at the 19 study sites listed in table 1 were plotted against the daily mean streamflows from the Auglaize River at Fort Jennings on the same days. The results of these graphical comparisons are shown in figures 2-11 (at back of report.) Although the Ottawa River Watershed and the area draining to the index station have several key similarities at the watershed scale, local factors can result in considerable scatter in the data and can make establishing a consistent streamflow-streamflow relation difficult, if not impossible. Examples of such local factors include differences in withdrawals or discharges, precipitation and (or) evapotranspiration, geology and certain streambed characteristics, physiography, and land use.

Table 1. Site location, dissolved oxygen concentrations, and streamflow data for the Ottawa River and selected tributaries [mg/L, milligrams per liter; ft³/s, cubic feet per second; quad, U.S. Geological Survey 7.5-minute topographic quadrangle map.]

A 404728083475300 Grass Creek near Ada, Ohio	Station letter	Station number	Station name	Location	Date	Time	Oxygen, dissolved (mg/L)	Stream- flow (ft ³ /s)
B	A	404728083475300	Grass Creek	Latitude 40°47′28″, longitude 83°47′53″,	09/17/99	0915	7.4	0.75
Grass Creek 1.5 mi northeast of Ada, Ohio. (Ada 1:24000 quad) 09/19/00 1545 10/23/00 0930 10/23/00 10/			near Ada, Ohio		07/11/00	0950		2.5
Ohio. (Ada 1:24000 quad) 10/23/00 0930 05/15/01 1010 6.6 08/13/01 0925 09/18/01 0815 6.6 09/18/01 1340 11/18/01 0850 09/18/01 0815 09/18/02 09/18/01 0815 09/18/02 09/18/01 0815 09/18/02 09/18/01 0815 09/18/02 09/					09/19/00	0745	4.2	
B					09/19/00	1545		.99
B 404746083492400 Hog Creek near Ada, Ohio Hog Creek Latitude 40°47'46", longitude 83°49'24", 09171990 0915 0.5				Ohio. (Ada 1:24000 quad)	10/23/00	0930		1.1
B					05/15/01	1010	6.6	22
B 404746083492400 Hog Creek near Ada, Ohio Ada Ohio Ohio, Oh					08/13/01	0925		1.1
B					09/18/01	0815	6.6	
B					09/18/01	1340		7.2
B					11/18/01	0850		1.0
B					07/15/02	0945		.71
Near Ada, Ohio Hardin County, Hydrologic Unit					09/16/02	0920		.68
Part of County Hydrologic Unit	В	404746083492400	Hog Creek	Latitude 40°47′46″, longitude 83°49′24″,	09/17/99	0915	6.5	.97
C 404616083564200 Hog Creek at Lafayette, Ohio Chic, (Beaverdam 1:24000 quad) 10/23/00 0800 0.845 0.9/18/01 1.025 0.9/18/01 0.9/								14
Hog Creek				04100007, at State Route 235 bridge over		0800	6.9	
Ada 1:24000 quad) 10/23/00 1030 7.4								1.6
C				(Ada 1:24000 quad)				5.4
C 404616083564200 Hog Creek at Lafayette, Ohio Discrete at Lafayette, Ohio Little Hog Creek at Lafayette, Ohio Discrete at Lafayette, Ohio Dis							7.4	58
C 404616083564200 Hog Creek at Lafayette, Ohio long the control of								4.4
C							5.8	
C 404616083564200 Hog Creek at Lafayette, Ohio Discrete Latitude 40°46′16″, longitude 83°56′42″, 09/17/90 0930 5.8 Allen County, Hydrologic Unit 04100007, 07/11/00 1120 09/18/01 1100 09/18/01 1100 09/18/01 1100 09/19/00 0830 8.5 09/19/00 1410 1100 09/18/01 1000 09/18/01 1100 09/18/								14
C 404616083564200 Hog Creek at Lafayette, Ohio Allen County, Hydrologic Unit 04100007, along North side of State Route 81 09/19/00 0830 8.5 between Center Road and Swaney Road, 1 mi northeast of Lafayette, Ohio.(Beaverdam 1:24000 quad) 05/15/01 1615 7.1 08/13/01 1035 09/18/01 1125 11/18/01 1110 07/15/02 1231 09/16/02 1202 D 404602083571700 Little Hog Creek at Lafayette, Ohio Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 10/23/00 1200 07/15/01 134 at State Route 81 bridge over Little Hog Orek, 0.5 mi northwest of Lafayette, 09/19/00 0845 6.2 Creek, 0.5 mi northwest of Lafayette, 09/19/00 1230 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1300 11/18/01 1300 11/18/01 1225								4.1
C 404616083564200 Hog Creek at Lafayette, Ohio Allen County, Hydrologic Unit 04100007, along tude 83°56′42″, 09/17/99 0930 5.8 Allen County, Hydrologic Unit 04100007, 07/11/00 1120 09/19/00 0830 8.5 between Center Road and Swaney Road, 1 mi northeast of Lafayette, Ohio.(Beaverdam 1:24000 quad) 05/15/01 1615 7.1 08/13/01 1035 09/18/01 1110 07/15/02 1231 09/16/02 1202 D 404602083571700 Little Hog Creek at Lafayette, Ohio Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 05/15/01 1134 114 114 114 114 115 115 115 115 115 11								.95
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Allen County, Hydrologic Unit 04100007, 07/11/00 1120 along North side of State Route 81 09/19/00 0830 8.5 between Center Road and Swaney Road, 1 mi northeast of Lafayette, Ohio.(Beaverdam 1:24000 quad) 05/15/01 1615 7.1 08/13/01 1035 09/18/01 1125 11/18/01 1110 07/15/02 1231 09/16/02 1200 D 404602083571700 Little Hog Creek at Lafayette, Ohio.(Beaverdam 1:24000 quad) Little Hog Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 05/15/01 1810 7.8 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1300 11/18/01 125	C	404616083564200	Hog Creek	Latitude 40°46′16″ longitude 83°56′42″			5.8	.81
along North side of State Route 81 09/19/00 0830 8.5 between Center Road and Swaney Road, 1 min northeast of Lafayette, Ohio.(Beaverdam 1:24000 quad) 05/15/01 1615 7.1 08/13/01 1035 09/18/01 0910 7.5 09/18/01 0910 7.5 09/18/01 1110 07/15/02 1231 09/16/02 1202 D 404602083571700 Little Hog Creek at Lafayette, Ohio Allen County, Hydrologic Unit 04100007, 07/11/00 1134 at State Route 81 bridge over Little Hog O9/19/00 0845 6.2 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 05/15/01 1310 09/18/01 1330 09/18/01 1330 09/18/01 1330 09/18/01 1330 09/18/01 1330 11/18/01 1225	•	101010005504200					2.0	17
between Center Road and Swaney Road, 1 mi northeast of Lafayette, Ohio.(Beaverdam 1:24000 quad)			,,				8.5	1,
1 mi northeast of Lafayette, Ohio.(Beaverdam 1:24000 quad)							0.5	1.7
Ohio.(Beaverdam 1:24000 quad) 05/15/01 1615 7.1 08/13/01 1035 09/18/01 0910 7.5 09/18/01 1125 11/18/01 1110 07/15/02 1231 09/16/02 1202 D 404602083571700 Little Hog Creek at Lafayette, Ohio Allen County, Hydrologic Unit 04100007, 07/11/00 1134 at State Route 81 bridge over Little Hog O9/19/00 0845 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 05/15/01 1810 7.8 08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225				1 mi northeast of Lafayette,				5.7
D 404602083571700 Little Hog Creek at Lafayette, Ohio Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) Little Hog Creek at State Route 81 bridge over Little Hog O9/19/00 0845 6.2 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) O9/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1130 09/18/01 1300 11/18/01 1225				Ohio.(Beaverdam 1:24000 quad)			7.1	35
D 404602083571700 Little Hog Creek at Lafayette, Ohio Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) Little Hog Creek at State Route 81 bridge over Little Hog O9/19/00 0845 0.2 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) Obj. (Beaverdam 1:24000 quad)							,	7.3
D 404602083571700 Little Hog Creek at Lafayette, Ohio at State Route 81 bridge over Little Hog Op/16/02 1230 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 Op/18/01 1330 09/18/01 1330 Op/18/01 1330 11/18/01 1225							7.5	, , , ,
D 404602083571700 Little Hog Creek at Lafayette, Ohio at State Route 81 bridge over Little Hog Oy16/02 1230 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 O9/18/01 1300 O9/18/01 0935 6.6 O9/18/01 1300 11/18/01 1225							,	3.9
D 404602083571700 Little Hog Creek at Lafayette, Ohio at State Route 81 bridge over Little Hog Oy16/02 1200 Little Hog Creek at Lafayette, Ohio at State Route 81 bridge over Little Hog Oy19/00 0845 6.2 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 Ohio.(Beaverdam 1:24000 quad) 09/18/01 1130 09/18/01 0935 6.6 09/18/01 1300 D 404602083571700 Little Hog Creek at Latitude 40°46′02″, longitude 83°57′17″, 09/17/99 1000 7.2 Allen County, Hydrologic Unit 04100007, 07/11/00 1134 at State Route 81 bridge over Little Hog O9/19/00 1230 Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 O5/15/01 1810 7.8 O8/13/01 1130 O9/18/01 0935 6.6 O9/18/01 1300 11/18/01 1225								5.6
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D 404602083571700 Little Hog Creek at Lafayette, Ohio at Lafayette, Ohio Allen County, Hydrologic Unit 04100007, 07/11/00 1134 at State Route 81 bridge over Little Hog O9/19/00 0845 6.2 Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 05/15/01 1810 7.8 08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225								.96
at Lafayette, Ohio Allen County, Hydrologic Unit 04100007, 07/11/00 1134 at State Route 81 bridge over Little Hog 09/19/00 0845 6.2 Creek, 0.5 mi northwest of Lafayette, 09/19/00 1230 Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 05/15/01 1810 7.8 08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225	D	404602002571700	Little Hea Creek	Latitude 40946'02" lancitude 92957'17"			7.7	.07
at State Route 81 bridge over Little Hog Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) Ohio.(Beaverdam 1:24000 quad) 09/19/00 1230 10/23/00 1300 05/15/01 1810 7.8 08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225	D	404002085571700					1.2	1.7
Creek, 0.5 mi northwest of Lafayette, Ohio.(Beaverdam 1:24000 quad) 09/19/00 1230 10/23/00 1300 05/15/01 1810 7.8 08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225			at Larayette, Omo				62	1.7
Ohio.(Beaverdam 1:24000 quad) 10/23/00 1300 05/15/01 1810 7.8 08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225							0.2	.15
05/15/01 1810 7.8 08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225								2.1
08/13/01 1130 09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225				•			7 8	36
09/18/01 0935 6.6 09/18/01 1300 11/18/01 1225							7.0	.35
09/18/01 1300 11/18/01 1225							66	.53
11/18/01 1225							0.0	7.6
V//15/02 1350								.82 .10
09/16/02 1325								.10

Table 1. Site location, dissolved oxygen concentrations, and streamflow data for the Ottawa River and selected tributaries —Continued [mg/L, milligrams per liter; ft³/s, cubic feet per second; quad, U.S. Geological Survey 7.5-minute topographic quadrangle map.]

Station letter	Station number	Station name	Location	Date	Time	Oxygen, dissolved (mg/L)	Stream- flow (ft ³ /s)
E	404504084030300	Ottawa River	Latitude 40°45′04″, longitude 84°03′03″,	09/17/99	1130	6.9	.81
		at Metzger Road	Allen County, Hydrologic Unit 04100007,	07/11/00	1245		21
		at Lima, Ohio	at the North end of Metzger Road,	09/19/00	0915	4.3	no flow
			downstream of the pump station, 0.2 mi	10/23/00	1405		no flow
			south of the Lima Reservoir, and 0.5 mi	05/16/01	0830	7.9	69
			north of Metzger Reservoir, 2 miles east of	08/13/01	1320		9.7
			Lima, Ohio.(Cairo 1:24000 quad)	09/18/01	0955		no flow
				11/18/01	1340		no flow
				07/15/02	1540		1.5
				09/16/02	1413		no flow
F	404448084034000	Lost Creek	Latitude 40°44'48", longitude 84°03'40",	09/17/99	1145	6.5	.33
-	101170001021000	near Lima, Ohio	Allen County, Hydrologic Unit 04100007,	07/11/00	1255	0.0	1.7
		,	north of High Street/Reservoir Road	09/19/00	0940	8.2	
			Bridge over Lost Creek, northeast of bait	09/19/00	1010	0.2	.22
			shop, 1 mi east of Lima, Ohio.(Lima	10/23/00	1430		.69
			1:24000 quad)	05/16/01	0930	8.3	129
				08/13/01	1220	0.5	.67
				09/18/01	1015	7.3	.07
				09/18/01	1130	,.5	24.6
				11/18/01	1400		.83
				07/15/02	1700		.48
				09/16/02	1425		.64
G	04187100	Ottawa River	Latitude 40°43′29″, longitude 84°07′35″,	09/15/99	1445	6.6	1.4
Ü	04107100	at Lima, Ohio	Allen County, Hydrologic Unit 04100007,	07/11/00	1610	0.0	30
		at Dilla, Ollo	at discontinued gaging station at the Lima	09/18/00	1515	9,9	2.6
			Wastewater Treatment Plant in Lima,	09/19/00	0840	10.0	2.0
			Ohio,(Cridersville 1:24000 quad)	10/23/00	1550	10.0	12
				05/15/01	1015	7.7	135
				08/13/01	1530	,.,	2.9
				09/18/01	1030	7.7	2.7
				09/18/01	1110	***	44
				11/18/01	1530		5.1
				07/15/02	1836		4.0
				09/16/02	1625		1.5
н	404224084090500	Ottawa River	I		1700	7.5	24
п	404224084090300	at Shawnee Road	Latitude 40°42′40″, longitude 84°09′05″, Allen County, Hydrologic Unit 04100007,	09/15/99		7.5	51
		near Lima, Ohio	at Shawnee Road bridge over Ottawa	07/11/00	1503	5 0	32
		near Erma, Omo	River near the intersection of Shawnee	09/18/00	1300	5.0	32
			Road and Amanda Road, 1 mi south of	09/19/00	0830	3.4	25
			Lima, Ohio.(Cridersville 1:24000 quad)	10/24/00	0830	0.6	35 160
			• •	05/15/01	1145	8.6	169
				08/13/01	1530	0.2	30
				09/18/01	0950	8.3	02
				09/18/01	1250		93
				11/18/01	0930		23
				07/15/02	1720		27
				09/17/02	0832		19

Table 1. Site location, dissolved oxygen concentrations, and streamflow data for the Ottawa River and selected tributaries —Continued [mg/L, milligrams per liter; ft³/s, cubic feet per second; quad, U.S. Geological Survey 7.5-minute topographic quadrangle map.]

Station letter	Station number	Station name	Location	Date	Time	Oxygen, dissolved (mg/L)	Stream- flow (ft ³ /s)
I	404221084091500	Little Ottawa River	Latitude 40°42′21″, longitude 84°09′15″,	09/15/99			no flow
		near Lima, Ohio	Allen County, Hydrologic Unit 04100007,	07/11/00	1510		1.6
			300 yards south of the intersection of the	09/18/00	1000	6.2	.04
			Little Ottawa River and Amanda Road, 1	09/19/00	0820	6.3	
			mi southwest of Lima, Ohio. (Cridersville	10/24/00	1030		.12
			1:24000 quad)	05/16/01	0850	6.8	52
				08/13/01	1715		.21
				09/18/01	0920	6.9	
				09/18/01	1440		2.5
				11/18/01	1100		.65
				07/15/02	1845		.10
				09/16/02	1740		no flow
J	404322084102600	Ottawa River	Latitude 40°43′22″, longitude 84°10′26″,	09/16/99	0915	5.4	18
		at State Route 117	Allen County, Hydrologic Unit 04100007,	07/11/00	1634		54
		near Lima, Ohio	at State Route 117 bridge over Ottawa	09/19/00	0905	4.5	
			River, 1 mi south of Lima, Ohio.	09/19/00	0930	4.5	26
			(Cridersville 1:24000 quad)	10/24/00	0850		26
				05/15/01	1400	8.3	294
				08/14/01	1430		28
				09/17/01	1610		28
				09/18/01	0855	6.3	
				11/18/01	1620		26
				07/15/02	1550		26
				09/17/02	0911		19
K	404808084121700	Ottawa River	Latitude 40°48′08″, longitude 84°12′17″,	09/16/99	1130	8.1	22
	10 10 00 00 1121 7 00	at Elida, Ohio	Allen County, Hydrologic Unit 04100007,	07/12/00	1523		52
			300 ft North of the end of Troyer Road, 1	09/19/00	0730	6.9	
			mi north of Elida, Ohio. (Elida 1:24000	09/19/00	1100	7.9	33
			quad)	10/23/00	1510		39
				05/15/01	1545	8.2	399
				08/14/01	1200		30
				09/17/01	1350		26
				09/18/01	0820	7.1	
				11/19/01	1045		31
				07/15/02	1325		27
				09/17/02	1050		20
L	404839084121400	Dug Run	Latitude 40°48'39", longitude 84°12'14",	09/16/99	1545	11.0	.49
	101033001121100	near Elida, Ohio	Allen County, Hydrologic Unit 04100007,	07/12/00	1419	11.0	2.3
		,	at Dutch Hollow Road bridge over Dug	09/19/00	0750	6.7	
			Run, 1.5 mi north of Elida, Ohio.(Elida	09/19/00	1330	12.7	1.3
			1:24000 quad)	10/23/00	1335		.91
				05/16/01	1400	6.2	32
				08/14/01	1045		.90
				09/17/01	1239		.79
				09/18/01	0718	6.1	
				11/18/01	1335		1.1
				07/15/02	1154		.67

Table 1. Site location, dissolved oxygen concentrations, and streamflow data for the Ottawa River and selected tributaries —Continued [mg/L, milligrams per liter; ft³/s, cubic feet per second; quad, U.S. Geological Survey 7.5-minute topographic quadrangle map.]

Station letter	Station number	Station name	Location	Date	Time	Oxygen, dissolved (mg/L)	Stream- flow (ft ³ /s)
	404826084130400	Honey Run	Latitude 40°48′26″, longitude 84°13′04″,	09/16/99	0915	3.0	.01
		near Elida, Ohio	Allen County, Hydrologic Unit 04100007,	07/12/00	1410		1.3
			at Billymack Road bridge over Honey	09/19/00	0740	5.7	
			Run, 1.5 mi northwest of Elida,	09/19/00	1215	6.0	.47
			Ohio.(Elida 1:24000 quad)	10/23/00	1634		1.2
				05/16/01	1115	6.8	66
				08/14/01	1310		.11
				09/17/01	1518		.18
				09/18/01	0755	5.7	
				11/18/01	1230		.89
				07/15/02	1440		.15
				09/17/02	1059		.05
N	405051084114000	Ottawa River	Latitude 40°50′51″, longitude 84°11′40″,	09/16/99	1340	12.1	23
• •	102021001114000	at Gomer, Ohio	Allen County, Hydrologic Unit 04100007,	07/12/00	1253	12.1	63
		,	at Lincoln Highway bridge over the	09/19/00	0755	5.8	05
			Ottawa River, 0.5 mile west of Gomer,	09/19/00	1600	11.9	36
			Ohio.(Elida 1:24000 quad)	10/23/00	1212	11.5	52
				05/16/01	0830	7.4	571
				08/14/01	0830	,,,	33
				09/17/01	0905		27
				09/18/01	1010	7.9	2,
				11/18/01	1445	7.5	34
				07/15/02	1000		27
				09/17/02	0801		21
0	405040004111000	Dil., D.,,	1 1 40050/40// 1 1 0.4011/10//			7.4	1.2
U	405048084111000	Pike Run at Gomer, Ohio	Latitude 40°50′48″, longitude 84°11′10″, Allen County, Hydrologic Unit	09/16/99	1615	7.4	
		at Gomer, Omo	04100007, at Gomer Road bridge over Pike	07/12/00	1245	£ 7	3.6
			Run, on the northside of Gomer,	09/19/00	0730	5.7	
			Ohio.(Elida 1:24000 quad)	09/19/00	1445	7.0	1.7
			1,	10/23/00	1046	7.5	1.6 59
				05/15/01	1400	7.5	
				08/14/01	1205		1.1
				09/17/01	1036 0955	6.9	1.6
				09/18/01		6.9	2.6
				11/19/01 07/16/02	0945 0736		1.3
				09/16/02	1640		1.3
	105500001110	0 P:	T			0.7	
P	405700084113600	Ottawa River	Latitude 40°57′00″, longitude 84°11′36″,	09/16/99	1130	9.5	26
		near Kalida, Ohio	Putnam County, Hydrologic Unit 04100007, 0.2 mi north of County Road	07/12/00	1115	10.0	77
			43 on east side of County Road 17 across	09/18/00	1600	10.3	32
			from old brick house, 2 mi south of	09/19/00	0845	7.6	
			Kalida, Ohio.(Kalida 1:24000 quad)	10/23/00	1120	7.5	54
				05/16/01	1030	7.5	754
				08/14/01	1010		33
				09/17/01	1510	7 F	29
				09/18/01	0825	7.5	4.
				11/19/01	0755		41
				07/16/02	0930		30
				09/16/02	1442		24

Table 1. Site location, dissolved oxygen concentrations, and streamflow data for the Ottawa River and selected tributaries —Continued [mg/L, milligrams per liter; ft³/s, cubic feet per second; quad, U.S. Geological Survey 7.5-minute topographic quadrangle map.]

Station letter	Station number	Station name	Location	Date	Time	Oxygen, dissolved (mg/L)	Stream- flow (ft ³ /s)
Q	04187995	Sugar Creek	Latitude 40°57′16″, longitude 84°10′45″,	09/16/99			no flow
-		near Kalida, Ohio	Putnam County, Hydrologic Unit	07/12/00	1038		10.4
			04100007,County Road 66 bridge over	09/18/00	1500	11.1	2.1
			Sugar Creek, 2.5 mi southeast of Kalida,	09/19/00	0825	5.8	
			Ohio.(Kalida 1:24000 quad)	10/23/00	0950		2.0
				05/15/01	1200	7.6	173
				08/14/01	0920		no flow
				09/17/01	1730		.46
				09/18/01	0755	6.2	
				11/19/01	0740		4.4
				07/16/02	0732		no flow
				09/16/02	1421		no flow
R	405901084124600	Ottawa River	Latitude 40°59'01", longitude 84°12'46",	09/16/99	1315	10.9	23
		at Kalida, Ohio	Putnam County, Hydrologic Unit	07/12/00	0916		95
			04100007, at end of drive into St.	09/18/00	1230	9.8	35
			Michaels Cemetery accessed by State	09/19/00	0920	6.6	
		Route 114, 0.2 mi nort Ohio.(Kalida 1:24000	Route 114, 0.2 mi northwest of Kalida,	10/23/00	1425		53
			Onio.(Kanda 1:24000 quad)	05/16/01	1230	7.9	980
				08/14/01	1630		31
				09/17/01	1240		31
				09/18/01	0915	7.4	
				11/19/01	1010		44
				07/16/02	1239		28
				09/16/02	1314		25
S	405913084123300	Plum Creek	Latitude 40°59'13", longitude 84°12'33",	09/16/99	1530	8.1	.22
		at Kalida, Ohio	Putnam County, Hydrologic Unit	07/12/00	0920		9.3
			04100007, at State Route 114 bridge over	09/18/00	1030	7.8	1.4
			Plum Creek, 0.2 mi northwest of Kalida,	09/19/00	0905	6.0	
			Ohio.(Kalida 1:24000 quad)	10/23/00	1310		1.2
				05/15/01	0945	8.2	38
				08/14/01	0805		.27
				09/17/01	1140		.48
				09/18/01	0900	5.8	
				11/19/01	0850		2.8
				07/16/02	1110		.44
				09/16/02	1228		.24

Water-quality characteristics

Water-quality data from the first sampling round (summer of 2000) are listed in Appendix 1, and the data from the second sampling round (spring of 2001) are listed in Appendix 2. Quality-control data (analyses of duplicate samples) are included as a second row of data for the same site and date at selected sites. The four or five dissolved-oxygen concentration data are listed on table 1.

Minimum, median, and maximum values of the nutrient and dissolved-oxygen concentrations and physical properties measured at the 18 or 19 sites are listed in table 2 (table 2 and all remaining tables are at back of report) for samples collected during low-flow and runoff events. Only 18 sites were sampled during the summer 2000 sampling round because there was no flow at the Ottawa River at Metzger Road (site E).

The median values of specific conductance, pH, dissolved oxygen, alkalinity, and orthophosphate were higher during low flow than during the runoff event. In contrast, the median concentrations of total phosphorus, ammonia nitrogen, nitrite plus nitrate nitrogen, and ammonia plus organic nitrogen were higher during the runoff event than during low flow. Concentrations of orthophosphate, phosphorus, and dissolved oxygen all exhibited wider ranges (lowest minimum value and the highest maximum value) during low flow than during the runoff event.

Concentrations of nitrite plus nitrate nitrogen in nine samples exceeded the U.S. Environmental Protection Agency (USEPA, 2002) Maximum Contaminant Level (MCL) for nitrate (10 mg/L, as nitrogen) during the runoff event, whereas concentrations in only one sample exceeded this standard during low flow. Although the MCL applies to treated drinking water and not to the samples collected

during this study, the MCL provides a frame of reference for evaluating the water-quality data.

Water-quality samples were collected and analyzed for major ions and trace elements during the low-flow period in September 2000. Summary statistics for the 15 constituents that were detected at all 18 sites are listed in table 3. An additional 10 constituents were detected infrequently (table 4) or not detected at all (table 5). As a frame of reference, lead concentrations, detected at 1 to 2 μ g/L, were well below the 15- μ g/L USEPA action level for treated drinking water.

During a runoff event in May 2001, water-quality samples were collected and analyzed for 48 pesticides. Of the 48 pesticides, 18 were detected, 13 of which were detected at five or more sites (table 6). The pesticides trifluralin, DCPA, malathion, tebuthiuron, and terbuthylylazine were detected at 3 or fewer sites, and 30 pesticides were not detected at any site (table 7). Acetochlor, atrazine, deethylatrazine, metolachlor, and simazine were detected in all 19 samples. The USEPA has established MCLs for drinking water of 3 μ g/L for atrazine and 4 μ g/L for simazine. Although the MCLs do not apply to stream water, they can be used as a frame of reference for evaluating the magnitude of the concentrations observed in the samples. Concentrations of atrazine exceeded the MCL at 13 sites; the simazine MCL was exceeded at 1 site. Of the three other pesticides detected in all 19 samples, acetochlor and metochlor do not have MCLs, and deethylatrazine is an atrazine metabolite. Detections of pesticides were not unexpected because sampling was targeted during a runoff event after recent planting and pesticide application.

Summary

In cooperation with the ORC, the USGS made 10 stream-flow measurements at each of 19 stream sites and at a USGS gaging station (index station). Nineteen plots were made of the daily mean streamflow at Auglaize River near Fort Jennings and the instantaneous streamflow at the 19 sites.

Two sets of samples were collected and analyzed for water-quality constituents at the 18 or 19 sites. Dissolved-oxygen concentrations were measured four or five times. The water-quality samples were collected during two periods when stream conditions potentially placed stress on aquatic life. Samples were collected and analyzed for nutrients and physical properties during both sampling rounds.

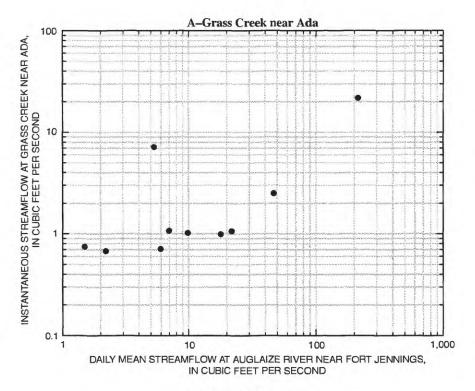
During low flow, the median values of specific conductance, pH, dissolved oxygen, alkalinity, and orthophosphate were higher than during the runoff-sampling. In contrast, the median concentrations in runoff samples were higher than in low-flow samples for total phosphorus, ammonia nitrogen, nitrite plus nitrate nitrogen, and, ammonia plus organic nitrogen. Concentrations of orthophos-

phate, phosphorus, and dissolved oxygen all exhibited wider ranges (lowest minimum value and the highest maximum value) during low flow than during the runoff event.

Water samples were collected and analyzed for major ions and trace elements during a low-flow period and for pesticides during a runoff event. Samples collected during the low-flow period were analyzed for 25 major ions and trace elements, 15 of which were detected in all the samples and 10 that were detected infrequently or not at all. Samples collected during the runoff event were analyzed for 48 pesticides, 18 of which were detected. Of the 18 pesticides detected, 5 were detected in all the samples: acetochlor, atrazine, deethylatrazine, metolachlor, and simazine. Alachlor and prometon were detected in 18 of the 19 samples, diazinon was detected in 17 samples, carbaryl and metribuzin sencor in 13, cyanazine in 8, chlorpyrifos in 6, and pendimethalin in 5 samples. The remaining pesticides—DCPA, malathion, tebuthiuron, terbuthylazine, and trifluralin-were detected in one, two, or three of the samples. Neither the pesticide nor the major ion and trace element data are unexpected, as both sets of analyses were targeted during times when environmental conditions could cause the pesticides and major ions and trace elements to be at high concentrations.

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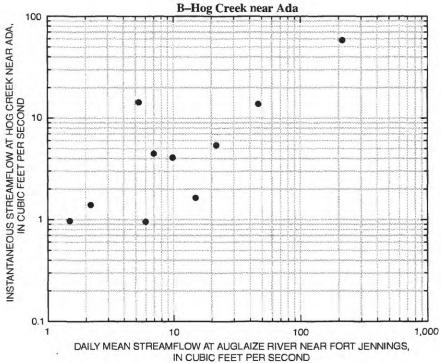
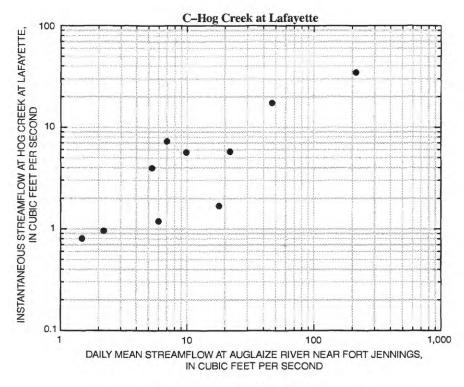


Figure 2. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Grass Creek and Hog Creek near Ada, Ohio.



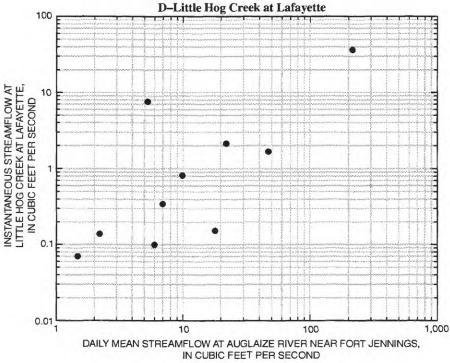
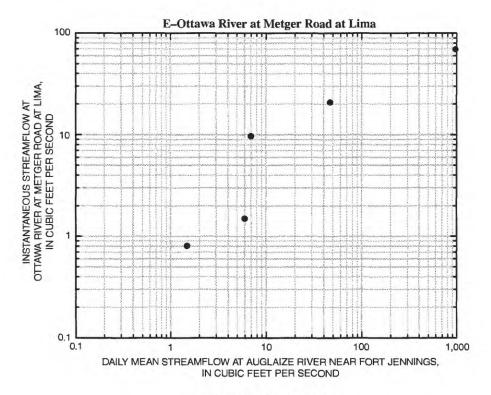


Figure 3. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Hog Creek and Little Hog Creek at Lafayette, Ohio.



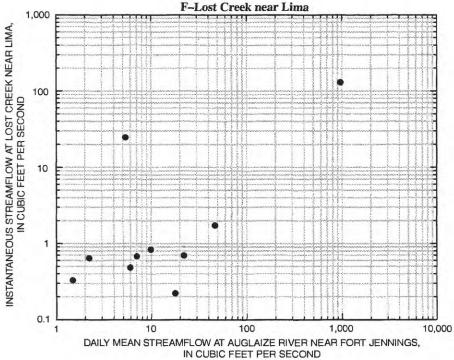
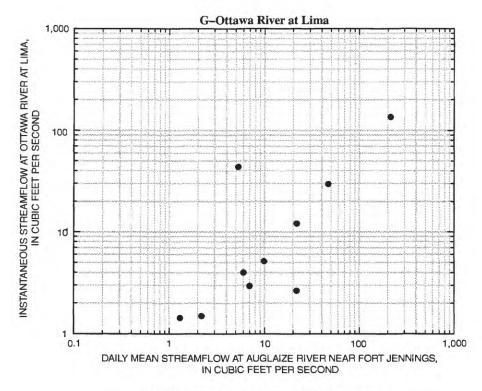


Figure 4. Relation between mean daily streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Ottawa River at Metzger Road at Lima and Lost Creek near Lima, Ohio.



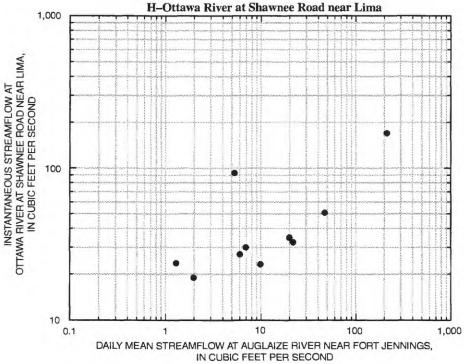
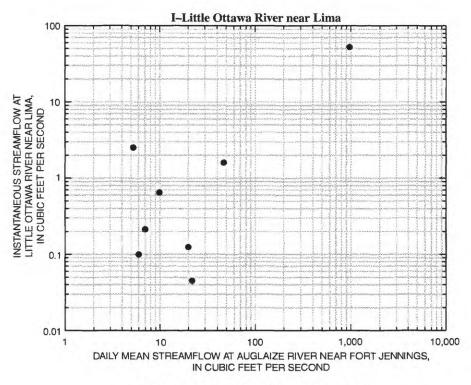


Figure 5. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Ottawa River at Lima and at Shawnee Road near Lima, Ohio.

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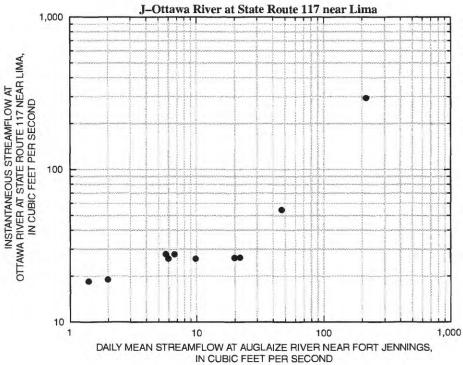
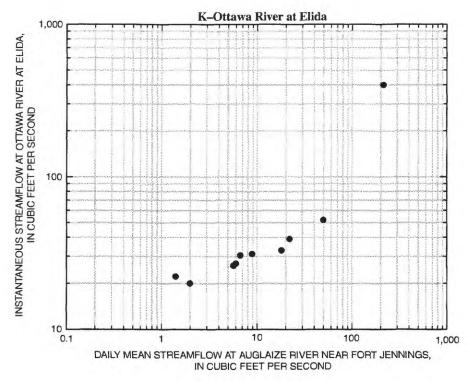


Figure 6. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Little Ottawa River and Ottawa River at State Route 117 near Lima, Ohio.



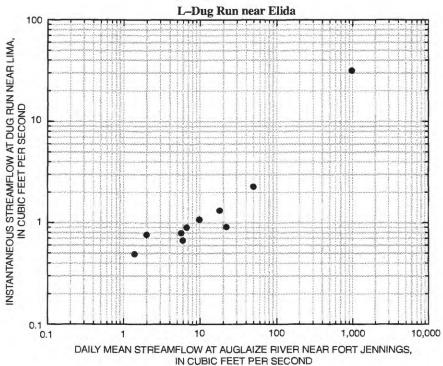
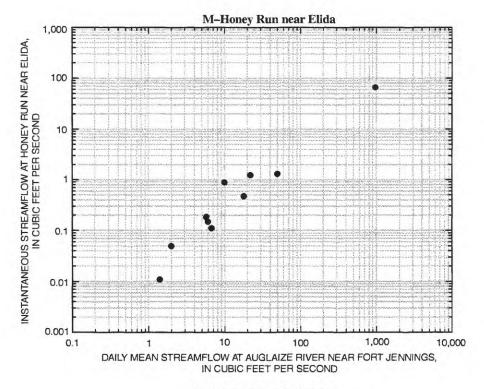


Figure 7. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Ottawa River at Elida and Dug Run near Elida, Ohio.



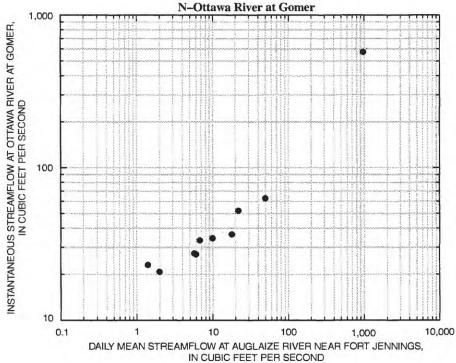
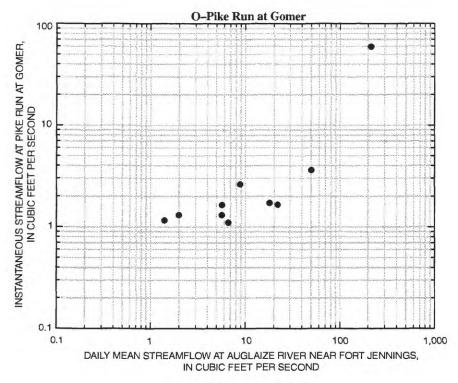


Figure 8. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Honey Run near Elida and Ottawa River at Gomer, Ohio.



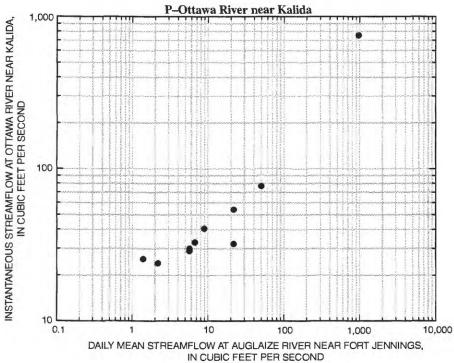
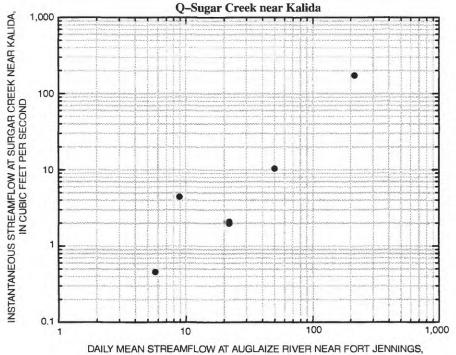


Figure 9. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Pike Run at Gomer and Ottawa River near Kalida, Ohio.





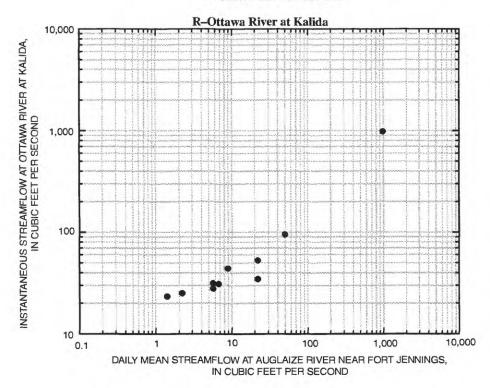


Figure 10. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Sugar Creek near Kalida and Ottawa River at Kalida, Ohio.

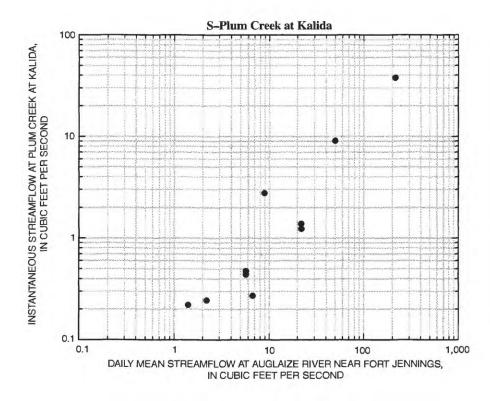


Figure 11. Relation between daily mean streamflow at Auglaize River near Ft. Jennings and instantaneous streamflow at Plum Creek at Kalida, Ohio.

Table 2. Statistical summary of physical properties and nutrient concentrations for samples collected at sites along the Ottawa River and selected tributaries

[°C, degrees Celsius; μ S/cm, microsiemens per centimeter at 25°C; mg/L, milligrams per liter; CaCO₃, calicum carbonate; N, nitrogen; P, phosphorus; e, estimated.]

	Number	Concentration or value				
Physical property or constituent	of samples	Minimum	Median	Maximum		
Water Temperature (°C)						
Low flow (sampling round 1)	18	14.0	18.0	21.0		
Runoff event (sampling round 2)	19	14.0	16.0	18.0		
Specific conductance (µS/cm)						
Low flow (sampling round 1)	18	738	1010	1730		
Runoff event (sampling round 2)	19	493	634	784		
pH (standard units)						
Low flow (sampling round 1)	18	7.2	7.8	8.4		
Runoff event (sampling round 2)	19	7.2	7.6	7.9		
Dissolved oxygen (mg/L)						
Low flow (sampling round 1)	18	4.2	7.8	12.7		
Runoff event (sampling round 2)	19	6.2	7.6	8.6		
Alkalinity (mg/L as CaCO ₃)						
Low flow (sampling round 1)	18	83	154	272		
Runoff event (sampling round 2)	19	79	121	248		
Nitrogen, ammonia plus organic, total (mg/L as N)						
Low flow (sampling round 1)	18	.55	.94	2.7		
Runoff event (sampling round 2)	19	.94	2.2	3.5		
Nitrogen, ammonia, dissolved (mg/L as N)	**					
Low flow (sampling round 1)	18	e.016	.076	1.3		
Runoff event (sampling round 2)	19	.089	.419	1.55		
Nitrogen, nitrite plus nitrate, dissolved (mg/L as N)	19					
Low flow (sampling round 1)	18	e.036	3.20	10.7		
Runoff event (sampling round 2)	18	.680	9.53	32.4		
, , ,	19	1000	,,,,,			
Phosphorus, orthophosphate, dissolved (mg/L as P) Low flow (sampling round 1)	18	.021	.398	1.34		
Runoff event (sampling round 2)	18 19	.044	.143	.314		
• • • • • •	19		15			
Phosphorus, total (mg/L as P) Low flow (sampling round 1)	10	.094	.413	1.53		
Runoff event (sampling round 2)	18	.179	.413	.597		
	19	.1/9	.420			

Table 3. Statistical summary of major ions and trace-element concentrations found at 18 sites along the Ottawa River and selected tributaries during September 2000

 $[\mu g/L$, micrograms per liter, mg/L, milligrams per liter. Statistics based on 18 samples. Charges of major ions and trace elements are implied; e, estimated.]

Major ions or trace elements	Minimum	Median	Maximum
Aluminum, total recoverable (µg/L as Al)	34	158	645
Barium, total recoverable (µg/L as Ba)	16.4	47.3	68.3
Boron, total recoverable (µg/L as B)	102	206	424
Calcium, dissolved (mg/L as Ca)	67.2	90.3	109
Chloride, dissolved (mg/L as Cl)	55.8	98	248
Fluoride, dissolved (mg/L as F)	.3	.7	1.2
Iron, total recoverable (µg/L as Fe)	90	390	1110
Lithium, total recoverable (µg/L as Li)	e5.1	17.0	33.9
Magnesium, dissolved (mg/L as Mg)	21	32.3	47.9
Manganese, total recoverable (μ g/L as Mn)	5	47	86
Potassium, dissolved (mg/L as K)	5.8	7.1	10.9
Silica, dissolved (mg/L as SiO ₂)	2.03	6.69	12.8
Sodium, dissolved (mg/L as Na)	36.1	72.0	205
Strontium, total recoverable (µg/L as Sr)	645	2600	5170
Sulfate, dissolved (mg/L as SO ₄)	101	186	338

Table 4. Statistical summary of infrequently detected major ions and trace elements at sites along the Ottawa River and selected tributaries during low flow

[µg/L, micrograms per liter, mg/L, milligrams per liter; --, denotes no median detection concentration for major ions and trace elements that only have two detections. Statistics based on 18 samples. Charges of major ions and trace elements are implied. Reported concentrations lower than reporting limit are detected values with concentrations too low to accurately measure; e, estimated.]

Major ions, trace elements	Reporting	Number	Reported concentrations			
and residue	limit	of detections	Minimum	Median	Maximum	
Lead, total recoverable (µg/L as Pb)	1	13	e1	1	2	
Molybdenum, total recoverable (µg/L as Mo)	70	1	e47		e47	
Residue, total at 105°C, suspended (mg/L)	10	5	13	20	29	
Vanadium, total (µg/L as V)	10	2	e10		e10	
Zinc, total recoverabl (µg/L as Zn)	31	5	e16	20	e21	

 $\begin{tabular}{ll} \textbf{Table 5}. & \textbf{Reporting limits for nondetected major ions} \\ \textbf{and trace elements} \\ \end{tabular}$

[μ g/L, micrograms per liter. Charges of trace elements are implied.]

Trace elements not detected	Reporting limit
Beryllium, total recoverable (µg/L as Be)	5
Cadmium, water, total, unfiltered (µg/L as Cd)	8
Cobalt, total recoverable (µg/L as Co)	16
Copper, total recoverable (µg/L as Cu)	20
Nickel, total recoverable (µg/L as Ni)	39
Silver, total recoverable (µg/L as Ag)	7

Table 6. Statistical summary of post-application pesticide detections in water samples from the Ottawa River and selected tributaries, May 2001

[μ g/L, microgram per liter; --, denotes no median detection concentration for pesticides that only had two detections, statistics based on 19 samples. Reported concentrations lower than reporting limit are detected values with concentrations too low to accurately measure; e, estimated.]

Pesticide	Reporting	Number	Number	Reported concentrations, in micrograms per liter			
resticide	(μ g/L)	samples	detection	Minimum detection	Median detection	Maximum detection	
Acetochlor	0.05	19	19	0.173	2.56	15.8	
Alachlor	.010	19	18	.006	.016	.179	
Atrazine	.05	19	19	.370	9.64	e44.8	
Carbaryl	.041	19	13	e.005	.020	e.057	
Chlorpyrifos	.010, .005*	19	6	e.004	.010	.025	
Cyanazine	.018	19	8	e.006	.011	.023	
DCPA	.003	19	2	e.002		.006	
Deethylatrazine	.05	19	19	e.098	.386	e1.6	
Diazinon	.005	19	17	.003	.026	.060	
Malathion	.013, .027 *	19	2	e.004		e .012	
Metolachlor	.05	19	19	.058	2.64	16.8	
Metribuzin	.006	19	13	.012	.582	2.23	
Pendimethalin	.010, .030 *	19	5	e.009	.040	.127	
Prometon	.015	19	18	e.010	.048	.300	
Simazine	.05	19	19	.035	.907	13.3	
Tebuthiuron	.016	19	3	e.014	.023	.026	
Terbuthylazine	••	19	2	e.002		e .026	
Trifluralin	.009	19	1	e.006		e.006	

^{*} Interferences in analysis or change in dilution of a sample may lead to more than one reporting limit.

Table 7. Reporting limits for undetected pesticides $[\mu g/L, micrograms per liter.]$

Pesticides not detected	Reporting limit (μg/L)	Pesticides not detected	Reporting limit (μg/L)
2,6-Diethylaniline	0.002	Molinate	.002
alpha-BHC	.005	Napropamide	.007
Benfluralin	.010	p, p '-DDE	.003
Butylate	.002	Parathion	.007
Carbofuran	.020	Pebulate	.002
Dieldrin	.005	cis-Permethrin	.006
Disulfoton	.021	Phorate	.011
EPTC	.002	Pronamide	.004
Ethalfluralin	.009	Propachlor	.010
Ethoprop	.005	Propanil	.011
Fonofos	.003	Propargite	.023
Lindane	.004	Terbacil	.034
Linuron	.035	Terbufos	.017
Methylazinphos	.050	Thiobencarb	.005
Methylparathion	.006	Triallate	.002

APPENDIXES	

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 [ft³/s, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μ S/cm, microsiemens per centimeter; deg C, degrees Celsius; μ g/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

Date	Time	Discharge, instan- taneous (ft³/s) (00061)	Barometric pressure (mm of Hg) (00025)	Oxygen, dissolved (mg/L) (00300)	Oxygen, dissolved (percent of saturation) (00301)	pH, whole water field (standard units (00400)	pH, , whole water, lab (standard units) (00403)	Specific conduct- ance, lab (µS/cm) (90095)
			4047200024	75200 CD 4 CC	CREEK NEAR	VDV OHIO		
Sept. 19	1545	.99	738	4.2	43	7.2	9.2	1030
•								
Sept. 20	0.0845	1.6	404746083 738	492400 HOG C 6.9	REEK NEAR / 74	<u>ADA. OHIO</u> 8.2	8.2	1020
3ept. 20	7 0045	1.0	130	0.9	/4	0.2	6.2	1020
					EEK AT LAFA			
Sept. 19	9 1410	1.7	738	8.5	88	7.8	8.1	949
		40	4602083571700	LITTLE HOG	CREEK AT LA	AFAYETTE, OI	HIO	
Sept. 19	9 1230	.15	738	6.2	64	7.7	8.2	1460
		4045040	084030300 OTT	AWA RIVER A	AT METZGER	ROAD AT LIM	A, OHIO	
Sept. 19	9 0915		••					
			4044480840	34000 LOST C	REEK NEAR I	LIMA, OHIO		
Sept. 19	9 1010	.22	739	8.2	80	7.7	8.0	797
			0410710	0 OTT 4 T 1 4 T	nen atina			
Sept. 18	8 1515	2.7	743	10.0	IVER AT LIM 114	<u>A. OHIO</u> 8.4	7.8	837
F			, .5	2010		•••		55,
~			4090500 OTTA					
	8 1300 8 1301	32	743 743	4.9 4.9	55 55	7.5 7.5	7.3 7.3	1770 1780
Sant 19	8 1000	.04	<u>4221084091500</u> 744	LITTLE OTTA 6.2	AWA RIVER N 62	EAR LIMA, OI 7.7	<u>HIO</u> 7.8	815
Sept. 10	3 1000	.04	/	0.2	02	7.7	7.0	013
			4102600 OTTAV					
Sept. 19	9 0930	26	740	4.5	50	7.6	7.8	1700
			40480808412	21700 OTTAW	A RIVER AT E	ELIDA, OHIO		
Sept. 19	9 1100	33	740	7.9	87	7.8	7.9	1610
			404839084	121400 DUG I	RUN NEAR EL	IDA OHIO		
Sept. 19	9 1330	1.3	740	12.7	145	8.4	8.4	1010
Sent 1	9 1215	.47	4048260841 740	30400 HONEY 6.0	RUN NEAR E 64	LIDA, OHIO 7.7	7.9	965
Sept. 1	9 1213	.47	740	0.0	04	1.1	1.9	903
					A RIVER AT G			
	9 1600 9 1601	36.5	740 740	11.9 11.9	139 139	8.3 8.3	8.2 8.3	1540 1530
-			,		107	0.0	0.0	
	0 .445				RUN AT GOM		2.2	204
Sept. 1	9 1445	1.7	740	7.0	76	7.8	8.0	884
			4057000841136	000 OTTAWA	RIVER NEAR	KALIDA, OHIO	2	
Sept. 1	8 1600	32	743	10.3	116	8.3	8.3	1170
			04187995	SUGAR CREE	K NEAR KAL	IDA. OHIO		
Sept. 1	8 1500	2.1	743	11.1	125	8.1	8.2	842

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 —Continued [ft³/s, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μS/cm, microsiemens per centimeter; deg C, degrees Celsius; μg/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

Oxygen,

Discharge, Barometric

pН,

dissolved whole water, whole water,

pН,

Specific

conduct-

Date	Time	instant- aneous (ft ³ /s) (00061)	pressure (mm of Hg) (00025)	Oxygen, dissolved (mg/L) (00300)	(percent of saturation) (00301)	field (standard units) (00400	iab (standard units) (00403)	ance, lab (μS/cm) (90095)
	4	40590108412	4600 OTTAWA	RIVER (ST. M	IICHAELS CEM	(ETERY) AT K	ALIDA, OHIO	
Sept. 18	1230	35	743	9.8	106	8.0	8.2	1030
					CREEK AT KA			
Sept. 18	1030	1.4	744	7.8	81	7.8	8.0	1500
0 10	1001		<u>405</u>	913084123399	BLANK SAMI		0.1	2
Sept. 19 20	1801		 			 	8.1 8.6	e3 7
Dat	te	Specific conduct- ance, field (µS/cm) (00095)	Air temperature (deg C) (00020)	Calcium, dissolved (mg/L as Ca) (00915)	Magnesium, dissolved (mg/L as Mg) (00925)	Potassium, dissolved (mg/L as K) (00935)	Sodium, dissolved mg/L as Na) (00930)	Alkalinity, water, dissolved, field (mg/L as CaCO ₃) (39086)
			40472808347	75300 GRASS	CREEK NEAR	ADA, OHIO		
Sept.	. 19	738	16.5	83.9	32.4	9.9	71.2	83
Sept.	. 20	1010	4047460834 16.5	192400 HOG C 92.7	CREEK NEAR A 34.4	ADA, OHIO 7.7	58.1	133
					EEK AT LAFA			
Sept.	. 19	920	16.5	94.0	32.2	6.3	47.7	199
C	10)4602083571700		CREEK AT LA 47.9	FAYETTE, OH		272
Sept.	. 19	1390	17.0	98.9			118	212
Sept.	. 19	404504 0915	084030300 OTTA 	AWA RIVER A	AT METZGER) 	ROAD AT LIM. 	<u>A. OHIO</u> 	
			4044480840	34000 LOST (REEK NEAR I	JMA, OHIO		
Sept.	. 19	780	17.0	71.9	21.0	6.6	46.1	135
			0418710	0 OTTAWA R	RIVER AT LIMA	A. OHIO		
Sept.	. 18	830	26.5	80.9	33.2	5.8	36.1	172
			4090500 OTTAV					
Sept.	. 18 18	1730 1730	22.0 22.0	95.6 98.3	38.8 38.2	9.7 10.1	205 197	156 156
	10	1750	22.0	70.5	30.2	10.1	191	150
Sept.	18	<u>40</u> 804	04221084091500 17.0	LITTLE OTTA 67.2	AWA RIVER N 23.2	EAR LIMA, OF 6.3	<u>IIO</u> 55.8	175
эері.	. 10	004	17.0	07.2	23.2	0.5	٥.۵٥	1/3
	10		4102600 OTTAW					150
Sept.	. 19	1720	17.0	97.6	38.2	10.9	182	152
			<u>40480808412</u>	1700 OTTAW	A RIVER AT E	LIDA, OHIO		

96.7

35.4

10.5

169

152

17.0

Sept. 19

1630

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 — Continued $[ft^3/s]$, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μ S/cm, microsiemens per centimeter; deg C, degrees Celsius; μ g/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

Date	Specific conduct- ance, field (µS/cm) (00095)	Air temperature (deg C) (00020)	Calcium, dissolved (mg/L as Ca) (00915)	Magnesium, dissolved (mg/L as Mg) (00925)	Potassium, dissolved (mg/L as K) (00935)	Sodium, dissolved mg/L as Na) (00930)	Alkalinity water, dissolved field (mg/L as CaCO ₃ (39086)
		404839084	121400 DUG I	RUN NEAR ELI	DA, OHIO		
Sept. 19	1010	17.0	94.7	27.1	8.4	72.7	142
		40482608413	0400 HONEY	' RUN NEAR EI	JIDA, OHIO		
Sept. 19	971	17.0	109	30.2	6.7	44.3	240
		405051084114	1000 OTTAW	A RIVER AT GO	OMER, OHIO		
Sept. 19	1550	16.5	98.5	35.8	10.1	163	154
19	1550	16.5	97.1	35.2	9.93	160	154
		405048084	1111000 PIKE	RUN AT GOM	ER, OHIO		
Sept. 19	890	19.0	85.9	22.2	7.2	59.7	154
		4057000841136	00 OTTAWA	RIVER NEAR K	ALIDA, OHIO		
Sept. 18	1190	22.0	84.8	29.2	7.6	101	156
		04187995	SUGAR CREE	K NEAR KALI	DA, OHIO		
Sept. 18	844	22.0	69.5	25.3	6.6	55.2	154
	40590108412	4600 OTTAWA 1	RIVER (ST. M	IICHAELS CEM	ETERY) AT K	ALIDA, OHIO	
Sept. 18	1040	21.0	79.9	27.6	6.7	81.3	164
		40591308412	23300 PLUM	CREEK AT KAI	JDA, OHIO		
Sept. 18	1480	17.0	88.0	36.7	7.0	146	194
		<u>405</u>	913084123399	BLANK SAME	LE		
Sept. 19			.06	e.011	<.24	<.1	
20			.04	<.014	<.24	<.1	

Date	Carbonate water, dissolved, field (mg/L as CO ₃) (00452)	Chloride, dissolved (mg/L as Cl) (00940)	Fluoride, dissolved (mg/L as F) (00950)	Silica, total (mg/L as SiO ₂) (00956)	Sulfate, dissolved (mg/L as SO ₄) (00945)	Nitrogen, ammonia plus organic, total (mg/L as N) (00625)	Nitrogen, ammonia, dissolved (mg/L as N) (00608)
		4047280834	75300 GRASS (CREEK NEAR	ADA, OHIO		
Sept. 19	23	90.8	.7	3.80	260	1.2	.048
		404746083	492400 HOG C	REEK NEAR A	ADA, OHIO		
Sept. 20	3	81.4	.7	3.20	228	.99	.124
		40461608356	4200 HOG CRE	EK AT LAFA	YETTE, OHIO		
Sept. 19		74.2	.6	3.28	181	.69	.066
	<u>40-</u>	4602083571700	LITTLE HOG	CREEK AT LA	AFAYETTE, O	HIO	
Sept. 19	4	180	.9	7.21	192	.55	.038

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 —Continued [ft³/s, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μS/cm, microsiemens per centimeter; deg C, degrees Celsius; μg/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

Date	Carbonate water, dissolved, field (mg/L as CO ₃) (00452)	Chloride, dissolved (mg/L as Cl) (00940)	Fluoride, dissolved (mg/L as F) (00950)	Silica, total (mg/L as SiO ₂) (00956)	Sulfate, dissolved (mg/L as SO ₄) (00945)	Nitrogen, ammonia plus organic, total (mg/L as N) (00625)	Nitrogen, ammonia, dissolved (mg/L as N) (00608)
Sept. 19	<u>4045040</u> 	84030300 OTT	AWA RIVER A	T METZGER I	ROAD AT LIM	IA, OHIO 	
Sept. 19		4044480840 84.5	034000 LOST C .5	REEK NEAR I 5.54	<u>IMA, OHIO</u> 110	.68	.074
Sept. 18	84	<u>041871</u> 6 55.8	00 OTTAWA R .7	IVER AT LIM 2.03	A <u>, OHIO</u> 180	1.3	e.016
	04224084	090500 OTTAV	VA RIVER AT	SHAWNEE RO	OAD NEAR LII	MA, OHIO	
Sept. 18 18		248 246	1.1 1.1	8.41 8.41	334 338	2.7 2.8	1.33 1.34
	404	1221084091500	LITTLE OTTA	WA RIVER N	EAR LIMA, OI	HIO	
Sept. 18		85.6	.6	7.21	101	.71	.073
Sept. 19	404322084 	102600 OTTAX 224	VA RIVER AT 1.0	STATE ROUT 8.00	E 117 NEAR L 338	<u>IMA, ОНЮ</u> 1.7	.236
Sept. 19		40480808412 189	21700 OTTAWA 1.2	<u>A RIVER AT E</u> 8.42	LIDA, OHIO 326	1.2	.196
			121400 DUG R				
Sept. 19		111	.7	4.48	153	.98	.144
Sept. 19		4048260841 82.4	30400 HONEY .3	RUN NEAR E 12.8	LIDA, OHIO 115	.58	.110
			4000 OTTAWA				
Sept. 19 19		183 185	1.2 1.1	7.81 7.78	309 317	.97 .98	.059 .054
		40504808	4111000 PIKE I	RUN AT GOM	ER, OHIO		
Sept. 19		94.9	.6	6.52	120	1.0	.419
Sept. 18		4057000841136 127	600 OTTAWA F .9	RIVER NEAR I 7.03	KALIDA, OHIO 232	e.92	.077
•		04187005	SUGAR CREEJ	K NEAD KALI	DA OHIO		
Sept. 18		88.7	.4	5.27	121	e.73	.052
	405901084124	600 OTTAWA	RIVER (ST. MI	CHAELS CEM	IETERY) AT K	ALIDA, OHIO	
Sept. 18		101	.8	6.86	194	e.76	.043
Sept. 18		4059130841 246	23300 PLUM C .7	REEK AT KA 4.46	LIDA, OHIO 174	e.87	.114
0 10		-	913084123399				
Sept. 19 20		<.3 1.0	<.1 <.1	.07 <.07	<.3 <.3	e.05 e.02	.036 e.020

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 —Continued [ft³/s, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μS/cm, microsiemens per centimeter; deg C, degrees Celsius; μg/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

Date	Nitrogen, nltrite plus nitrate, dissolved (mg/L as N) (00631)	dissolved	Phosphorus, total (mg/L as P) (00665)		Aluminum, total recoverable (μg/L as Al) (01105)	Barium, total recoverable (μg/L as Ba) (01007)	Beryllium, total recoverable (μg/L as Be) (01012)
		40.45300	002 455200 CD	OO CDEEK NE		^	
Sept. 19	10.7	.549	.762	SS CREEK NE <10	SAR ADA, OHIO 59	16.4	<5
Sept. 20	5.49	<u>404746</u> .623	<u>6083492400 HC</u> .924	OG CREEK NEA 24	AR ADA, OHIO 410	41.1	<5
		40461608	3564200 HOG	CREEK AT LA	FAYETTE, OH	TO	
Sept. 19	2.35	.783	.416	<10	257	58.7	<5
		40460208357	1700 LITTLE H	IOG CREEK AT	LAFAYETTE	оню	
Sept. 19	1.31	.338	.411	<10	53	51,6	<5
Sept. 19	<u>4045040</u> 	84030300 OTT. 	AWA RIVER A	AT METZGER I	ROAD AT LIM	A. OHIO 	
		404448	084034000 I OS	ST CREEK NE	AR LIMA, OHIO	1	
Sept. 19	.641	.065	.108	<10	177	48.4	<5
				A RIVER AT L			
Sept. 18	e.036	.021	.175	<10	157	42.4	<5
	04224	4084090500 OT	TAWA RIVER	AT SHAWNE	E ROAD NEAR	LIMA, OHIO	
Sept. 18	4.15	.552	.698	<10	81 88	60.3 56.5	<5 <5
18	4.11	.019	.737	<10	88	30.3	<>>
				TTAWA RIVE	R NEAR LIMA		
Sept. 18	.516	.493	.588	<10	166	29.9	<5
	40432	2084102600 OT	TAWA RIVER	AT STATE RO	OUTE 117 NEA	R LIMA, OHIO	<u>)</u>
Sept. 19	4.22	.601	.742	<10	102	56.1	<5
		4048080	084121700 OTT	'AWA RIVER A	T ELIDA, OHI	0	
Sept. 19	6.55	.559	.695	<10	149	46.0	<5
		40483	9084121400 DI	JG RUN NEAR	ELIDA OHIO		
Sept. 19	8.52	1.34	1.53	<10	34	36.0	<5
		10.100			D === 0.000	•	
Sept. 19	1.42	.081	.094 .094	NEY RUN NEA <10	R ELIDA, OHI 158	<u>0</u> 65.2	<5
Sept. 19	6.64	<u>40505108</u> .457	.562	<u>AWA RIVER A</u> <10	T GOMER, OH 132	<u>IO</u> 45.8	<5
19	6.69	.447	.561	<10	135	45.3	<5
		4050	40004111000 D	IKE RUN AT G	OMED OUTO		
Sept. 19	3.31	.279	.333	<10	97	47.6	<5
•							
Sept. 18	3.09	<u>405700084</u> .233	113600 OTTA e.340	<u>WA RIVER NE.</u> 20	AR KALIDA, O 466	<u>HIO</u> 47.0	<5
офь 10	5.09		5,540	20	700	77,0	~
C 10	407			REEK NEAR K		40.7	.E
Sept. 18	.487	.059	e.133	13	329	48.7	<5

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 — Continued [ft³/s, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μ S/cm, microsiemens per centimeter; deg C, degrees Celsius; μ g/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

	Nitrogen, nitrite pius nitrate,	Phosphorus, ortho-Phosphorus, phosphate, totai at		Aluminum, total recoverable	Barium, total	Beryliium, total	
Date	dissoived (mg/L as N) (00631)	dissolved	(mg/L as P) (00665)	suspended (mg/L) (00530)	(μg/L as Ai) (01105)	(μg/L as Ba) (01007)	(μg/L as Be) (01012)
	40590108	4124600 OTTA	WA RIVER (S	Γ. MICHAELS	CEMETERY) A	T KALIDA, O	HIO
Sept. 18	2.13	.238	e.133	16	371	44.4	<5
				3399 BLANK S		_	_
Sept. 19 20	<.037 <.037	<.010 <.010	e.001 e.002	<10 <10	<28 <28	e.5 2.0	<5 <5
	Boron,	Cadmium,	Cobait,	Copper,	Iron,	Lead,	Lithium,
	totai recoverable	water, total unfiltered	totai recoverable	total recoverable	total recoverable	total recoverable	total recoverable
Date	(μg/L as B) (01022)	(μg/L as Cd) (01027)	(μg/L as Co) (01037)	(μg/L as Cu) (01042)	(μg/L as Fe) (01045)	(μg/L as Pb) (01051)	(μg/L as Li) (01132)
		4047280834	75300 GRASS	CREEK NEAR			
Sept. 19	300	<8.0	<16	<20	90	<1	32.3
Sept. 20	246	404746083 <8.0	492400 HOG C <16	REEK NEAR A	ADA <u>, OHIO</u> 710	e1	27.4
Sept. 19	153	404616083564 <8.0	4200 HOG CRE <16	EEK AT LAFAY <20	YETTE, OHIO 390	e1	22.0
Sept. 19	4 <u>0</u> 199	4602083571700 <8.0	LITTLE HOG <16	CREEK AT LA	AFAYETTE, OF	<u>IIO</u> <1	33.9
осри. 19							33.9
Sept. 19	<u>4045040</u> 	184030300 OTT. 	AWA RIVER A	T METZGER I	ROAD AT LIM	A, OHIO 	
		4044480840	34000 LOST C	REEK NEAR L			
Sept. 19	108	<8.0	<16	<20	370	el	e5.1
0 10	201			IVER AT LIMA		2	
Sept. 18	201	<8.0	<16	<20	430	2	14.5
Sept. 18	<u>04224084</u> 355	090500 OTTAV <8.0		SHAWNEE RC	DAD NEAR LIN 420	<u>//A. OHIO</u> 2	22.5
18	336	<8.0	<16 <16	<20	420	2	20.6
	<u>40</u> -	4221084091500	LITTLE OTTA	WA RIVER N	EAR LIMA, OF	IIO	
Sept. 18	131	<8.0	<16	<20	340	el	9.5
		102600 OTTAV					
Sept. 19	418	<8.0	<16	<20	400	2	21.3
0 . 10				A RIVER AT E			10.0
Sept. 19	424	<8.0	<16	<20	320	1	19.7
Sant 10	211			RUN NEAR ELI		-1	12.0
Sept. 19	211	<8.0	<16	<20	160	<1	12.0

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 —Continued [ft³/s, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μS/cm, microsiemens per centimeter; deg C, degrees Celsius; μg/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

Date	Boron, total recoverable (μg/L as B) (01022)	Cadmium, water, total unfiltered (μg/L as Cd) (01027)	Cobalt, total recoverable (μg/L as Co) (01037)	Copper, total recoverable (μg/L as Cu) (01042)	iron, total recoverable (μg/L as Fe) (01045)	Lead, total recoverable (μg/L as Pb) (01051)	Lithium, total recoverable (μg/L as Li) (01132)
		4040260041	20400 HONEN	DININEADE	IDA OIIIO		
Sept. 19	102	<8.0	<16	RUN NEAR EI <20	390	<l< td=""><td>11.0</td></l<>	11.0
		40505100411	4000 OFF	DT TTD + T C	0) (ED 01110		
Sept. 19	402	<8.0	4000 OTTAWA <16	RIVER AT GO <20	280	e1	17.8
19	403	<8.0	<16	<20	280	2	18.4
		40504808	4111000 PIKE	RUN AT GOM	FR OHIO		
Sept. 19	162	<8.0	<16	<20	180	<1	9.5
		10.55000001110					
Sept. 18	304	4057000841136 <8.0	000 OTTAWA I <16	CIVER NEAR I	780	2	16.3
Зері. 16	304	<0.0	<10	<20	780	2	10.5
				K NEAR KALI			
Sept. 18	119	<8.0	<16	<20	600	el	9.7
	405901084124	600 OTTAWA	RIVER (ST. M	ICHAELS CEM	ETERY) AT K	ALIDA, OHIO	
Sept. 18	234	<8.0	<16	<20	620	1	13.0
		4050120941	22200 DI IDA C	REEK AT KAI	יוטא טחוט		
Sept. 18	182	<8.0	<16	<20	1110	1	18.4
-							
C 10	e13	<8.0		BLANK SAMF <20		-1	<7.0
Sept. 19 20	e13	<8.0 <8.0	<16 <16	<20	<20 <20	<1 <1	<7.0
		Molybdenum,		Silver,	-		Zinc,
	totai	totai recoverabie	total	total	total	Vanadium, total	total recoverable
Date	(μg/L	(μg/L	(μg/L	(μg/L	(μg/L	total (μg/L	(μg/L
	as Mn)	as Mo)	asNi)	as Ag)	as Sr)	as V)	as Zn)
	(01055)	(01062)	(01067)	(01077)	(01082)	(01087)	(01092)
		4047280834	75300 GRASS	CREEK NEAR	ADA OHIO		
Sept. 19	5	<70	<39	<7	4200	<10	<31
		10.15.15000	100100 7700		D. 01770		
Sept. 20	36	404746083 <70	492400 HOG C <39	REEK NEAR A <7	4020	<10	e20
5 ° P " - "						120	
	40			EK AT LAFAY			
Sept. 19	48	<70	<39	<7	3240	<10	e16
	<u>40</u>	4602083571700	LITTLE HOG	CREEK AT LA	FAYETTE, OF	IIO	
Sept. 19	28	<70	<39	<7	5170	<10	<31
	4045040	84030300 OTT	AWA RIVER A	T METZGER I	ROAD AT LIM	A. OHIO	
Sept. 19		••					
		4044480840	34000 LOST C	REEK NEAR L	IMA. OHIO		
Cant 10	52	-70	-20		645	-10	-21

Sept. 19

53

<70

<39

<7

645

<31

<10

Table A-1. Water-quality data for the Ottawa River and selected tributaries in Ohio, September 18-20, 2000 —Continued [ft³/s, cubic feet per second; (00061), USGS National Water Information System parameter code; mm of Hg, millimeters of mercury; mg/L, milligrams per liter; μS/cm, microsiemens per centimeter; deg C, degrees Celsius; μg/L, micrograms per liter; <, concentration or value reported is less than that indicated; --, no data; e, estimated.]

Date	total	Molybdenum, total recoverable (μg/L as Mo) (01062)	total	Silver, total recoverable (μg/L as Ag) (01077)	Strontium, total recoverable (μg/L as Sr) (01082)	Vanadium, total (μg/L as V) (01087)	Zinc, total recoverable (μg/L as Zn) (01092)
		0418710	O OTTAWAR	IVER AT LIMA	A. OHIO		
Sept. 18	66	<70	<39	<7	1840	<10	<31
	04224084	090500 OTTAV	VA RIVER AT	SHAWNEE RO	AD NEAR LIM	IA, OHIO	
Sept. 18	65	<70	<39	<7	4230	<10	e21
18		e44.4	<39	<7	4020	<10	<31
	<u>40</u> 4	4221084091500	LITTLE OTTA	WA RIVER N	EAR LIMA, OH	IIO	
Sept. 18	86	<70	<39	<7	2570	<10	<31
	404322084	102600 OTTAV	VA RIVER AT	STATE ROUT	E 117 NEAR LI	MA, OHIO	
Sept. 19	49	e47	<39	<7	4110	e10	e17
		40480808412	21700 OTTAW	A RIVER AT E	LIDA. OHIO		
Sept. 19	32	<70	<39	<7	3940	<10	<31
		40.4020004	121 400 DUC D	UN NEAR ELI	DA OITIO		
Sept. 19	21	404839084 <70	39 <39	UN NEAR ELI <7	1330	<10	e21
•							_
G . 10	65			<u>RUN NEAR EI</u>		10	
Sept. 19	67	<70	<39	<7	801	<10	<31
		40505108411	4000 OTTAWA	RIVER AT GO	OMER, OHIO		
Sept. 19	24	e40	<39	<7	3720	<10	<31
19	24	<70	<39	<7	3660	<10	<31
			4111000 PIKE	RUN AT GOM			
Sept. 19	38	<70	<39	<7	828	<10	<31
		4057000841136	00 OTTAWA I	RIVER NEAR K	ALIDA, OHIO		
Sept. 18	46	<70	<39	<7	2640	<10	<31
		04187995	SUGAR CREE	K NEAR KALI	DA. OHIO		
Sept. 18	50	<70	<39	< 7	737	<10	<31
	405001084124	600 OTTAWA	DIVED OT M	CHAELS CEM	ETEDV) AT V	AT IDA OUIO	
Sept. 18	36	<70	<39	<7	2210	e10	<31
		10#0:		DEED:	TD 1 0 === 0		
Sept. 18	63	4059130841; <70	23300 PLUM C <39	REEK AT KAI <7	<u>JDA, OHIO</u> 2020	<10	<31
осре. 10	0.5	270	\ 37	~1	2020	110	\ J1
G	_			BLANK SAME			
Sept. 19 20	<3 <3	<70 <70	<39 <39	<7 <7	1.46 1.54	<10 <10	<31 <31

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001

Date	Discharge, instan- taneous (ft ³ /s) (00061)	Barometric pressure (mm of Hg) (00025)	Oxygen, dissolved (mg/L) (00300)	Oxygen, dissolved (percent of saturation) (00301)	pH, whole water, fleid (standard units) (00400	Specific conduct- ance, field (μS/cm) (00095)	Temper- ature, air (deg C) (00020)	Temper- ature, water (deg C) (00010)
		404728	208347 53 00 <i>(</i>	GRASS CREEK	NEAR ADA	OHIO		
May 15	22	736	6.6	67	7.4	584	14.5	14.0
May 15	58	40474 734	16083492400 7.4	HOG CREEK 1 83	NEAR ADA. (7.4	<u>OHIO</u> 609	19.5	15.0
		4046160	183564200 H	OG CREEK AT	LAFAVETTE	E OHIO		
May 15	35	733	7.1	88	7.8	752	24.0	17.5
		4046020835	71700 LITTL	E HOG CREEK	AT LAFAYI	ETTE, OHIO		
May 15	36	733	7.8	102	7.8	625	26.5	17.0
	<u>404</u>	15 04084030300	OTTAWA R	IVER AT MET	ZGER ROAD	AT LIMA, O	HIO	
May 16	69	736	7.9	88	7.9	679	18.5	16.5
		40444	8084034000 I	LOST CREEK	NEAR LIMA.	OHIO		
May 16	129	735	8.3	96	7.8	493	20.5	16.0
		<u>04</u>	187100 OTT	AWA RIVER A	T LIMA, OH	<u>10</u>		
May 15	135	745	7.7	77	7.6	660	14.5	16.0
	4042	24084090500 C	TTAWA RIV	VER AT SHAW	NEE ROAD	NEAR LIMA.	ОНЮ	
May 15	221	745	8.6	91	7.6	777	16.5	17.0
		40422108409	91500 LITTL	E OTTAWA R	IVER NEAR I	IMA, OHIO		
May 16	52	733	6.8	76	7.6	548	18.5	16.5
	40432	22084102600 O	TTAWA RIV	ER AT STATE	ROUTE 117	NEAR LIMA.	OHIO	
May 15	294	740	8.3	95	7.6	728	20.0	17.0
		4048080	84121700 OT	TAWA RIVER	NEAR ELID	A, OHIO		
May 15	399	743	8.2	95	7.6	784	21.5	18.0
		4048	39084121400	DUG RUN NE	EAR ELIDA. C	OHIO		
May 16	32	733	6.2	74	7.4	582	22.0	17.0
		404820	6084130400 H	HONEY RUN N	NEAR ELIDA.	OHIO		
May 16	66	734	6.8	76	7.2	634	19.0	15.0
		4050510	084114000 O	TTAWA RIVE	R AT GOMER	R. OHIO		
May 16	571	745	7.4	80	7.4	722	17.5	16.0
		4050	04808411100	0 PIKE RUN A	T GOMER, O	HIO		
May 15	59	740	7.5	97	7.6	503	26.5	15.5
		40570008	4113600 OT	TAWA RIVER	NEAR KALII	DA. OHIO		
May 16	754	745	7.5	83	7.5	647	19.0	16.0
		0418	37995 SUGAI	R CREEK NEA	R KALIDA, C	OHIO		
May 15	173	742	7.6	93	7.5	585	24.0	14.5

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Discharge, instant- aneous (ft ³ /s) (00061)	Barometric pressure (mm of Hg) (00025)	Oxygen, dissolved (mg/L) (00300)	Oxygen, dissolved (percent of saturation) (00301)	pH, whole water, field (standard units) (00400	Specific conduct- ance, field (μS/cm) (00095)	Temper- ature, air (deg C) (0020)	Temperature, water (deg C) (00010)
		4124600 OTTA						
May 16	980	745	7.9	88	7.5	645	19.5	16.0
May 15	38	<u>40591</u> 743	3084123300 P 8.2	LUM CREEK 88	AT KALIDA. 7.7	<u>ОНЮ</u> 600	18.0	15.0
May 15	56	743				000	10.0	15.0
May 15			405913084	123399 BLAN 	K SAMPLE 			
16								
16								
	Alkalinity,		Nitrogen, ammonia	Nitrogen,	Phos- phorus,			
	water,	Nitrogen,	plus	plus	ortho-	Phos-	2,6-Dlethyl-	
	dissolved,	ammonia,	organic.	nitrate,	phosphate,	phorus,	aniline,	
Date	IT, field	dissolved	total	dissolved	dissolved	total	water.	Aceto-
	(mg/L	(mg/L	(mg/L	(mg/L	(mg/	(mg/L	filtered	chlor
	as CaCO ₃)	as N)	as N)	as N)	as P)	as P)	(μ g/L)	(μ g/L)
	(39086)	(00608)	(00625)	(00631)	(00671)	(00665)	(82660)	(49260)
May 15	121	<u>404728</u> .585	3083475300 G 1.6	RASS CREEK 9.53	NEAR ADA.	<u>ОНЮ</u> .428	<.002	2.22
,		.5 05	110	7.00			11002	
		-			NEAR ADA, C			
May 15	144	.378	1.7	11.2	.215	.333	<.002	2.56
					LAFAYETTE			
May 15	185	.089	.94	4.00	.161	.301	<.002	.816
		4046020835	71700 LITTLI	HOG CREE	AT LAFAYE	ETTE, OHIO		
May 15	155	.312	1.7	9.10	.216	.179	<.002	6.16
	<u>404</u>	504084030300	OTTAWA R	IVER AT MET	ZGER ROAD	AT LIMA, C	OHIO	
May 16	166	.318	1.8	7.07	.118	.272	<.002	4.65
		<u>40444</u>	8084034000 L	OST CREEK	NEAR LIMA,	OHIO		
May 16	95	.543	3.3	7.40	.083	.566	<.002	5.98
					AT LIMA, OHI			. =
May 15	202	.414	1.2	.68	.067	.196	<.002	.173
NG 16		24084090500 C						***
May 15	176	.278	1.4	2.48	.186	.367	<.002	.195
					IVER NEAR L			
May 16	98	.419	2.6	8.37	.143	.597	<.002	7.62
		2084102600 O						
May 15	204	.331	1.8	2.92	.117	.475	<.002	e.283

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Alkalinity, water, dissolved, IT, field (mg/L as CaCO ₃) (39086)	Nitrogen, ammonia, dissolved (mg/L as N) (00608)	Nitrogen, ammonia plus organic, total (mg/L as N) (00625)	Nitrogen, nitrite plus nitrate, dissolved (mg/L as N) (00631)	Phos- phorus, ortho- phosphate, dissolved (mg/ as P) (00671)	Phos- phorus, total (mg/L as P) (00665)	2,6-Diethyl- anillne, water, filtered (μg/L) (82660)	Aceto- chlor (μg/L) (49260)
		4048080	84121700 OT	TAWA RIVEF	NEAR ELIDA	A, OHIO		
May 15	248	.400	2.2	6.79	.157	.453	<.002	1.98
					EAR ELIDA, O			
May 16	93	.829	2.7	17.3	.044	.333	<.002	.752
					NEAR ELIDA.			
May 16	79	1.55	3.5	32.4	.144	.517	<.002	15.8
		4050510	084114000 O	TAWA RIVE	R AT GOMER	OHIO		
May 16	117	.702	2.6	16.2	.150	.467	<.002	e3.43
		4050	048084111000) PIKE RUN A	T GOMER, OF	-IIO		
May 15	82	.633	2.5	17.9	.122	.423	<.002	2.16
		40570008	4113600 OTT	'AWA RIVER	NEAR KALID	A. OHIO		
May 16	101	.702	2.7	18.4	.111	.494	<.002	3.94
		0418	7995 SUGAR	CREEK NEA	R KALIDA, O	ніо		
May 15	125	.258	2.4	16.5	.051	.422	<.002	4.66
	40590108	4124600 OTT	AWA RIVER	(ST MICHAE	LS CEMETER	V) AT KAI I	DA OHIO	
May 16	107	.634	2.6	18.2	.145	.483	<.002	3.98
		40501	308/123300 E	I IIM CDEEK	AT KALIDA,	OHIO		
May 15	117	.467	2.1	10.6	.111	.455	<.002	.853
			405012004	100000 DT 4 N	TZ C A MOLE			
May 15		e.044	.15	123399 BLAN <.037	<.018	.005		
16 16		e.040 <.049	<.08 <.08	<.037 <.037	<.018 <.018	<.004 <.004		
10		<.049	<.06	2.03 7	<.016	2.004		
	Alachlor	alpha-BHC	Atrazine	Benfluralin	Butylate	Carbaryi	Carbofuran	Chlor- pyrifos
Date	(μg/L) (46342)	(μ g/L) (34253)	(μ g/L) (39632)	(μg/L) (82673)	(μ g/L) (04028)	(μ g/L) (82680)	(μ g/L) (82674)	(μg/L) (38933)
May 15	.039	404728 <.005	8083475300 C 2.42	RASS CREEI <.010	K NEAR ADA. <.002	<u>OHIO</u> <.041	<.020	<.005
		· · · · · · · · · · · · · · · · · · ·			NEAR ADA, C			
May 15	.019	<.005	2.38	<.010	<.002	<.041	<.020	<.005
		4046160	083564200 H	OG CREEK A	<u> LAFAYETTE</u>	OHIO		
May 15	.007	<.005	1.85	<.010	<.002	<.041	<.020	<.005
		4046020835	71700 LITTL	E HOG CREE	K AT LAFAYE	TTE, OHIO		
May 15	.007	<.005	12.2	<.010	<.002	e.005	<.020	<.010

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Alachior (μg/L) (46342)	aipha-BHC (μg/L) (34253)	Atrazine (μg/L) (39632)	Benfiuralin (μg/L) (82673)	Butyiate (μg/L) (04028)	Carbaryl (μg/L) (82680)	Carbofuran (μg/L) (82674)	Chior- pyrifos (μg/L) (38933)
	40	4504084030300	OTTAWA F	UVER AT MET	ZGER ROAL	AT LIMA. C	оніо	
May 16	.014	<.005	9.64	<.010	<.002	e.009	<.020	<.005
	222			LOST CREEK N				
May 16	.023	<.005	e28.2	<.010	<.002	e.023	<.020	.025
				AWA RIVER A				20#
May 15	.014	<.005	.370	<.010	<.002	e.021	<.020	<.005
				VER AT SHAW				
May 15	.015	<.005	.446	<.010	<.002	e.020	<.020	<.005
		40422108409	91500 LITTL	E OTTAWA RI	VER NEAR I	LIMA, OHIO		
May 16	.006	<.005	e29.5	<.010	<.002	e.020	<.020	<.010
	40432	22084102600 O	TTAWA RIV	ER AT STATE	ROUTE 117	NEAR LIMA	<u>, OHIO</u>	
May 15	.015	<.005	1.57	<.010	<.002	e.057	<.020	<.005
		4048080	84121700 OT	TAWA RIVER	NEAR ELID	A. OHIO		
May 15	.011	<.005	8.93	<.010	<.002	e.015	<.020	<.005
		4048	39084121400	DUG RUN NE	ARFLIDA (OHIO		
May 16	.016	<.005	15.2	<.010	<.002	e.012	<.020	<.010
		404826	5084130400 F	HONEY RUN N	EAR ELIDA	OHIO		
May 16	.147	<.005	e44.8	<.010	<.002	<.041	<.020	e.005
		4050510	084114000 O	TTAWA RIVER	AT GOME	OHIO		
May 16	.026	<.005	e34.2	<.010	<.002	e.037	<.020	.016
		40#		^ D	T 001 FFD 0	****		
May 15	<.010	4050 <.005	9,28	<u>0 PIKE RUN AT</u> <.010		e.020	<.020	<.010
May 16	.179	40570008 <.005	4113600 OT 16.2	[AWA RIVER] <.010	NEAR KALII <.002	OA, OHIO e.011	<.020	.009
way 10	.179	<.005	10.2	<.010	₹.002	Ç.011	<.020	.009
	004			CREEK NEAF			200	004
May 15	.035	<.005	12.3	<.010	<.002	<.041	<.020	e.004
			AWA RIVER	(ST. MICHAEI				
May 16	.152	<.005	14.7	<.010	<.002	e.009	<.020	.011
		405913	3084123300 I	PLUM CREEK	AT KALIDA.	ОНЮ		
May 15	.013	<.005	4.65	<.010	<.002	<.041	<.020	<.005
			405913084	123399 BLANE	SAMPLE			
May 15								
16 16					 			

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

			Deethyl-	Diazinon,				
Date	Cyanazine (μg/L) (04041)	DCPA (μg/L) (82682)	atrazine (μg/L) (04040)	D10, (μg/L) (91063)	Diazinon (μg/L) (39572)	Dieldrin (μg/L) (39381)	Disulfoton (μg/L) (82677)	EPTC (μg/L) (82668)
		40472	8083475300 G	RASS CREE	K NEAR ADA.	OHIO		
May 15	.023	<.003	e.149	129	.060	<.005	<.021	<.002
		40.47	460024024001	HOC CREEK	NIEAD ADA C	NIIO		
May 15	e.015	<.003	e.144	104	NEAR ADA, C .022	<.005	<.021	<.002
•								
May 15	e.006	404616 <.003	083564200 HC e.098	G CREEK A' 124	<u>LAFAYETTE</u> e.003	<u>C.OHIO</u> <.005	<.021	<.002
May 15	C.000	<.003	6.096	124	6.003	<.003	V.021	\.002
					K AT LAFAYE			
May 15	<.018	<.003	e.562	103	<.005	<.005	<.021	<.002
	4045	504084030300	OTTAWA RI	VER AT ME	TZGER ROAD	AT LIMA, C	HIO	
May 16	<.018	<.003	e.285	109	.008	<.005	<.021	<.002
		40444	18084034000 L	OST CREEK	NEAR LIMA.	ОНІО		
May 16	e.013	<.003	e1.6	103	.031	<.005	<.021	<.002
		0	4107100 OTT 4	WA DIVED	AT 1 1344 OUT	•		
May 15	<.018	<.003	e.126	109	AT LIMA, OHI .055	<u>U</u> <.005	<.021	<.002
•								
May 15	40422 <.018	4084090500 (<.003	OTTAWA RIV e.100	<u>ER AT SHAV</u> 117	<u>VNEE ROAD N</u> .045	<u>EAR LIMA.</u> <.005	<u>ОНІО</u> <.021	<.002
May 13	<.016	<.003	6.100	117	.045	<.005	<.021	<.002
					IVER NEAR L			
May 16	e.008	<.003	e1.5	107	.025	<.005	<.021	<.002
	404322	2084102600 C	OTTAWA RIV	ER AT STAT	E ROUTE 1171	NEAR LIMA	OHIO	
May 15	<.018	<.003	e.155	117	e.035	<.005	<.021	<.005
		4048080	084121700 OT	TAWA RIVE	R NEAR ELIDA	OHIO		
May 15	<.018	<.003	e.428	106	.038	<.005	<.021	<.002
		40.40	22000 4121 400	DIIG DIBIN	CAD ELIDA O	1110		
May 16	<.018	<.003	e.515	<u>DUG RUN N</u> 104	EAR ELIDA, C .019	<u>ни</u> <.005	<.021	<.002
May 16	- 010				NEAR ELIDA.	OHIO <.005	- 021	- 000
May 16	<.018	.006	e1.5	115	.009	<.003	<.021	<.002
		405051	084114000 OT		R AT GOMER	, OHIO		
May 16	e.010	e.002	e.658	122	e.029	<.005	<.021	<.002
		405	5048084111000	PIKE RUN A	AT GOMER, O	HIO		
May 15	<.018	<.003	e.153	107	.040	<.005	<.021	<.002
		4057000	84113600 ೧ ፻ፕ	'AWA DIWED	NEAR KALID	A OHIO		
May 16	e.007	<.003	e.715	111	.022	<.005	<.021	<.002
•				OD PET	D W 11 *** -			
May 15	<.018	<.003	<u>87995 SUGAR</u> e.386	CREEK NEA	AR KALIDA. O .026	<u>HIO</u> <.005	<.021	<.002
	4.010	<003	0.500	110	.020	1,000	-,0=1	
16					ELS CEMETER			. 000
May 16	e.012	<.003	e.689	104	.025	<.005	<.021	<.002

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Cyanazine (μg/L) (04041)	DCPA (μg/L) (82682)	Deethyl- atrazine (μg/L) (04040)	Diazinon, D10, (μg/L) (91063)	Diazinon (μg/L) (39572)	Dieldrin (μg/L) (39381)	Disulfoton (μg/L) (82677)	EPTC (μg/L) (82668)
		40591	3084123300 P	LUM CREEK	AT KALIDA	ОНО		
May 15	<.018	<.003	e.254	101	<.005	<.005	<.021	<.002
			405913084	123399 BLAN	K SAMPLE			
May 15 16					 			
16							- -	
	Ethal-						Methyl-	Methyl-
Date	fluralin (μg/L) (82663)	Ethoprop (μg/L) (82672)	Fonofos (μg/L) (04095)	Lindane (μg/L) (39341)	Linuron (μg/L) (82666)	Malathion (μg/L) (39532)	azinphos (μg/L) (82686)	parathion (μg/L) (82667)
		404728	 R083475300 G	RASS CREEK	NEAR ADA	OHIO		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		40474	4608349 2 400 1	HOG CREEK	NEAR ADA.	ОНІО		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		4046160	083564200 HC	G CREEK AT	LAFAYETT	E. OHIO		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		4046020835	71 700 LITT LI	E HOG CREEK	X AT LAFAY	ETTE, OHIO		
May 15	<.009	<.005	<.003	<.004	<.035	e.004	<.050	<.006
	<u>404</u> :	504084030300	OTTAWA R	IVER AT MET	TZGER ROAL	AT LIMA, O	<u>HIO</u>	
May 16	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		40444	8084034000 L	OST CREEK	NEAR LIMA.	OHIO		
May 16	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		04	187100 OTTA	WA RIVER A	AT LIMA, OH	<u>10</u>		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
	40422	4084090500 C	TTAWA RIV	ER AT SHAW	VNEE ROAD	NEAR LIMA,	OHIO	
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		40422108409	91500 LITTLE	EOTTAWA R	IVER NEAR I	LIMA, OHIO		
May 16	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
	40432	2084102600 O	TTAWA RIV	ER AT STATE	E ROUTE 117	NEAR LIMA.	OHIO	
May 15	<.009	<.005	<.003	<.004	<.035	<.013	<.050	<.006
		4048080	84121700 OT	TAWA RIVER	NEAR ELID	A, OHIO		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
			39084121400	DUG RUN NE	EAR ELIDA. (<u>OHIO</u>		
May 16	<.009	<.005	<.003	<.004	<.035	e.012	<.050	<.006
		404826	5084130400 H	ONEY RUN N	NEAR ELIDA	OHIO		
	000							

May 16

<.009

<.003

<.004

<.035

<.027

<.050

<.006

<.005

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Ethal- fluralin (µg/L) (82663)	Ethoprop (μg/L) (82672)	Fonofos (µg/L) (04095)	Lindane (μg/L) (39341)	Linuron (μg/L) (82666)	Malathion (μg/L) (39532)	Methyl- azinphos (μg/L) (82686)	Methyl- parathion (μg/L) (82667)
		405051	084114000 OT	TAWA RIVE	R AT GOME	R. OHIO		
May 16	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		405	048084111000	PIKE RUN A	T GOMER, C	HIO		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		40570008	4113600 OTT	AWA RIVER	NEAR KALI	DA. OHIO		
May 16	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		0418	7995 SUGAR	CREEK NEA	R KALIDA, (OHIO		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
	4059010	84124600 OTT	AWA RIVER	(ST. MICHAE	LS CEMETE	RY) AT KALII	DA. OHIO	
May 16	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
		40591	3084123300 P	LUM CREEK	AT KALIDA	OHIO		
May 15	<.009	<.005	<.003	<.004	<.035	<.027	<.050	<.006
			405913084	123399 BLAN	K SAMPLE			
May 15								
16 16								
10								

Date	Metolachlor (μg/L) (39415)	Metribuzin (μg/L) (82630)	Molinate (μg/L) (82671	Naprop- amide (μg/L) (82684)	p,p -DDE (μg/L) (34653)	Parathion (μg/L) (39542)	Pebulate (μg/L) (82669)	Pendi- methalin (μg/L) (82683)
		404728	2083475300 G	DASS CREEK	NEAR ADA.	OHIO		
May 15	.058	.012	<.002	<.007	<.003	<.007	<.002	e.009
		40.47	16002402400	IOC CREEK	NEAD 454 4	21110		
May 15	.092	.041	16083492400 <u>1</u> <.002	<.007	NEAR ADA. 0 <.003	<u>2HIO</u> <.007	<.002	<.010
1114, 10	.052	.011	1.002	4,007	1,005	4,007		4.020
		4046160	83564200 HO	G CREEK AT	LAFAYETT	E. OHIO		
May 15	.092	<.006	<.002	<.007	<.003	<.007	<.002	<.010
		40.46000005		TIOC CREE	C 400 T 471430	CTTTC 01110		
					K AT LAFAY		000	010
May 15	1.48	<.006	<.002	<.007	<.003	<.007	<.002	<.010
	404	504084030300	OTTAWA RI	VER AT ME	TZGER ROAD	AT LIMA. OI	HIO	
May 16	.551	<.020	<.002	<.007	<.003	<.007	<.002	<.010
					<u>NEAR LIMA.</u>			
M ay 16	16.8	.042	<.002	<.007	<.003	<.007	<.002	<.010
		04	187100 OTTA	WA DIVED	AT LIMA, OH	īO.		
May 15	.099	<.006	<.002	<.007	<.003	<.007	<.002	.127
iviay 15	.099	~.000	3.002	\.00 /	~.00 5	<.007	3.002	.127
	40422	4084090500 C	TTAWA RIV	ER AT SHAV	VNEE ROAD	NEAR LIMA.	OHIO	
May 15	.128	<.006	<.002	<.007	<.003	<.007	<.002	.037

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Metolachlor (μg/L) (39415)	Metribuzin (μg/L) (82630)	Molinate (μg/L) (82671	Naprop- amide (μg/L) (82684)	p,p ² DDE (μg/L) (34653)	Parathion (μg/L) (39542)	Pebulate (μg/L) (82669)	Pendi- methalin (μg/L) (82683)
		4042210840	91500 LITTLE	E OTTAWA R	IVER NEAR L	IMA, OHIO		
May 16	13.9	.024	<.002	<.007	<.003	<.007	<.002	<.010
	404322	2084102600 O	TTAWA RIV	ER AT STATE	ROUTE 117	NEAR LIMA.	OHIO	
May 15	.887	<.006	<.002	<.007	<.003	<.007	<.002	.054
		4048080	084121700 OT	TAWA RIVER	NEAR ELID	A. OHIO		
May 15	2.64	.272	<.002	<.007	<.003	<.007	<.002	<.010
		4048	39084121400	DUG RUN NE	EAR ELIDA, C	OHIO		
May 16	9.83	1.83	<.002	<.007	<.003	<.007	<.002	<.030
		40492	600/120/00 TJ	ONEV DIININ	JEAR ELIDA.	OHIO		
May 16	10.4	.674	<.002	<.007	<.003	<.007	<.002	<.010
•								
May 16	7.26	<u>405051</u> .582	084114000 OT <.002		R AT GOMER <.003	<u>. OHIO</u> <.007	<.002	.040
May 16	7.20	.382	<.002	<.007	<.003	<.007	<.002	.040
					T GOMER, OI			
May 15	4.42	.706	<.002	<.007	<.003	<.007	<.002	<.010
		40570008	34113600 OTT	AWA RIVER	NEAR KALID	A, OHIO		
May 16	4.83	1.30	<.002	<.007	<.003	<.007	<.002	<.010
		0419	27005 STIGAD	CDEEK NEV	R KALIDA, O	ніо		
May 15	6.05	2.23	<.002	<.007	<.003	<.007	<.002	<.010
	40500100	4124600 OTT	AWA DIVIED	OT MICHAE	i o oriverro	V) AT 17 AT 11	24 01110	
May 16	4.26	1.12	<.002	<.007	LS CEMETER <.003	<.007	<u>5A. OHIO</u> <.002	<.010
,								
May 15	200				AT KALIDA.		- 000	- 010
May 15	.280	.014	<.002	<.007	<.003	<.007	<.002	<.010
			405913084	123399 BLAN	K SAMPLE			
May 15 16					 			
16								
	cis-					************		
Date	Permethrin,	Phorate	Prometon		Propachior	Propanil	Propargite	Simazin
	(μ g/L) (82687)	(μg/L) (82664)	(μg/L) (04037)	(μ g/L) (82676)	(μ g/L) (04024)	(μg/L) (82679)	(μg/L) (82685)	(μg/L) (04035)
			,,		,,			
M. 15	. 007				NEAR ADA.		. 000	
May 15	<.006	<.011	.019	<.004	<.010	<.011	<.023	.257
		4047	46083492400 1	HOG CREEK	NEAR ADA. C	OHIO		
May 15	<.006	<.011	e.010	<.004	<.010	<.011	<.023	.366
		4046160	083 5 64200 HC	G CREEK AT	LAFAYETTE	OHIO		

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

	cis-							
Date	Permethrin, (μg/L) (82687)	Phorate (μg/L) (82664)	Prometon (μg/L) (04037)	Pronamide (μg/L) (82676)	Propachlor (μg/L) (04024)	PropanII (μg/L) (82679)	Propargite (μg/L) (82685)	
		4046020825	71700 I ITTI I	E UAG CREEK	K AT LAFAYE	TTE OUIO		
May 15	<.006	<.011	.027	<.004	<.010	<.011	<.023	1.89
•								
May 16					ZGER ROAD			1.65
May 16	<.006	<.011	.022	<.004	<.010	<.011	<.023	1.65
		<u>40444</u>	18084034000 I	OST CREEK	NEAR LIMA.	OHIO		
May 16	<.006	<.011	.040	<.004	<.010	<.011	<.023	1.41
		O.	4187100 OTT	AWA RIVER A	AT LIMA, OHI	0		
May 15	<.006	<.011	.054	<.004	<.010	<.011	<.023	.035
May 15	40422 <.006	4084090500 (<.011	<u>OTTAWA RIV</u> .085	ER AT SHAV <.004	/NEE ROAD N <.010	EAR LIMA. <.011	<u>OHIO</u> <.023	.044
May 15	<.006	<.011	.083	<.004	<.010	<.011	<.023	.044
		4042210840	91500 LITTL	E OTTAWA R	IVER NEAR L	IMA, OHIO		
May 16	<.006	<.011	.024	<.004	<.010	<.011	<.023	.768
	404323	0084102600 C	TTAWA RIV	FR ΔΤ SΤΔΤΙ	E ROUTE 117 N	JEAR LIMA	OHIO	
May 15	<.006	<.011	.096	<.004	<.010	<.011	<.023	.547
May 15	<.006	4048080 <.011	084121700 OT .041	<u>TAWA RIVER</u> <.004	NEAR ELIDA	<u>. OHIO</u> <.011	<.023	1.58
May 15	<.000	<.011	.041	<.004	<.010	<.011	<.023	1.50
					EAR ELIDA. O			
May 16	<.006	<.011	.300	<.004	<.010	<.011	<.023	2.65
		40482	6084130400 H	IONEY RUN N	NEAR ELIDA.	OHIO		
May 16	<.006	<.011	<.015	<.004	<.010	<.011	<.023	13.3
		405051	004444000		D + T CO + CD	01110		
May 16	<.006	<u>405051</u> <.011	.084114000 O .054		R AT GOMER <.010	<u>. OHIO</u> <.011	<.023	2.46
11149 10	2.000	2,011	.054	₹.00+	4.010	2.011	1.025	2.10
					T GOMER, OI			
May 15	<.006	<.011	.124	<.004	<.010	<.011	<.023	.907
		40570008	84113600 OT7	AWA RIVER	NEAR KALID	A. OHIO		
May 16	<.006	<.011	.058	<.004	<.010	<.011	<.023	2.55
		041	05005 5775 47	CDEEKAR	D W 4 I ID 4 O	1770		
May 15	<.006	<.011	87995 SUGAF .260	<.004	<u>R KALIDA, O</u> <.010	+10 <.011	<.023	.130
may 15	<.000	<.011	.200	 004	<.010	V.011	<.025	.150
					LS CEMETER			
May 16	<.006	<.011	.068	<.004	<.010	<.011	<.023	2.18
		40591	13084123300 F	LUM CREEK	AT KALIDA,	OHIO		
May 15	<.006	<.011	.022	<.004	<.010	<.011	<.023	.460
			40504000	100000 77 /	T/ 0 4 3 (D) T			
May 15			<u>405913084</u> 	123399 BLAN 	K SAMPLE	· 		
16								
16								

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Tebuthiuron (μg/L) (82670)	Terbacil (µg/L) (82665)	Terbufos (μg/L) (82675)	Terbuthyl- azine (µg/L) (04022)	Thio- bencarb (µg/L) (82681)		Trifluralin (μg/L) (82661)	
May 15	<.016	40472 <.034	8083475300 G <.017	RASS CREEK 	NEAR ADA. <.005	OHIO <.002	<.009	
May 15	<.016	4047 <.034	46083492400 I <.017	HOG CREEK I	NEAR ADA, (<.005	<u>OHIO</u> <.002	<.009	
May 15	<.016	404616 <.034	083564200 HO <.017	G CREEK AT	LAFAYETTI <.005	E. OHIO <.002	<.009	
May 15	<.016	<u>4046020835</u> <.034	71700 LITTLE <.017	HOG CREEK	<u>AT LAFAYI</u> <.005	<u><.002</u>	<.009	
May 16	4045 <.016	04084030300 <.034	OTTAWA RI <.017	VER AT MET	ZGER ROAD <.005	AT LIMA, O <.002	<u>HIO</u> <.009	
May 16	<.016	40444 <.034	8084034000 L <.017	OST CREEK N 	NEAR LIMA. <.005	<u>OHIO</u> <.002	e.006	
May 15	<.016	<.034	4187100 OTTA <.017	WA RIVER A	T LIMA, OHI <.005	<u>(O</u> <.002	<.009	
May 15	404224 <.016	4084090500 (<.034	CTTAWA RIV <.017	ER AT SHAW 	NEE ROAD ! <.005	NEAR LIMA. <.002	<u>OHIO</u> <.009	
May 16	<.016	4042210840 <.034	9 <u>1500 LITTLE</u> <.017	OTTAWA RI	<u>VER NEAR I</u> <.005	<u>IMA, OHIO</u> <.002	<.009	
May 15	.023	084102600 C <.034	**************************************	ER AT STATE 	ROUTE 117 <.005	NEAR LIMA. <.002	<u>OHIO</u> <.009	
May 15	<.016	4048080 <.034	84121700 OTT <.017	AWA RIVER	NEAR ELID <.005	A. OHIO <.002	<.009	
May 16	<.016	<u>4048</u> <.034	39084121400 <u>1</u> <.017	DUG RUN NE 	AR ELIDA, C <.005	<u>>OHIO</u> <.002	<.009	
May 16	<.016	40482 <.034	6084130400 He <.017	ONEY RUN N e.026	EAR ELIDA. <.005	OHIO <.002	<.009	
May 16	e.014	405051 <.034	084114000 OT <.017	TAWA RIVER 	R AT GOMER <.005		<.009	
May 15	<.016	405 <.034	048084111000 <.017	PIKE RUN A	Γ GOMER, O <.005	HIO <.002	<.009	
May 16	<.016	40570008 <.034	4113600 OTT. <.017	AWA RIVER I 	NEAR KALID <.005	OA, OHIO <.002	<.009	
May 15	.026	<u>0418</u> <.034	37995 SUGAR <.017	CREEK NEAL e.002	<.005	<u>+HIO</u> <.002	<.009	
May 16	405901084 <.016	124600 OTT. <.034	<u>AWA RIVER (</u> <.017	ST. MICHAEI 	LS CEMETER <.005	(Y) AT KALI <.002	OA. OHIO <.009	

Table A-2. Water-quality data for the Ottawa River and selected tributaries in Ohio, May 15-16, 2001 —Continued

Date	Tebuthiuron (μg/L) (82670)	Terbacii (μg/L) (82665)	Terbufos (μg/L) (82675)	Terbuthyl- azine (μg/L) (04022)	Thio- bencarb (μg/L) (82681)	Triallate (μg/L) (82678)	Trifluralin (μg/L) (82661)	
		40591	3084123300 P	LUM CREEK	AT KALIDA.	OHIO		
May 15	<.016	<.034	<.017		<.005	<.002	<.009	
			405913084	123399 BLANI	K SAMPLE			
May 15								
16								
16								