Water-Quality Data for Nutrients, Pesticides, and Volatile Organic Compounds in Near-Surface Aquifers of the Midcontinental United States, 1992–1994

By Dana W. Kolpin, Kathryn E. Zichelle, and E. Michael Thurman

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Multiply	By	To obtain
foot	0.3048	meter (m)
gallon	3.785	liter (L)
ounce	28.353	gram (g)

Degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) by using the following formula:

$$°F = 9/5(°C) + 32.$$

Milligram per liter (mg/L) is a unit expressing the concentration of a chemical constituent in solution as weight (milligrams) of solute per unit volume (liter) of water.

Microgram per liter (µg/L) is a unit expressing the concentration of a chemical constituent in solution as weight (micrograms) of solute per unit volume (liter) of water.

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ABSTRACT

Water samples were collected from 175 wells in 12 Midcontinental States (Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin) from 1992 through 1994 to determine the spatial distribution of nutrients, pesticides, and volatile organic compounds in ground water, and to document the potential effects of the historic flooding that occurred during 1993 on ground-water quality.

Concentrations of nitrate greater than the 0.05 mg/L reporting limit were found in 69.1 percent of the water samples, and nitrate concentrations exceeded the U.S. Environmental Protection Agency maximum contaminant limit of 10 mg/L in 9.6 percent of the 249 samples analyzed for nitrate. Pesticides or pesticide metabolites were detected in 72.4 percent of the 210 pesticide analyses, and 28 different compounds were found. Concentrations of multiple pesticide compounds above analytical reporting limits were found in water from about 60 percent of the wells sampled. Although pesticides were frequently detected, only one sample had a pesticide concentration that exceeded a maximum contaminant level for drinking water. The most frequently detected compounds, however, were pesticide metabolites for which maximum contaminant levels have not yet been established. Volatile organic compounds were detected in 13.5 percent of the 155 samples analyzed for these compounds. Only one sample had concentrations of volatile organic compounds that exceeded a maximum contaminant level for drinking water.

INTRODUCTION

This report is one in a series of water-quality reports that present the analytical results from regional studies conducted by the U.S. Geological Survey (USGS) that investigate the movement and distribution of agricultural chemicals in the water resources of the Midcontinental United States. Previous published data in the series report the analytical results from regional studies of ground water (Kolpin, Burkart, and Thurman, 1993), surface water (Scribner and others, 1993), storm runoff (Scribner and others, 1994), and precipitation (Goolsby and others, 1995).

The Midcontinental United States (the region comprised of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin) is the largest and most intensive crop producing region of the country. This region accounts for about 60 percent of the Nation's pesticide use (Gianessi and Puffer, 1990; 1992) and inorganic fertilizer use (U.S. Environmental Protection Agency, 1990), although it makes up only about 21 percent of the Nation's land surface. More than 29 million people in the Midcontinent rely on ground water as a source of drinking water (U.S. Geological Survey, 1985). Thus, the intensive application of agricultural chemicals to the land surface has created concern about nonpoint-source contamination of the region's ground-water resources.

To better understand the movement and distribution of agricultural chemicals in ground water, the USGS designed a reconnaissance network that was geographically and hydrogeologically representative of near-surface aquifers in the corn- and soybean-producing region of the Midcontinental United States (Kolpin and Burkart, 1991). The objectives of this study were to (1) determine the hydrogeologic, spatial, and seasonal distribution of agricultural chemicals in near-surface aquifers in the Midcontinental United States, (2) determine the statistical relations of agricultural chemicals to natural and anthropogenic factors, and (3) obtain data on agricultural chemical concentrations in ground water from geographic areas where few data existed. Near-surface aquifers were defined as having the top of the aquifer material within about 15 m of land surface.

The first part of the study began in 1991. A random approach was used to select 303 wells from which water samples were collected in March or April (preplanting) and July or August (postplanting) 1991. Measurable concentrations of herbicides or triazine metabolites were detected in 28.4 percent of the 303 wells sampled during the 1991 study. However, concentrations of these compounds did not exceed maximum contaminate levels or health advisory levels (U.S. Environmental Protection Agency, 1992) for drinking water. The results of the 1991 study showed that water from near-surface unconsolidated aquifers is more likely to contain both pesticides and nitrate (nitrate plus nitrite, hereafter referred to as "nitrate") than water from near-surface bedrock aquifers (Kolpin and others, 1994). A complete description of the interpretive and analytical results for the 1991 study can be found elsewhere (Burkart and Kolpin, 1993; Kolpin and others, 1994; Kolpin, Burkart, and Thurman, 1993).

Additional ground-water samples were collected from 1992 through 1994 to continue the ongoing investigation of the regional distribution of agricultural chemicals in ground water. The objectives of the 1992 sampling and analyses were to determine the relations of analytical reporting limits, the number of parent compounds present, and the number of metabolites to the frequency of pesticide detection. The objective of the 1993 sampling and analyses was to determine whether the 1993 flooding had immediate effects on the water quality of near-surface unconsolidated aquifers in the upper Mississippi River Basin. The objective of the 1994 sampling and analyses was to determine if there had been long-term effects of the 1993 flood on the water quality of near-surface unconsolidated aquifers underlying areas in the upper Mississippi River Basin that had been severely flooded. Funding for the collection and analysis of water samples from 38 wells during the 1994 postplanting season was provided by the U.S. Environmental Protection Agency (USEPA).

The purpose of this report is to present the water-quality data collected from the ground-water monitoring network during July through August 1992, September through October 1993, and July through August 1994.

METHODS OF INVESTIGATION

Sampling-Site Selection

In 1992, 101 wells were sampled during July or August after the application of pesticides. These 101 wells were randomly selected by a process that ensured a geographic distribution by State and hydrogeologic distribution by aquifer class (unconsolidated or bedrock) across the Midcontinent (Kolpin, Goolsby, and others, 1993; Kolpin and others, 1995).

In 1993, 110 wells were sampled during September or October. Wells selected for the 1993 sampling were completed in unconsolidated aquifers, contained post-1953 water (determined from analysis of tritium concentrations), and were located in the region of the Midcontinent that had more than 150 percent of normal rainfall from April 1 to July 31, 1993 (Kolpin and Thurman, 1995).

In 1994, 38 wells were sampled during July or August. These wells were a subset of the wells sampling during 1993 and were located in areas that were noted to have the worst flooding problems during the 1993 sampling (Kolpin, Nations, and others, 1996).

Sampling Methods

The locations of the 175 wells sampled from the ground-water reconnaissance network since 1992 are shown in figures 1 and 2. The methods used to collect and process the water samples were identical to those for the 1991 study (Kolpin and Burkart, 1991). All of the samples were collected by USGS personnel with equipment constructed of materials, such as glass and stainless steel, that would not leach or adsorb organic compounds. Decontamination procedures were implemented to prevent cross-contamination of water between wells and samples. Wells were purged before sampling until pH, water temperature, and specific conductance stabilized. Where possible, water levels were measured before purging.

Figure 1. Locations of wells sampled in Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota during 1992–94.

Figure 2. Locations of wells sampled in Illinois, Indiana, Michigan, Ohio, and Wisconsin during 1992–94.

Laboratory Methods

A routine analytical method by gas chromatography/mass spectrometry (GC/MS) following solid-phase extraction on C-18 cartridges (Thurman and others, 1990; Meyer and others, 1993) was used to obtain concentrations of selected herbicides and triazine metabolites. The analytical reporting limit for this method was 0.05 µg/L for all compounds.

To quantify concentrations less than 0.05 µg/L, analytes were extracted by a solid-phase extraction method from 1-liter water samples (Zaugg and others, 1995). This method used disposable polypropylene cartridges containing 0.5 g of porous silica coated with a chemically bonded, octydecyl (C-18) phase. Chlorophenoxy-acid herbicides were analyzed by methods described in Wershaw and others (1987). An alachlor metabolite, alachlor ethanesulfonic acid (alachlor-ESA), was isolated by solid-phase extraction and analyzed by enzyme-linked immunosorbent assay (Aga and others, 1994). In addition, cyanazine metabolites (cyanazine amide, deethylcyanazine amide, and deethylcyanazine) were isolated and analyzed by a method of solid-phase extraction and GC/MS (Meyer, 1994).

Concentrations of selected inorganic nutrients were determined by colorimetric methods (Fishman and Friedman, 1989). Concentrations of 63 volatile organic compounds were analyzed in unacidified water samples according to USEPA method 524.2. Methylene blue active substances (MBAS), which is an indicator measurement for anionic surfactants, were determined by extraction into chloroform, backwashed with an acidified phosphate-based buffer solution, and measured against external standards with a probe spectrophotometer (Burkhardt and others, 1995). The analytical reporting limit for this method was 0.01 mg/L.

WATER-QUALITY DATA FOR NUTRIENTS, PESTICIDES, AND VOLATILE ORGANIC COMPOUNDS

From 1992 to 1994, 249 water samples were collected from 175 wells in the ground-water reconnaissance network. Hydrogeologic, well construction, land-use, and locational information for these wells is published elsewhere (Kolpin and others, 1993). Concentrations of nitrate greater than the 0.05 mg/L analytical reporting limit were found in 69.1 percent of the 249 samples analyzed for nutrients; nitrate in 9.6 percent of the samples exceeded the USEPA maximum contaminant level (MCL) of 10.0 mg/L.

Concentrations of pesticides or pesticide metabolites at or greater than analytical reporting limits were found in 72.4 percent of the 210 samples analyzed for pesticides. The frequencies of detection for the 28 pesticides and pesticide metabolites found in ground water during 1992–94 are listed in table 1 (p. 8). Although pesticides were frequently detected, only one sample had a pesticide concentration that exceeded a USEPA MCL for drinking water. However, pesticide metabolites were the most frequently detected compounds during the 1992–94 sampling. Thus, pesticide metabolites are prevalent in ground water and, in many cases, are more persistent and mobile than the parent compound (Kolpin, Thurman, and Goolsby, 1996). For example, alachlor-ESA was found about 10 times as frequently and at much higher concentrations than alachlor itself (table 1). Consequently, if herbicide metabolites are not quantified, the effects of herbicide use on ground-water quality can be substantially underestimated. Drinking-water standards have yet to be determined for the metabolites examined for this study.

Multiple pesticide compounds commonly were found in a single water sample (figures 3 and 4). The potential synergistic effects to human health and the aquatic environment from the presence of multiple pesticides compounds are not yet clearly understood. Water in about 60 percent of the wells sampled contained more than one pesticide compound, and as many as 13 different compounds were detected in a single well (fig. 3).

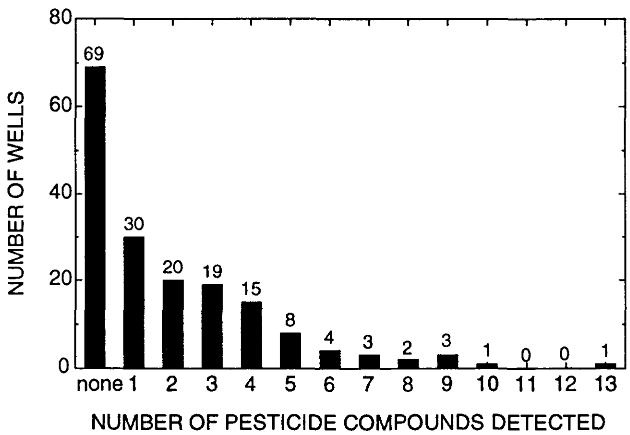

Figure 3. Number of pesticide compounds detected per well for sites sampled from the Midcontinental United States, 1992–94.

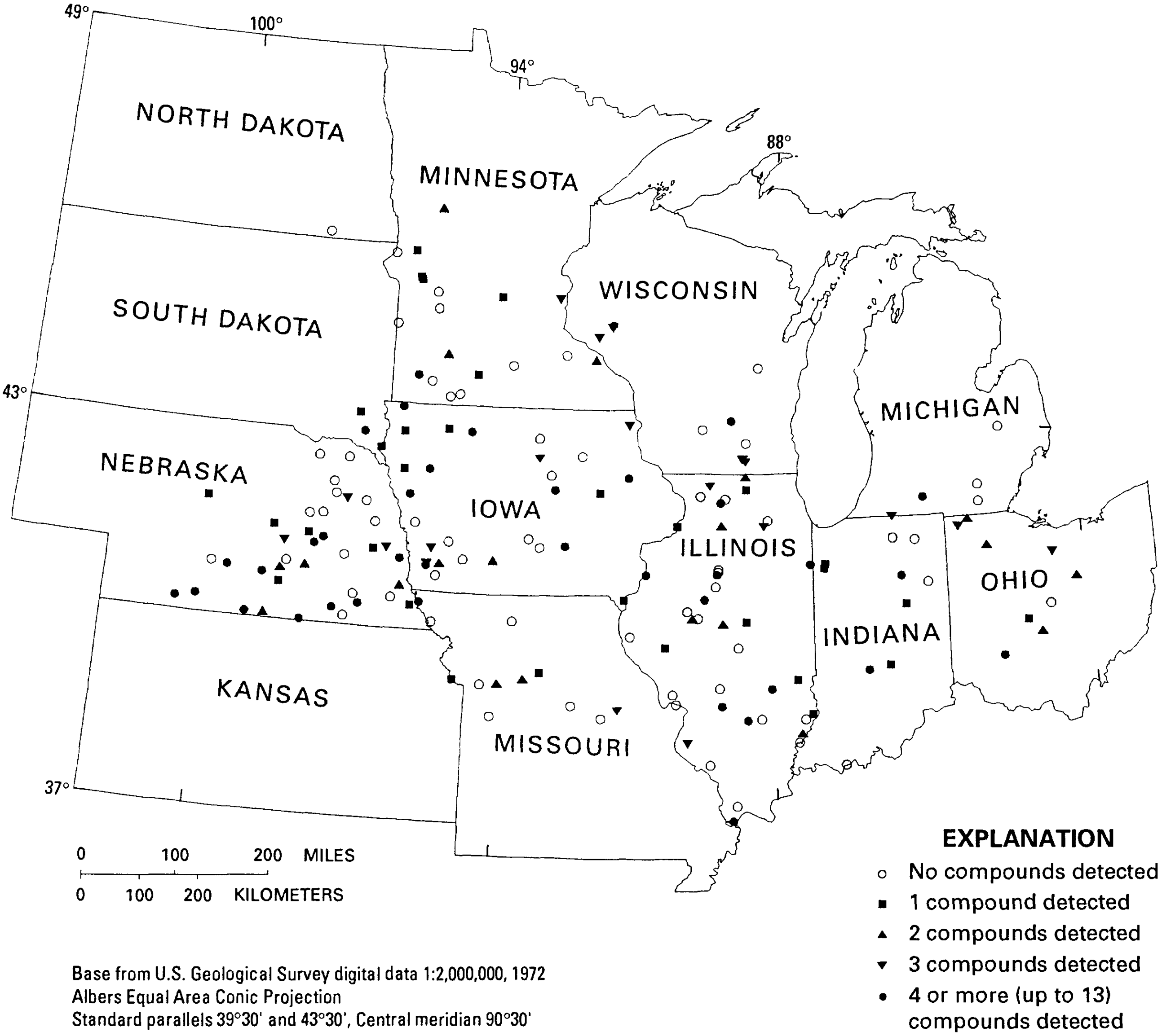

Figure 4. Locations of wells sampled during 1992–94, and the corresponding number of pesticide compounds detected.

Volatile organic compounds were detected in 13.5 percent of the 155 samples analyzed for these compounds. Only one sample had concentrations of volatile organic compounds that exceeded USEPA MCL's for drinking water.

1992 Study Results

Water samples collected from 101 wells during July or August 1992 were analyzed for concentrations of 4 inorganic nutrients (table 2, p. 10), 66 pesticide or pesticide metabolites (many with analytical reporting limits as low as 0.002 µg/L) (tables 3–5, p. 15–26), and 63 volatile organic compounds (table 6, p. 27). During this study, nitrate concentrations equalled or exceeded 3.0 mg/L in 32.7 percent of the samples, and nitrate concentrations exceeded the USEPA MCL in water from 7.9 percent of the wells sampled. Pesticides or pesticide metabolites were detected in water from 62 percent of the samples collected in 1992. This frequency of detection is substantially greater than the 24 percent determined from 579 samples collected for the previous (1991) study of the reconnaissance network (Kolpin and others, 1994). The greater frequency of detection during 1992 was primarily due to the increased number of pesticide metabolites examined and the much lower analytical reporting limits that were available (Kolpin and others, 1995). The frequency of pesticide detection was inversely related to the analytical reporting limit. A monotonic increase was determined in the frequency of detection as analytical reporting limits are decreased (Kolpin and others, 1995; Kolpin and Goolsby, 1995). For example, the number of atrazine detections decreases by about one-half as the reporting limit increases from 0.01 µg/L to 0.10 µg/L. At least one volatile organic compound was detected in 11.1 percent (5 of 45 wells) of the analyses. Chloroform was the most frequently detected volatile organic compound in samples collected during 1992 (table 6).

1993 Study Results

Water samples collected from 110 wells from September to October 1993 were analyzed for concentrations of 4 inorganic nutrients (table 7, p. 29), 14 pesticides or pesticide metabolites (table 8, p. 34), and 63 volatile organic compounds (table 9, p. 39). Nitrate concentrations exceeded the MCL of 10 mg/L in water from 10 percent of the sampled wells. Pesticides or pesticide metabolites were detected in water from 55.4 percent of the wells; alachlor-ESA was the most frequently detected compound. One sample contained a concentration of alachlor that exceeded the MCL of 2.0 µg/L for treated drinking water (table 8). Several previous water samples from this well exceeded one-half of the MCL for alachlor (table 3) (Kolpin, Burkart, and Thurman, 1993). Water from 14.5 percent of the wells contained at least one of the 63 volatile organic compounds for which samples were analyzed for this study. Only 1,2-dichloroethane and benzene concentrations in one sample exceeded a USEPA MCL (5.0 µg/L) for treated drinking water. Significantly more urban residential and industrial land use was within a 30-meter radius of wells where volatile organic compounds were detected (Kolpin and Thurman, 1995).

The historic 1993 flooding affected ground-water quality. There is direct relation between increases in total herbicide concentration (between the preflood and postflood sample) and the occurrence of stream flooding near a well (Kolpin and Thurman, 1995). About 63 percent of the wells that had at least a 20-percent increase in total herbicide concentration in water samples were located in areas that also were severely affected by stream flooding. An inverse relation was determined between well depth and changes in total herbicide concentration (Kolpin and Thurman, 1995). Water in shallow wells more quickly reflects changes in water quality in response to changes in recharge from the 1993 flooding.

1994 Study Results

Water samples were collected from 38 wells sampled during July to August 1994 and analyzed for concentrations of 4 inorganic nutrients (table 10, p. 41) and 18 pesticides and pesticide metabolites (table 11, p. 43). Nitrate concentrations exceeded the MCL of 10 mg/L in water from 13.2 percent of the sampled wells. Pesticides or pesticide metabolites were detected in water from 76.3 percent of the wells. However, no pesticide concentrations exceeded USEPA MCL's for treated drinking water. Alachlor-ESA again was the most frequently detected pesticide compound found in the samples taken during 1994. No acetochlor concentrations above the analytical reporting limit of 0.05 µg/L were reported. Acetochlor is an herbicide used with corn crops, and it was first registered by the USEPA for use during 1994. Possible explanations for the absence of acetochlor in ground water in the 1994 samples include the rapid degradation of acetochlor in the soil zone, insufficient time for this first extensive use of acetochlor to have reached the aquifers sampled, and the possible lack of acetochlor use in the recharge areas for the wells sampled (Kolpin, Nations, and others, 1996).

Table 1. Pesticide compounds detected in ground-water samples from the Midcontinental United States, 1992–94

[Alachlor-ESA, ethanesulfonic acid; sensitive, results of analyses using lower reporting limits; µg/L, micrograms per liter; Max, maximum; conc., concentrations; MCL, maximum contaminant level; HAL, health advisory level, —, no data]

Compound	Percent detection	Number of samples	Reporting limit (µg/L)	Max conc. (µg/L)	Median reported conc. (µg/L)	MCL (µg/L)	HAL (µg/L)	Use or origin
Alachlor-ESA	46.7	214	.10	8.63	.665	—	—	Herbicide metabolite (alachlor)
Atrazine (sensitive)	37.2	94	.003	.84	.035	3	3	Herbicide
Deethyl-atrazine	27.1	214	.05	1.79	.135	—	—	Triazine metabolite (atrazine, propazine)
Atrazine	26.2	214	.05	1.8	.215	3	3	Herbicide
Deethyl-atrazine (sensitive)	25.5	94	.002	.14	.009	—	—	Triazine metabolite (atrazine, propazine)
2,6-Diethyl-analine	16.0	94	.002	.022	.003	—	—	Herbicide metabolite (alachlor)
DCPA acid metabolite	15.6	45	.01	2.22	.03	—	—	Herbicide metabolite (dacthal)
Simazine (sensitive)	12.8	94	.002	.077	.0035	4	4	Herbicide
Deisopropyl-atrazine	13.6	214	.05	.48	.13	—	—	Triazine metabolite (atrazine, cyanazine, simazine)
Metolachlor (sensitive)	10.6	94	.002	.57	.0185	—	1000	Herbicide
Cyanazine Amide	9.6	104	.05	.55	.16	—	—	Herbicide metabolite (cyanazine)
Prometon	8.4	214	.05	1.35	.10	—	100	Herbicide
2,4-D	6.7	45	.01	.89	.17	70	70	Herbicide
P,P'DDE	6.4	94	.006	.03	.011	—	—	Insecticide metabolite (DDT)
Prometon (sensitive)	6.4	94	.01	.96	.055	—	100	Herbicide
Metolachlor	6.1	214	.05	.76	.19	—	1000	Herbicide
Alachlor (sensitive)	5.3	94	.003	.662	.079	2	—	Herbicide
Dicamba	4.4	45	.01	.01	.01	—	200	Herbicide
Picloram	4.4	45	.01	.03	.02	500	500	Herbicide
Alachlor	4.2	214	.05	4.27	.23	2	—	Herbicide
Chlorpyrifos	4.2	94	.002	.024	.009	—	20	Insecticide

Table 1. Pesticide compounds detected in ground-water samples from the Midcontinental United States, 1992–94—Continued

Compound	Percent detection	Number of samples	Reporting limit (μg/L)	Max conc. (μg/L)	Median reported conc. (μg/L)	MCL (μg/L)	HAL (μg/L)	Use or origin
Ethalfluralin	3.2	94	.005	.014	.012	—	—	Herbicide
Cyanazine	2.8	214	.05	.88	.115	—	1	Herbicide
2,4,5-T	2.2	45	.01	.02	.02	—	70	Herbicide
Cyanazine (sensitive)	2.1	94	.01	.02	.015	—	1	Herbicide
EPTC	2.1	94	.002	.003	.0025	—	—	Herbicide
Trifluralin	2.1	94	.003	.016	.012	—	5	Herbicide
Triallate	2.1	94	.003	.007	.0055	—	—	Herbicide
Simazine	1.9	214	.05	.09	.07	4	4	Herbicide
Metribuzin	1.4	214	.05	.22	.08	—	200	Herbicide
Benfluralin	1.1	94	.005	.018	.018	—	—	Herbicide
Napropamide	1.1	94	.002	.008	.008	—	—	Herbicide
Pendimethalin	1.1	94	.008	.01	.01	—	—	Herbicide
Tebuthiuron	1.1	94	.01	.05	.05	—	500	Herbicide
Propachlor (sensitive)	1.1	94	.002	.002	.002	—	90	Herbicide
Metribuzin (sensitive)	1.1	94	.005	.01	.01	—	200	Herbicide

Table 2. Water-quality data from field measurements and laboratory analyses of water samples for inorganic nutrients, 1992

[°C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; —, no data; <, less than]

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temperature (°C)	Specific conductance (µS/cm)	pH (standard units)	Dissolved oxygen (mg/L)	Nitrite, dissolved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammonium, dissolved (mg/L as N)	Phosphorus ortho, dissolved (mg/L as P)
Illinois										
IL04	08-12	—	17.5	680	6.9	0.2	<0.01	<0.05	0.66	0.15
IL05	07-30	—	17.0	685	6.9	1.6	<.01	3.3	.04	.01
IL09	08-20	—	12.5	652	7.6	2.0	.01	27	<.01	<.01
IL12	08-11	—	14.5	747	7.2	.0	<.01	<.05	.70	.04
IL13	08-04	—	17.0	1080	6.8	2.0	<.01	7.2	<.01	<.01
IL18	07-29	—	14.0	840	6.9	.6	<.01	<.05	.47	.03
IL24	08-03	40	14.5	786	7.3	.0	<.01	<.05	3.9	.22
IL25	08-05	—	19.0	719	6.9	4.1	<.01	2.4	<.01	.13
IL26	08-04	—	17.5	293	7.7	1.9	<.01	4.3	<.01	.05
IL27	08-05	—	15.0	1260	7.1	3.0	<.01	3.7	<.01	<.01
IL34	08-10	—	13.5	499	7.1	.1	.01	.69	.14	.06
IL36	08-20	—	14.5	771	8.9	1.7	<.01	.31	<.01	<.01
IL39	08-06	—	16.5	720	7.1	.1	<.01	<.05	.51	.01
IL40	07-31	—	15.5	1420	8.9	.0	<.01	<.05	.16	.08
IL41	07-29	—	16.0	932	6.5	.0	<.01	<.05	.36	.05
IL42	07-30	—	16.0	733	7.3	.0	<.01	<.05	.29	.01
IL44	07-31	—	14.5	222	8.6	.1	<.01	<.05	.20	.07
IL48	07-30	—	12.0	530	6.9	.2	<.01	<.05	1.0	.02
IL53	07-30	—	16.0	902	7.0	4.9	<.01	7.7	.02	<.01
IL59	08-03	—	16.0	692	6.6	3.8	<.01	1.5	.03	.02
IL68	08-21	—	16.0	554	7.1	.1	<.01	<.05	<.01	<.01
Indiana										
IN01	08-14	—	12.5	801	7.0	.2	<.01	<.05	.10	.01
IN04	08-26	—	14.0	333	7.4	.1	<.01	<.05	0.24	<.01
IN06	08-25	—	11.5	333	8.2	5.2	<.01	6.6	<.01	.01
IN08	08-19	37	15.0	248	7.4	1.9	<.01	2.4	.02	.01

Table 2. Water-quality data from field measurements and laboratory analyses of water samples for inorganic nutrients, 1992—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temperature (°C)	Specific conductance (µS/cm)	pH (standard units)	Dissolved oxygen (mg/L)	Nitrite, dissolved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammonium, dissolved (mg/L as N)	Phosphorus ortho, dissolved (mg/L as P)
Indiana (Continued)										
IN11	08-25	17	12.5	233	7.6	.1	<.01	<.05	.35	.03
IN12	08-20	—	13.0	388	7.1	.3	<.01	<.05	.23	<.01
IN14	08-24	—	12.5	367	7.2	1.6	<.01	6.3	.02	<.01
IN17	08-20	—	13.0	712	7.3	.1	<.01	<.05	.43	.02
IN23	08-21	—	13.0	219	7.7	.1	<.01	<.05	.06	<.01
IN28	08-26	—	14.5	117	7.9	3.2	.01	4.4	.02	<.01
IN29	08-17	—	13.5	349	7.4	8.1	<.01	8.3	.01	<.01
Iowa										
IA02	08-14	—	14.0	633	6.4	.6	<.01	<.05	1.4	<.01
IA03	08-20	—	14.5	581	7.3	11.8	<.01	5.60	<.01	0.03
IA05	08-14	15	13.0	693	6.8	1.8	.02	4.2	.05	<.01
IA08	08-25	—	12.5	758	6.9	.7	<.01	<.05	.46	<.01
IA12	08-26	—	14.0	611	7.0	.0	<.01	<.05	.08	<.01
IA13	08-25	6	10.0	726	7.7	.9	<.01	<.05	.14	<.01
IA15	08-27	19.2	12.0	814	7.1	1.9	<.01	17.0	.03	.02
IA18	08-26	—	13.0	375	6.3	.1	.01	<.05	.51	<.01
IA19	08-13	—	11.0	570	7.6	.7	<.01	5.4	<.01	<.01
IA21	08-26	9.71	13.0	382	6.3	9.2	<.01	5.5	<.01	.06
IA24	08-27	13.54	10.0	464	7.0	9.3	<.01	.94	.42	.13
IA25	08-26	8.60	11.0	800	7.2	.4	<.01	.92	.17	.02
IA26	08-27	—	11.0	645	6.7	4.3	<.01	6.0	.02	.16
IA27	08-27	—	11.0	460	6.5	8.1	<.01	12	.01	.10
IA28	08-26	23	11.5	769	7.0	1.3	<.01	6.9	<.01	.11
IA32	08-13	—	13.0	498	6.2	.2	<.01	<.05	1.3	<.01
IA34	08-26	—	10.5	590	7.2	.4	<.01	1.4	.04	.01

Table 2. Water-quality data from field measurements and laboratory analyses of water samples for inorganic nutrients, 1992—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temp-perature (°C)	Specific conduct-ance (μS/cm)	pH (stan-dard units)	Dis-solved oxygen (mg/L)	Nitrite, dis-solved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammo-nium, dis-solved (mg/L as N)	Phospho-rus ortho, dissolved (mg/L as P)
Michigan										
MI02	08-31	—	11.5	864	7.3	.1	<.01	.07	.15	<.01
MI05	08-27	—	11.5	665	7.5	.0	<.01	<.05	.01	<.01
MI13	08-28	—	16.0	537	7.5	.0	<.01	.08	.01	.01
MI14	08-28	—	12.0	1110	7.2	.2	<.01	<.05	.05	<.01
Minnesota										
MN02	08-17	—	13.5	568	7.4	16	<.01	2.5	<.01	.02
MN04	08-18	—	11.5	2700	6.8	.1	<.01	.07	2.0	<.01
MN06	08-18	—	10.5	913	7.5	.1	<.01	.12	5.7	.34
MN12	08-18	—	19.0	2710	7.5	11	<.01	.08	1.8	.02
MN14	08-14	—	11.0	1170	7.7	6.6	<.01	3.5	.02	.07
MN15	08-18	—	10.5	1100	7.1	3.6	<.01	21	.02	.04
MN16	08-18	—	10.5	1920	6.6	.2	<.01	.07	.12	<.01
MN21	08-17	—	14.5	516	7.7	.1	<.01	.08	.03	.01
MN24	08-17	—	11.0	502	7.7	.1	<.01	.08	.02	<.01
Missouri										
MO06	08-12	—	14.5	765	7.1	.2	<.01	<.05	.26	.15
MO10	08-12	—	15.0	1270	7.1	.9	<.01	.70	1.4	.18
MO11	08-10	41.0	15.5	659	7.2	6.0	.02	1.9	.02	.03
MO16	08-11	—	16.0	648	7.3	.1	<.01	<.05	.18	.01
MO21	08-13	—	18.0	2360	7.8	.1	<.01	<.05	.27	<.01
Nebraska										
NE05	08-04	—	14.0	2000	7.0	2.0	<.01	3.9	.03	.19
NE15	08-04	—	20.0	960	7.3	7.6	<.01	20	.05	.02
NE17	08-07	48	13.5	740	7.1	5.6	<.01	3.6	.01	.09

Table 2. Water-quality data from field measurements and laboratory analyses of water samples for inorganic nutrients, 1992—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temp-perature (°C)	Specific conduct-ance (μS/cm)	pH (stan-dard units)	Dis-solved oxygen (mg/L)	Nitrite, dis-solved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammo-nium, dis-solved (mg/L as N)	Phospho-rus ortho, dissolved (mg/L as P)
Nebraska (Continued)										
NE18	08-07	—	12.5	842	7.0	1.7	<.01	.91	.06	.20
NE19	08-04	21	12.5	744	7.0	8.6	<.01	6.7	.04	.24
NE21	08-03	—	13.5	501	7.1	3.1	<.01	1.7	.02	.18
NE24	08-05	—	12.5	356	7.7	7.0	<.01	.37	.03	<.01
NE25	08-03	—	12.0	682	7.2	.2	<.01	.37	.02	.28
NE27	08-05	—	12.5	972	7.6	.2	.01	.17	.05	.02
NE28	08-03	—	12.0	608	7.1	5.7	<.01	4.3	.06	.21
NE35	08-05	—	14.5	1040	7.2	2.1	<.01	5.0	.02	.03
NE36	08-06	—	13.0	559	6.7	1.9	<.01	7.1	.01	.45
NE39	08-04	—	14.5	90	6.9	4.5	<.01	.25	.05	.35
NE40	08-03	—	13.0	298	6.6	8.0	<.01	2.2	.06	.20
NE41	08-03	—	13.5	745	6.9	.4	.04	1.1	.22	.22
NE42	08-05	—	13.3	716	7.2	2.9	<.01	2.6	.02	.07
Ohio										
OH07	08-19	—	13.0	699	7.0	.1	<.01	<.05	.33	<.01
OH13	08-18	—	11.5	585	7.4	.2	<.01	<.05	.12	<.01
OH16	08-17	33.34	14.5	795	7.3	.4	<.01	<.05	.25	.02
OH18	08-18	10.95	16.0	710	7.3	2.9	<.01	<.05	.11	<.01
OH19	08-19	—	13.0	795	7.4	.1	<.01	<.05	.25	.02
OH25	08-18	—	13.0	2550	7.7	.2	<.01	<.05	.60	<.01
OH26	08-18	—	12.5	980	7.2	.4	<.01	<.05	.28	.01
OH27	08-18	—	12.5	710	7.4	.2	<.01	<.05	.10	<.01
OH30	08-17	—	12.0	950	7.4	.1	<.01	<.05	.49	<.01

Table 2. Water-quality data from field measurements and laboratory analyses of water samples for inorganic nutrients, 1992—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temp-perature (°C)	Specific conduct-ance (μS/cm)	pH (stan-dard units)	Dis-solved oxygen (mg/L)	Nitrite, dis-solved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammo-nium, dis-solved (mg/L as N)	Phospho-rus ortho, dissolved (mg/L as P)
Wisconsin										
WI02	08-20	—	11.5	198	7.2	7.5	<.01	8.8	.03	.10
WI03	08-20	—	10.5	268	6.8	4.2	<.01	14	.03	<.01
WI05	08-19	—	10.5	615	7.5	8.2	<.01	5.1	.02	.01
WI06	08-25	—	11.5	662	7.2	9.5	<.01	12	.03	<.01
WI07	08-20	—	12.0	418	6.5	7.2	<.01	17	.02	<.01
WI10	08-19	—	11.0	536	7.3	1.0	<.01	<.05	.06	<.01
WI11	08-18	—	10.5	619	7.5	5.2	<.01	7.6	.03	<.01
WI13	08-18	—	10.5	930	7.5	1.2	<.01	<.05	.06	<.01
WI17	08-19	—	11.5	628	7.2	5.5	.01	.38	.03	<.01

Table 3. Water-quality data from routine laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1992

[Samples were analyzed for the compounds ametryn, deethylcyanazine amide, deethylcyanazine, prometryn, propazine, and terbutryn, but these compounds were not detected above 0.05 µg/L reporting limits. µg/L, micrograms per liter; Alachlor-ESA, alachlor ethanesulfonic acid; <, less than]

Site identifier (figs. 1–2)	Ala-chlor (µg/L)	Atra-zine (µg/L)	Cyana-zine (µg/L)	Cyana-zine Amide (µg/L)	Deiso-propyl-atrazine (µg/L)	Deethyl-atra-zine (µg/L)	Ala-chlor-ESA (µg/L)	Meto-lachlor (µg/L)	Metri-buzin (µg/L)	Pro-meton (µg/L)	Sim-azine (µg/L)
Illinois											
IL04	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	1.0	<0.05	<0.05	<0.05	<0.05
IL05	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL09	<.05	<.05	<.05	<.05	<.05	<.05	.78	<.05	<.05	<.05	<.05
IL13	<.05	<.05	<.05	<.05	<.05	<.05	.53	<.05	<.05	<.05	<.05
IL18	<.05	.26	<.05	<.05	.05	.21	.13	<.05	<.05	.08	<.05
IL25	<.05	.08	<.05	.06	.28	.15	<.10	<.05	<.05	<.05	<.05
IL26	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL27	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL34	<.05	<.05	<.05	<.05	<.05	<.05	.77	<.05	<.05	<.05	<.05
IL39	<.05	.45	<.05	<.05	<.05	.05	.94	<.05	<.05	<.05	<.05
IL41	<.05	.07	<.05	<.05	<.05	<.05	.15	<.05	<.05	<.05	<.05
IL42	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL48	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL53	<.05	.22	<.05	<.05	.05	.20	.22	<.05	<.05	.08	<.05
IL59	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Indiana											
IN01	<.05	<.05	<.05	<.05	<.05	<.05	.53	<.05	<.05	<.05	<.05
IN04	<.05	<.05	<.05	<.05	<.05	<.05	5.0	<.05	<.05	<.05	<.05
IN06	<.05	<.05	<.05	<.05	<.05	<.05	.63	<.05	<.05	<.05	<.05
IN08	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IN14	<.05	.12	<.05	<.05	<.05	.09	.36	<.05	<.05	<.05	<.05
IN28	<.05	<.05	<.05	<.05	<.05	<.05	1.3	<.05	<.05	<.05	<.05
IN29	<.05	.18	<.05	.11	.23	.35	<.10	<.05	<.05	<.05	<.05

Table 3. Water-quality data from routine laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1992—Continued

Site identifier (figs. 1–2)	Ala-chlor (µg/L)	Atra-zine (µg/L)	Cyana-zine (µg/L)	Cyana-zine Amide (µg/L)	Deiso-propyl-atrazine (µg/L)	Deethyl -atra-zine (µg/L)	Ala-chlor-ESA (µg/L)	Meto-lachlor (µg/L)	Metri-buzin (µg/L)	Pro-meton (µg/L)	Sim-azine (µg/L)
Iowa											
IA03	<.05	.06	<.05	<.05	.07	.10	.07	<.05	<.05	<.05	<.05
IA05	.25	.98	<.05	.19	.12	.18	.93	.21	.05	.10	<.05
IA12	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA13	<.05	<.05	<.05	<.05	<.05	<.05	.43	<.05	<.05	<.05	<.05
IA15	.11	1.0	<.05	.55	.27	.40	2.5	.76	<.05	<.05	<.05
IA18	<.05	<.05	<.05	<.05	<.05	<.05	.06	<.05	<.05	<.05	<.05
IA19	<.05	.05	<.05	<.05	<.05	.09	.72	<.05	<.05	<.05	<.05
IA21	<.05	<.05	<.05	<.05	<.05	<.05	.05	<.05	<.05	<.05	<.05
IA24	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA25	<.05	<.05	<.05	<.05	<.05	<.05	.62	<.05	<.05	.08	<.05
IA26	<.05	<.05	<.05	<.05	<.05	<.05	.40	<.05	<.05	<.05	<.05
IA28	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA34	<.05	<.05	<.05	<.05	<.05	<.05	.70	<.05	<.05	<.05	<.05
Michigan											
MI13	<.05	.17	<.05	<.05	.06	.09	.82	<.05	<.05	<.05	<.05
Minnesota											
MN02	<.05	.06	<.05	<.05	<.05	.06	<.10	<.05	<.05	<.05	<.05
MN14	<.05	<.05	<.05	<.05	<.05	.11	<.10	<.05	<.05	<.05	<.05
MN16	<.05	<.05	<.05	<.05	<.05	<.05	.11	<.05	<.05	<.05	<.05
MN24	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Missouri											
MO06	.99	<.05	<.05	<.05	<.05	<.05	<.10	.08	<.05	<.05	<.05
MO11	<.05	.12	<.05	.06	<.05	.06	<.10	<.05	<.05	<.05	<.05

Table 3. Water-quality data from routine laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1992—Continued

Site identifier (figs. 1–2)	Ala-chlor (µg/L)	Atra-zine (µg/L)	Cyana-zine (µg/L)	Cyana-zine Amide (µg/L)	Deiso-propyl-atrazine (µg/L)	Deethyl -atra-zine (µg/L)	Ala-chlor-ESA (µg/L)	Meto-lachlor (µg/L)	Metri-buzin (µg/L)	Pro-meton (µg/L)	Sim-azine (µg/L)
Nebraska											
NE05	<.05	.19	<.05	<.05	<.05	.19	<.10	<.05	<.05	.47	<.05
NE15	<.05	.08	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE17	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE19	<.05	1.0	<.05	<.05	.15	.59	<.10	<.05	<.05	<.05	<.05
NE24	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE25	<.05	.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	.10	<.05
NE27	<.05	.15	<.05	<.05	<.05	.06	<.10	<.05	<.05	<.05	<.05
NE35	<.05	.50	<.05	<.05	.20	1.8	1.6	<.05	<.05	<.05	<.05
NE36	<.05	.18	<.05	<.05	<.05	.12	<.10	<.05	<.05	<.05	<.05
NE39	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE40	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE41	<.05	.49	<.05	<.05	.05	.15	<.10	<.05	<.05	1.4	.09
NE42	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Ohio											
OH07	<.05	<.05	<.05	<.05	<.05	<.05	.14	<.05	<.05	<.05	<.05
OH18	<.05	<.05	<.05	<.05	<.05	<.05	.22	<.05	<.05	<.05	<.05
OH25	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
OH30	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Wisconsin											
WI02	<.05	<.05	<.05	<.05	<.05	<.05	.83	<.05	<.05	<.05	<.05
WI03	<.05	<.05	<.05	<.05	<.05	.05	1.0	<.05	<.05	<.05	<.05
WI05	<.05	<.05	<.05	<.05	<.05	.11	.28	<.05	<.05	<.05	<.05
WI06	<.05	.05	<.05	<.05	<.05	.20	2.9	<.05	<.05	<.05	<.05
WI07	<.05	<.05	<.05	<.05	<.05	<.05	1.2	<.05	<.05	<.05	<.05
WI10	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
WI11	<.05	.09	<.05	.09	.06	.22	1.0	<.05	<.05	<.05	<.05

Table 4. Water-quality data from sensitive analytical methods of water samples for selected pesticides and pesticide metabolites, 1992 [1]

[µg/L, micrograms per liter; DEA, Deethylatrazine; <, less than]

Site identifier (figs. 1–2)	Atrazine (µg/L)	DEA (µg/L)	2,6-Die-thani-line(µg/L)	Sima-zine (µg/L)	Metol-achlor (µg/L)	Pro-meton (µg/L)	P,P' DDE (µg/L)	Ala-chlor (µg/L)	Chlor-pyrifos (µg/L)	Ethal-fluralin (µg/L)
Illinois										
IL04	<0.005	<0.003	0.004	<0.005	0.003	<0.01	<0.008	<0.003	<0.002	<0.005
IL09	<.005	<.003	.007	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IL13	.029	<.003	.003	.007	<.002	.01	<.008	<.003	<.002	<.005
IL24	<.005	<.003	<.002	<.005	<.002	<.01	.009	<.003	<.002	<.005
IL25	.068	.012	<.002	<.005	.024	.02	<.008	<.003	<.002	<.005
IL26	<.005	.004	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IL34	.022	<.003	.005	<.005	.011	<.01	<.008	<.003	<.002	<.005
IL41	.061	<.003	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
Indiana										
IN06	<.005	.004	.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IN14	.090	.007	.003	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IN17	<.005	<.003	.003	<.005	<.002	<.01	<.008	<.003	<.002	<.005
Iowa										
IA05	.560	.012	.007	.010	.180	.05	<.008	.190	<.002	<.005
IA15	.580	.036	<.002	<.005	.570	<.01	<.008	.079	<.002	<.005
IA18	<.005	<.003	.003	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IA19	.035	.007	.003	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IA21	.010	.005	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IA25	.010	<.003	<.002	<.005	.019	<.01	<.008	<.003	<.002	<.005
IA26	.016	<.003	.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IA28	.011	<.003	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IA32	.009	<.003	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
IA34	<.005	<.003	.006	<.005	<.002	<.01	<.008	<.003	<.002	<.005

Table 4. Water-quality data from sensitive analytical methods of water samples for selected pesticides and pesticide metabolites, 1992—Continued

Site identifier (figs. 1–2)	Cyana-zine (µg/L)	EPTC (µg/L)	Triflura-lin (µg/L)	Trial-late (µg/L)	Benflu-ralin (µg/L)	Napro-pamide (µg/L)	Pendi-methalin (µg/L)	Propa-chlor (µg/L)	Tebuth-iuron (µg/L)	Metri-buzin (µg/L)
Illinois										
IL04	<0.01	<0.002	<0.008	<0.003	<0.005	<0.002	<0.01	<0.002	0.05	<0.01
IL09	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IL13	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IL24	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IL25	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IL26	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IL34	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IL41	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
Indiana										
IN06	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IN14	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IN17	<.01	.002	<.008	<.003	<.005	<.002	<.01	.002	<.01	<.01
Iowa										
IA05	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	.01
IA15	.02	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA18	<.01	.003	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA19	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA21	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA25	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA26	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA28	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA32	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
IA34	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01

Table 4. Water-quality data from sensitive analytical methods of water samples for selected pesticides and pesticide metabolites, 1992—Continued

Site identifier (figs. 1–2)	Atrazine (µg/L)	DEA (µg/L)	2,6-Die-thaniline (µg/L)	Sima-zine (µg/L)	Metol-achlor (µg/L)	Pro-meton (µg/L)	P,P' DDE (µg/L)	Ala-chlor (µg/L)	Chlor-pyrifos (µg/L)	Ethal-fluralin (µg/L)
Michigan										
MI13	.130	.009	<.002	.005	<.002	<.01	<.008	<.003	<.002	<.005
Minnesota										
MN02	.046	.006	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
MN14	.030	.007	<.002	<.005	<.002	<.01	<.008	.003	<.002	<.005
MN15	.013	.007	<.002	<.005	.013	<.01	<.008	<.003	<.002	<.005
Missouri										
MO06	<.005	<.003	<.002	<.005	.080	<.01	<.008	.662	.024	<.005
MO11	.086	.005	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
Nebraska										
NE05	.140	.036	<.002	<.005	.003	.47	.016	<.003	.008	.012
NE15	.048	.009	<.002	<.005	<.002	<.01	.030	<.003	.010	.014
NE19	.840	.140	<.002	.011	<.002	<.01	<.008	<.003	<.002	<.005
NE25	.040	<.003	<.002	<.005	<.002	.06	<.008	<.003	<.002	<.005
NE27	.120	.013	.002	.010	<.002	<.01	<.008	<.003	<.002	<.005
NE36	.120	.009	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
NE40	<.005	<.003	<.002	<.005	<.002	<.01	.013	<.003	.005	.011
NE41	.370	.033	<.002	.077	.018	.96	<.008	<.003	<.002	<.005
Ohio										
OH07	.003	<.003	<.002	.004	<.002	<.01	.001	<.003	<.002	<.005
OH13	.003	<.003	<.002	.003	<.002	<.01	<.008	<.003	<.002	<.005
OH16	.003	.002	<.002	.002	<.002	<.01	<.008	<.003	<.002	<.005
OH18	.003	<.003	<.002	.002	<.002	<.01	<.008	<.003	<.002	<.005
OH19	.003	<.003	<.002	.003	<.002	<.01	<.008	<.003	<.002	<.005
OH25	.003	<.003	<.002	.002	<.002	<.01	<.008	<.003	<.002	<.005

Table 4. Water-quality data from sensitive analytical methods of water samples for selected pesticides and pesticide metabolites, 1992—Continued

Site identifier (figs. 1–2)	Cyanazine (µg/L)	EPTC (µg/L)	Trifluralin (µg/L)	Triallate (µg/L)	Benfluralin (µg/L)	Napropamide (µg/L)	Pendimethalin (µg/L)	Propachlor (µg/L)	Tebuthiuron (µg/L)	Metribuzin (µg/L)
Michigan										
MI13	.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
Minnesota										
MN02	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
MN14	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
MN15	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
Missouri										
MO06	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
MO11	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
Nebraska										
NE05	<.01	<.002	.008	.004	<.005	<.002	<.01	<.002	<.01	<.01
NE15	<.01	<.002	.016	.007	.018	<.002	.01	<.002	<.01	<.01
NE19	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
NE25	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
NE27	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
NE36	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
NE40	.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
NE41	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
Ohio										
OH07	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
OH13	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
OH16	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
OH18	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
OH19	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
OH25	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01

Table 4. Water-quality data from sensitive analytical methods of water samples for selected pesticides and pesticide metabolites, 1992—Continued

Site identifier (figs. 1–2)	Atrazine (µg/L)	DEA (µg/L)	2,6-Die-thani-line(µg/L)	Sima-zine (µg/L)	Metol-achlor (µg/L)	Pro-meton (µg/L)	P,P' DDE (µg/L)	Ala-chlor (µg/L)	Chlor-pyrifos (µg/L)	Ethal-fluralin (µg/L)
Ohio (Continued)										
OH26	.004	<.003	<.002	.004	<.002	<.01	<.008	<.003	<.002	<.005
OH27	.003	<.003	<.002	.003	<.002	<.01	<.008	<.003	<.002	<.005
Wisconsin										
WI02	<.005	.004	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
WI03	.009	.009	<.002	<.005	<.002	<.01	<.008	.003	<.002	<.005
WI05	.036	.017	<.002	<.005	<.002	<.01	<.008	<.003	<.002	<.005
WI07	<.005	<.003	.022	<.005	<.002	<.01	.009	<.003	<.002	<.005
WI11	.079	.035	.005	<.005	<.002	<.01	<.008	<.003	<.002	<.005

Table 4. Water-quality data from sensitive analytical methods of water samples for selected pesticides and pesticide metabolites, 1992—Continued

Site identifier (figs. 1–2)	Cyanazine (µg/L)	EPTC (µg/L)	Trifluralin (µg/L)	Triallate (µg/L)	Benfluralin (µg/L)	Napropamide (µg/L)	Pendimethalin (µg/L)	Propachlor (µg/L)	Tebuthiuron (µg/L)	Metribuzin (µg/L)
Ohio (Continued)										
OH26	<.01	<.002	<.008	<.003	<.005	.008	<.01	<.002	<.01	<.01
OH27	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
Wisconsin										
WI02	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
WI03	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
WI05	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
WI07	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01
WI11	<.01	<.002	<.008	<.003	<.005	<.002	<.01	<.002	<.01	<.01

[1] Reporting limits of compounds not detected: alpha BHC (0.002), butylate (0.002), carbaryl (0.01), carbofuran (0.01), dacthal (0.002), diazinon (0.002), dieldrin (0.002), dimethoate (0.02), disulfoton (0.017), ethoprop (0.003), fonofos (0.003), linuron (0.01), lindane (0.008), malathion (0.005), methyl parathion (0.008), methyl azinphos (0.005), molinate (0.004), parathion (0.005), pebulate (0.005), permethrin (0.01), phorate (0.003), (0.002), pronamide (0.004), propargite (0.02), propanil (0.005), terbacil (0.01), terbufos (0.013), thiobencarb (0.002)

Table 5. Water-quality data from laboratory analysis of water samples for selected chlorophenoxy-acid and other miscellaneous herbicides, 1992

[µg/L, micrograms per liter; DCPA, DCPA-acid metabolite; <, less than]

Site indentifier (figs. 1–2)	Acifluor-fen, (µg/L)	Bentazon (µg/L)	2,4-D (µg/L)	DCPA (µg/L)	Dicamba (µg/L)	2,4-DP (µg/L)	Picloram (µg/L)	Silvex (µg/L)	2,4,5-T (µg/L)
Illinois									
IL04	<0.01	<0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
IL05	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL09	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL13	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL25	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL26	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL34	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL41	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL42	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IL48	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Iowa									
IA05	<.01	<.10	<.01	.49	<.01	<.01	<.01	<.01	<.01
IA13	<.01	<.10	.10	<.01	<.01	<.01	<.01	<.01	.02
IA15	<.01	<.10	.17	<.01	.01	<.01	<.01	<.01	<.01
IA19	<.01	<.10	<.01	.03	<.01	<.01	<.01	<.01	<.01
IA21	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IA24	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IA25	<.01	<.10	<.01	<.01	.01	<.01	<.01	<.01	<.01
IA26	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IA34	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Indiana									
IN04	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IN06	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IN14	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
IN28	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01

Table 5. Water-quality data from laboratory analyses of water samples for selected chlorophenoxy-acid and other miscellaneous herbicides, 1992—Continued

Site indentifier (figs. 1–2)	Acifluor-fen, (µg/L)	Bentazon (µg/L)	2,4-D (µg/L)	DCPA (µg/L)	Dicamba (µg/L)	2,4-DP (µg/L)	Picloram (µg/L)	Silvex (µg/L)	2,4,5-T (µg/L)
Michigan									
MI13	<.01	<.10	<.01	.01	<.01	<.01	<.01	<.01	<.01
Minnesota									
MN02	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
MN14	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Missouri									
MO06	<.01	<.10	.89	<.01	<.01	<.01	<.01	<.01	<.01
MO11	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
Nebraska									
NE05	<.01	<.10	<.01	.47	<.01	<.01	<.01	<.01	<.01
NE15	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NE17	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NE19	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NE24	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NE25	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NE27	<.01	<.10	<.01	.01	<.01	<.01	.01	<.01	<.01
NE36	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
NE39	<.01	<.10	<.01	.01	<.01	<.01	<.01	<.01	<.01
NE41	<.01	<.10	<.01	<.01	<.01	<.01	.03	<.01	<.01
NE42	<.01	<.10	<.01	2.22	<.01	<.01	<.01	<.01	<.01
Ohio									
OH07	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01

Table 5. Water-quality data from laboratory analyses of water samples for selected chlorophenoxy-acid and other miscellaneous herbicides, 1992—Continued

Site indentifier (figs. 1–2)	Acifluor-fen, (µg/L)	Bentazon (µg/L)	2,4-D (µg/L)	DCPA (µg/L)	Dicamba (µg/L)	2,4-DP (µg/L)	Picloram (µg/L)	Silvex (µg/L)	2,4,5-T (µg/L)
Wisconsin									
WI02	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
WI03	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
WI05	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
WI10	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01
WI11	<.01	<.10	<.01	<.01	<.01	<.01	<.01	<.01	<.01

Table 6. Water-quality data from laboratory analyses of water samples for detected volatile organic compounds and methylene-blue active substances, 1992

[µg/L, micrograms per liter; MBAS, methylene-blue active substances; <, less than; —, no data]

Site identifier (figs. 1–2)	1,2-di-chloro-ethane (mg/L)	Chloro-form (µg/L)	MBAS (µg/L)	Tetra-chloro-ethylene (µg/L)
Illinois				
IL04	<0.2	<0.2	0.04	<0.2
IL05	<.2	<.2	.04	<.2
IL09	<.2	<.2	.22	<.2
IL13	<.2	.7	.06	.9
IL25	<.2	<.2	.04	<.2
IL26	<.2	<.2	.04	<.2
IL34	<.2	<.2	.03	<.2
IL41	<.2	<.2	.03	<.2
IL42	<.2	<.2	.02	<.2
IL48	<.2	<.2	.01	<.2
Indiana				
IN04	<.2	<.2	.03	<.2
IN06	<.2	<.2	.07	<.2
IN14	<.2	<.2	.08	<.2
IN28	<.2	<.2	.06	<.2
Iowa				
IA05	<.2	<.2	.06	<.2
IA13	<.2	<.2	.02	<.2
IA15	<.2	<.2	.17	<.2
IA19	<.2	<.2	.06	<.2
IA21	<.2	<.2	.06	<.2
IA24	<.2	<.2	.02	<.2
IA25	<.2	<.2	.04	<.2
IA26	<.2	<.2	.07	<.2
IA34	<.2	<.2	.02	<.2
Michigan				
MI13	<.2	<.2	.03	<.2
Minnesota				
MN02	<.2	<.2	.03	<.2
MN14	<.2	<.2	.08	<.2
Missouri				
MO06	<.2	.2	.03	<.2
MO11	<.2	<.2	.03	<.2
Nebraska				
NE05	.2	<.2	.12	1.1
NE15	<.2	.2	.11	<.2
NE17	<.2	<.2	.04	<.2
NE19	<.2	<.2	.07	<.2
NE24	<.2	<.2	.02	<.2
NE25	<.2	<.2	.02	<.2
NE27	<.2	<.2	.02	<.2
NE36	<.2	.4	.08	<.2
NE39	<.2	<.2	.01	<.2
NE41	<.2	.8	.03	<.2
NE42	<.2	<.2	.05	<.2
Ohio				
OH07	<.2	<.2	.02	<.2

Table 6. Water-quality data from laboratory analyses of water samples for detected volatile organic compounds and methylene-blue active substances, 1992—Continued

Site identifier (figs. 1–2)	1,2-dichloroethane (mg/L)	Chloroform (μg/L)	MBAS (μg/L)	Tetrachloroethylene (μg/L)
Wisconsin				
WI02	<.2	<.2	.09	<.2
WI03	<.2	<.2	.13	<.2
WI05	<.2	<.2	—	<.2
WI10	<.2	<.2	<.01	<.2
WI11	<.2	<.2	.08	<.2

Table 7. Water-quality data from field measurements and laboratory analyses for inorganic nutrients, 1993

[°C, degrees Celsius; µS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; —, no data; <, less than]

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temperature (°C)	Specific conductance (µS/cm)	pH (standard units)	Dissolved oxygen (mg/L)	Nitrite, dissolved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammonium, dissolved (mg/L as N)	Phosphorus ortho, dissolved (mg/L as P)
Illinois										
IL01	09–17	—	12.0	1010	6.9	0.1	<0.01	0.36	0.08	0.07
IL03	09–23	—	11.5	655	7.0	3.9	<.01	4.4	.02	.02
IL07	09–17	—	16.0	797	7.0	3.0	<.01	4.4	.02	.02
IL09	09–29	—	12.0	638	7.4	1.5	<.01	<.05	.05	.02
IL11	09–23	—	23.5	658	7.1	2.5	<.01	11	.01	<.01
IL13	09–29	—	18.0	1140	6.8	.9	<.01	6.1	.02	<.01
IL14	09–23	—	11.0	792	6.7	.1	<.01	<.05	.42	.01
IL16	09–24	—	11.5	599	7.0	4.6	<.01	3.4	.02	<.01
IL17	09–27	—	13.5	731	7.0	.0	.01	.86	.10	.01
IL19	09–22	—	15.0	526	7.2	3.9	<.01	2.5	<.01	.02
IL20	09–22	—	13.5	778	7.0	.1	<.01	<.05	4.2	.03
IL21	10–05	—	14.0	550	7.2	.1	.06	5.2	.33	.04
IL22	10–12	—	13.0	395	7.2	.0	<.01	<.05	.14	.08
IL25	09–16	—	18.5	901	6.8	6.0	<.01	6.2	.04	.09
IL26	10–12	—	15.0	389	7.6	1.8	<.01	9.2	.02	.05
IL27	09–23	—	14.5	738	7.0	.0	<.01	<.05	.03	<.01
IL30	10–06	—	11.5	800	6.9	4.3	<.01	9.1	.03	<.01
IL31	09–22	—	16.0	691	6.9	.5	<.01	1.2	.09	<.01
IL32	09–20	—	13.0	558	7.5	4.9	<.01	21	.02	.05
IL34	09–22	—	13.5	504	6.9	.1	<.01	.30	.11	.05
IL35	09–28	—	22.5	357	7.0	7.0	<.01	.72	.02	.02
IL36	09–29	—	15.0	687	6.7	.5	<.01	2.4	.02	.02
IL37	09–28	—	13.5	922	7.0	.1	<.01	<.05	.02	.06
IL39	09–16	—	15.0	716	7.0	.1	<.01	<.05	.57	<.01
IL62	09–24	—	18.0	607	7.2	1.8	<.01	.17	.01	<.01
IL63	09–23	—	15.5	650	6.8	3.4	<.01	4.4	.05	<.01
IL64	09–28	—	15.0	681	6.8	3.0	<.01	5.7	.04	.16

Table 7. Water-quality data from field measurements and laboratory analyses for inorganic nutrients, 1993—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temperature (°C)	Specific conductance (µS/cm)	pH (standard units)	Dissolved oxygen (mg/L)	Nitrite, dissolved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammonium, dissolved (mg/L as N)	Phosphorus ortho, dissolved (mg/L as P)
Iowa										
IA09	09–28	—	12.0	586	6.9	1.8	<.01	.97	.03	.04
IA13	09–23	—	9.5	610	6.9	.1	<.01	<.05	.17	.02
IA15	09–21	18.11	12.5	805	7.0	5.3	<.01	12	.03	.03
IA16	09–21	—	13.0	599	7.1	1.2	.01	2.2	.08	.10
IA17	09–23	—	10.5	595	7.2	.1	<.01	<.05	1.4	.07
IA18	09–20	—	13.5	260	6.2	.0	<.01	<.05	.42	<.01
IA20	09–20	17.90	10.0	784	6.5	8.9	<.01	13	.04	.04
IA21	09–21	3.96	13.0	338	6.6	9.6	<.01	2.1	.03	.06
IA22	09–20	15.50	9.5	1250	6.2	.4	<.01	.07	.33	<.01
IA23	09–22	—	12.0	610	6.7	.6	<.01	.66	.09	.05
IA24	09–20	12.90	11.0	458	7.2	4.3	<.01	.27	.35	.07
IA25	09–20	9.10	10.0	750	7.1	.5	<.01	<.05	.16	.04
IA26	09–22	—	12.0	722	6.9	3.8	<.01	4.3	.03	.16
IA27	09–22	—	12.0	473	6.9	8.0	<.01	12	.02	.10
IA28	09–21	19.80	11.5	802	6.8	2.7	<.01	6.2	.02	.14
IA34	09–20	—	10.0	612	6.8	.5	<.01	.34	.06	.02
IA35	09–21	6.02	14.0	565	8.2	5.8	.02	.21	.16	.11
IA36	09–21	—	13.0	648	6.9	1.7	<.01	2.7	.04	.05
IA37	09–21	16.48	11.5	280	7.0	7.9	<.01	2.0	.02	.12
IA38	09–13	—	15.0	912	7.0	1.4	.02	13	.24	.01
IA40	09–21	—	12.0	927	6.3	.3	.02	3.8	.07	.02
Kansas										
KS01	10–05	—	15.0	1190	7.1	.3	<.01	.08	.91	.34

Table 7. Water-quality data from field measurements and laboratory analyses for inorganic nutrients, 1993—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temperature (°C)	Specific conductance (µS/cm)	pH (standard units)	Dissolved oxygen (mg/L)	Nitrite, dissolved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammonium, dissolved (mg/L as N)	Phosphorus ortho, dissolved (mg/L as P)
Minnesota										
MN01	10–07	52.00	12.0	713	7.2	.1	<.01	<.05	1.1	.01
MN03	10–04	15.18	13.0	927	7.4	.1	<.01	<.05	2.1	.02
MN04	10–06	—	11.0	2840	6.9	.1	<.01	<.05	2.3	<.01
MN05	10–06	8.00	10.0	486	7.6	1.0	.02	.75	.02	<.01
MN09	09–29	—	11.0	798	7.4	3.2	<.01	.81	.02	<.01
MN10	09–27	21.47	8.0	720	7.2	6.4	<.01	17	.03	.01
MN11	09–28	27.52	11.0	1070	7.3	.2	<.01	<.05	1.5	<.01
MN13	09–29	12.80	9.0	1480	7.1	.4	<.01	<.05	.68	<.01
MN15	10–06	—	10.0	1160	7.2	.1	<.01	<.05	.29	<.01
MN16	09–29	12.30	9.5	2020	6.9	.1	<.01	<.05	.06	.02
MN18	10–05	—	14.5	579	7.1	.1	<.01	<.05	.15	.06
MN26	10–05	15.27	12.0	1070	7.0	.2	<.01	13	.09	.02
MN27	10–06	7.24	13.0	1560	6.7	.3	<.01	<.05	.09	<.01
MN28	09–28	9.98	12.5	1930	6.8	.1	<.01	<.05	.27	<.01
Missouri										
MO03	10–04	—	14.0	738	7.2	.0	<.01	<.05	.26	<.01
MO04	10–21	—	14.5	794	7.6	—	<.01	.62	.04	.01
MO05	10–04	15.00	14.0	609	7.1	.6	<.01	.48	.14	.01
MO06	10–05	—	13.5	841	7.2	.1	<.01	<.05	.30	<.01
MO07	10–04	—	15.0	878	7.1	5.0	<.01	.42	.15	.01
MO08	10–05	—	13.0	931	7.2	.1	<.01	<.05	.75	.48
MO09	10–04	—	14.5	715	7.1	.2	<.01	.15	.06	.03
MO15	9–14	—	13.5	797	7.2	—	<.01	.28	.14	<.01

Table 7. Water-quality data from field measurements and laboratory analyses for inorganic nutrients, 1993—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water tem-pera-ture (⁰C)	Specific con-duct-ance (µS/cm)	pH (stan-dard units)	Dis-solved oxygen (mg/L)	Nitrite, dis-solved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammo-nium, dis-solved (mg/L as N)	Phospho-rus ortho, dissolved (mg/L as P)
Nebraska										
NE03	09–28	—	19.0	956	7.7	8.7	<.01	.39	.24	<.01
NE04	09–15	—	15.0	668	6.7	2.9	<.01	7.8	.04	.15
NE06	09–16	—	14.0	356	7.2	6.0	<.01	2.7	.01	.12
NE07	09–14	—	13.5	516	7.4	.3	<.01	<.05	.03	.13
NE08	09–15	—	12.5	1090	7.0	1.4	.01	.44	.05	.05
NE09	09–15	—	15.5	332	6.9	.2	<.01	.81	.02	.06
NE10	09–16	—	10.5	766	7.1	.1	<.01	.84	.05	.02
NE11	09–23	—	13.0	462	7.2	3.4	<.01	2.6	.02	.18
NE13	09–15	—	12.0	1040	7.1	.1	<.01	<.05	.37	.06
NE14	09–17	—	12.0	585	7.1	.2	.02	.29	.17	.15
NE16	09–15	—	11.5	798	7.1	3.0	<.01	6.9	.03	.18
NE17	09–22	—	13.0	698	6.1	6.0	<.01	5.6	.03	.10
NE18	09–21	—	12.0	738	7.1	1.0	<.01	2.1	.05	.12
NE19	09–17	—	12.5	740	6.8	7.6	<.01	7.9	<.01	.25
NE20	09–17	—	13.0	491	6.9	8.9	<.01	9.5	<.01	.19
NE21	09–14	—	13.0	492	7.1	2.1	<.01	1.7	.02	.18
NE22	09–22	—	12.5	478	6.8	5.8	<.01	6.5	.02	.39
NE23	09–14	—	12.5	860	7.1	3.9	<.01	2.2	.03	.17
NE25	09–16	—	12.0	895	7.1	.2	<.01	2.0	0.02	.31
NE27	09–16	—	13.5	992	7.5	.1	<.01	.19	.01	.02
NE28	09–14	—	11.5	596	7.0	5.8	<.01	3.6	<.01	.21
NE29	09–17	—	12.0	653	6.8	5.9	<.01	11	.02	.17
NE30	09–16	—	11.5	780	7.2	1.5	<.01	3.6	.02	.08
NE31	09–15	—	13.0	891	7.4	.4	<.01	1.4	.06	.03
NE33	09–23	—	11.5	1940	7.1	.9	<.01	20	.04	.09
NE34	09–15	—	14.5	784	7.2	.5	<.01	.33	.11	.06
NE35	09–14	—	14.5	998	7.1	1.0	<.01	5.4	.03	.03

Table 7. Water-quality data from field measurements and laboratory analyses for inorganic nutrients, 1993—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temperature (°C)	Specific conductance (µS/cm)	pH (standard units)	Dissolved oxygen (mg/L)	Nitrite, dissolved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammonium, dissolved (mg/L as N)	Phosphorus ortho, dissolved (mg/L as P)
Nebraska (Continued)										
NE36	09–21	—	13.5	538	6.7	2.4	<.01	7.5	.03	.44
NE38	09–24	—	13.0	718	6.9	4.4	<.01	11	.03	.30
NE40	09–17	—	13.5	324	6.9	7.0	<.01	2.6	.02	.19
NE41	09–16	—	12.5	783	7.1	.2	<.01	.71	.16	.25
NE43	09–16	—	11.5	348	7.3	.1	.03	.26	.23	.14
NE44	09–15	—	12.0	688	7.0	6.6	<.01	7.4	.02	.22
North Dakota										
ND01	10–05	8.20	14.0	630	7.4	.3	<.01	<.05	.05	.02
South Dakota										
SD01	09–30	4.83	11.5	820	7.3	2.4	<.01	<.05	.34	.02
SD02	09–30	0.89	18.5	746	7.3	.1	<.01	.19	.14	.06
SD03	09–30	12.57	11.5	1140	7.4	.1	<.01	<.05	.02	.02
Wisconsin										
WI02	10–21	—	11.0	174	7.1	7.5	<.01	7.2	.02	.13
WI05	10–06	—	11.0	576	7.4	8.0	<.01	5.1	.03	.01

Table 8. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1993

[Samples were analyzed for the compounds ametryn, prometryn, propazine, and terbutryn, but these compounds were not detected above the 0.05 μg/L reporting limit. μg/L, micrograms per liter; Alachlor-ESA, alachlor ethanesulfonic acid ; <, less than]

Site identifier (figs. 1–2)	Alachlor (μg/L)	Atrazine (μg/L)	Cyanazine (μg/L)	Deisopropylatrazine (μg/L)	Deethylatrazine (μg/L)	Alachlor-ESA (μg/L)	Metolachlor (μg/L)	Metribuzin (μg/L)	Prometon (μg/L)	Simazine (μg/L)
Illinois										
IL01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	<0.05	<0.05	<0.05	<0.05
IL03	<.05	<.05	<.05	<.05	<.05	.94	<.05	<.05	<.05	<.05
IL07	<.05	.37	<.05	<.05	.09	.30	<.05	<.05	<.05	<.05
IL09	<.05	<.05	<.05	<.05	<.05	.97	<.05	<.05	<.05	<.05
IL11	<.05	<.05	<.05	<.05	.20	3.0	<.05	<.05	<.05	<.05
IL13	<.05	<.05	<.05	<.05	<.05	.86	<.05	<.05	.05	<.05
IL14	<.05	.08	<.05	<.05	.12	.60	<.05	<.05	<.05	<.05
IL16	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL17	<.05	<.05	<.05	<.05	<.05	.29	<.05	<.05	.09	<.05
IL19	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL20	<.05	<.05	<.05	<.05	<.05	1.1	<.05	<.05	<.05	<.05
IL21	<.05	<.05	<.05	<.05	<.05	.57	<.05	<.05	<.05	<.05
IL22	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL25	<.05	<.05	<.05	.16	<.05	<.10	<.05	<.05	.05	<.05
IL26	<.05	<.05	<.05	<.05	.32	.54	<.05	<.05	<.05	<.05
IL27	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL30	<.05	<.05	<.05	<.05	<.05	.87	<.05	<.05	<.05	<.05
IL31	<.05	.21	<.05	.11	.12	.56	<.05	<.05	<.05	<.05
IL32	<.05	<.05	<.05	<.05	<.05	1.4	<.05	<.05	<.05	<.05
IL34	<.05	<.05	<.05	<.05	<.05	1.2	<.05	<.05	<.05	<.05
IL35	<.05	.39	.10	.12	.13	.45	.10	<.05	<.05	.05
IL36	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL37	<.05	<.05	<.05	<.05	<.05	.58	<.05	<.05	<.05	<.05
IL39	<.05	.40	<.05	<.05	<.05	.71	<.05	<.05	<.05	<.05
IL62	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL63	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IL64	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05

Table 8. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1993—Continued

Site identifier (figs. 1–2)	Ala-chlor (μg/L)	Atrazine (μg/L)	Cyan-azine (μg/L)	Deiso-propyl-atrazine (μg/L)	De-ethyl-atrazine (μg/L)	Ala-chlor-ESA (μg/L)	Metol-achlor (μg/L)	Metri-buzin (μg/L)	Pro-meton (μg/L)	Simazine (μg/L)
Iowa										
IA09	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA13	<.05	<.05	<.05	<.05	<.05	.55	<.05	<.05	<.05	<.05
IA15	<.05	.50	<.05	.21	.31	.51	.59	<.05	<.05	<.05
IA16	<.05	.32	.05	.14	.17	.80	.07	<.05	<.05	<.05
IA17	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA18	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA20	<.05	.09	<.05	.13	.09	.35	<.05	<.05	.35	<.05
IA21	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA22	<.05	<.05	<.05	<.05	<.05	.17	<.05	<.05	<.05	<.05
IA23	<.05	.07	<.05	.13	.06	<.10	<.05	<.05	<.05	<.05
IA24	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA25	<.05	<.05	<.05	<.05	<.05	.63	<.05	<.05	.10	<.05
IA26	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA27	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA28	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA34	<.05	<.05	<.05	<.05	<.05	.43	<.05	<.05	<.05	<.05
IA35	<.05	.34	<.05	.45	.43	.09	<.05	<.05	<.05	<.05
IA36	<.05	<.05	<.05	<.05	<.05	.28	<.05	<.05	<.05	<.05
IA37	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA38	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA40	<.05	.32	<.05	<.05	.06	.79	.32	<.05	<.05	<.05
Kansas										
KS01	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Minnesota										
MN01	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MN03	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05

Table 8. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1993—Continued

Site identifier (figs. 1–2)	Ala-chlor (µg/L)	Atrazine (µg/L)	Cyan-azine (µg/L)	Deiso-propyl-atrazine (µg/L)	De-ethyl-atrazine (µg/L)	Ala-chlor-ESA (µg/L)	Metol-achlor (µg/L)	Metri-buzin (µg/L)	Pro-meton (µg/L)	Simazine (µg/L)
Minnesota (Continued)										
MN04	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MN05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MN09	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MN10	<.05	<.05	<.05	.48	<.05	<.10	<.05	<.05	<.05	.07
MN11	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MN13	<.05	<.05	<.05	<.05	<.05	.71	<.05	<.05	<.05	<.05
MN15	<.05	<.05	<.05	<.05	<.05	.30	<.05	<.05	<.05	<.05
MN16	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MN18	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MN26	<.05	<.05	<.05	<.05	<.05	7.3	<.05	<.05	<.05	<.05
MN27	<.05	<.05	<.05	<.05	<.05	2.2	<.05	<.05	<.05	<.05
MN28	<.05	<.05	<.05	<.05	<.05	.11	<.05	<.05	<.05	<.05
Missouri										
MO03	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MO04	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MO05	.23	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MO06	4.3	<.05	<.05	<.05	<.05	<.10	.51	.22	<.05	<.05
MO07	<.05	<.05	<.05	<.05	<.05	.05	<.05	.08	<.05	<.05
MO08	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MO09	.14	<.05	<.05	<.05	<.05	.22	<.05	<.05	<.05	<.05
MO15	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Nebraska										
NE03	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE04	<.05	.22	<.05	<.05	.29	<.10	<.05	<.05	.35	<.05
NE06	<.05	.08	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE07	<.05	.36	<.05	<.05	.08	.11	<.05	<.05	<.05	<.05

Table 8. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1993—Continued

Site identifier (figs. 1–2)	Ala-chlor (µg/L)	Atrazine (µg/L)	Cyan-azine (µg/L)	Deiso-propyl-atrazine (µg/L)	De-ethyl-atrazine (µg/L)	Ala-chlor-ESA (µg/L)	Metol-achlor (µg/L)	Metri-buzin (µg/L)	Pro-meton (µg/L)	Simazine (µg/L)
Nebraska (Continued)										
NE08	<.05	1.2	<.05	.11	.73	1.1	<.05	<.05	<.05	<.05
NE09	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE10	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE11	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE13	<.05	.59	<.05	<.05	.10	1.6	<.05	<.05	<.05	<.05
NE14	<.05	.62	.45	.09	.10	.43	.08	<.05	<.05	<.05
NE16	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE17	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE18	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE19	<.05	.88	<.05	.23	.85	<.10	<.05	<.05	<.05	<.05
NE20	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE21	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE22	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE23	<.05	<.05	<.05	<.05	<.05	.22	<.05	<.05	<.05	<.05
NE25	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	1.1	<.05
NE27	<.05	.14	<.05	<.05	.06	.08	<.05	<.05	<.05	<.05
NE28	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE29	<.05	.36	<.05	.09	.29	.50	<.05	<.05	<.05	<.05
NE30	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE31	<.05	.06	<.05	<.05	.20	<.10	<.05	<.05	<.05	<.05
NE33	<.05	.07	<.05	<.05	.30	.83	<.05	<.05	<.05	<.05
NE34	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE35	<.05	.56	<.05	.25	1.7	3.0	<.05	<.05	.15	<.05
NE36	<.05	.05	<.05	<.05	.06	<.10	<.05	<.05	<.05	<.05
NE38	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE40	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE41	<.05	<.05	<.05	<.05	<.05	.06	<.05	<.05	.05	<.05
NE43	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE44	<.05	.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05

Table 8. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1993—Continued

Site identifier (figs. 1–2)	Ala-chlor (µg/L)	Atrazine (µg/L)	Cyan-azine (µg/L)	Deiso-propyl-atrazine (µg/L)	De-ethyl-atrazine (µg/L)	Ala-chlor-ESA (µg/L)	Metol-achlor (µg/L)	Metri-buzin (µg/L)	Pro-meton (µg/L)	Simazine (µg/L)
North Dakota										
ND01	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
South Dakota										
SD01	.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
SD02	.07	1.8	.88	.32	.42	1.3	.34	<.05	<.05	<.05
SD03	<.05	<.05	<.05	<.05	<.05	1.1	<.05	<.05	<.05	<.05
Wisconsin										
WI02	<.05	<.05	<.05	<.05	<.05	2.2	<.05	<.05	<.05	<.05
WI05	<.05	<.05	<.05	<.05	.13	.43	<.05	<.05	<.05	<.05

Table 9. Water-quality data from laboratory analyses of water samples for selected volatile organic compounds for wells with reported detections, 1993 [1]

[µg/L, micrograms per liter; <, less than]

Site identifier (figs. 1–2)	1,1,1-Trichloroethane (µg/L)	1,1-Dichloroethane (µg/L)	1,2,3-Trichloropropane (µg/L)	1,2,-Dichloroethane (µg/L)	Benzene (µg/L)	Bromoform (µg/L)	Chlorodibromomethane (µg/L)	Chloroform (µg/L)
Illinois								
IL01	<0.2	<0.2	<0.2	<0.2	0.3	<0.2	<0.2	<0.2
IL07	1.3	0.4	<.2	<.2	<.2	<.2	<.2	0.2
IL13	<.2	<.2	<.2	<.2	<.2	<.2	<.2	1.6
IL26	0.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2
IL35	<.2	<.2	<.2	<.2	<.2	<.2	5.7	51.0
IL63	<.2	<.2	<.2	<.2	<.2	<.2	<.2	2.4
Iowa								
IA27	<.2	<.2	<.2	<.2	<.2	1.7	1.6	<.2
IA28	<.2	<.2	<.2	<.2	<.2	<.2	<.2	0.3
Minnesota								
MN15	<.2	<.2	<.2	<.2	<.2	<.2	<.2	44.0
MN26	0.3	0.2	<.2	0.6	<.2	<.2	<.2	<.2
MN28	<.2	<.2	2.3	6.9	78.0	<.2	<.2	<.2
Missouri								
MO04	<.2	<.2	<.2	<.2	<.2	<.2	0.4	5.6
Nebraska								
NE08	<.2	<.2	<.2	0.2	<.2	<.2	<.2	<.2
NE22	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2
NE34	<.2	0.2	<.2	<.2	<.2	<.2	<.2	<.2
North Dakota								
ND01	<.2	<.2	<.2	<.2	0.3	<.2	<.2	<.2

[1] Reporting limits of compounds not detected in (µg/L): 1,1,1,2-Tetrachloroethane (0.2), 1,1,2,2-Tetrachloroethane (0.2), 1,1,2-Trichloroethane (0.2), 1,1-Dichloroethylene (0.2), 1,1-Dichloropropane (0.2), 1,2,3-Trichlorobenzene (0.2), 1,2,4-Trichlorobenzene (0.2), 1,2,4-Trimethylbenzene (0.2), 1,2-Chlorotoluene (0.2), 1,2-Dibromoethane (0.2), 1,2-Dichlorobenzene (0.2), 1,2-Dichloropropane (.2), 1,2-Transdichloroethene (0.2), 1,3,5-Trimethylbenzene (0.2), 1,3-Dichlorobenzene (0.2), 1,3-Dichloropropane (0.2), 1,4-Chlorotoluene (0.2), 1,4-Dichlorobenzene (0.2), 2,2-Dichloropropane (0.2), 2-Chloro-

Table 9. Water-quality data from laboratory analyses of water samples for selected volatile organic compounds for wells with reported detections, 1993—Continued

Site identifier (figs. 1–2)	Dichloro-bromo-methane (µg/L)	Ethyl-benzene (µg/L)	Methyl-chloride (µg/L)	Methyl-ene-chloride (µg/L)	Tetra-chloro-ethylene (µg/L)	Toluene (µg/L)	Tri-chloro-ethylene (µg/L)	Xylenes (µg/L)
Illinois								
IL01	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
IL07	<.2	<.2	<.2	<.2	<.2	<.2	<.2	.2
IL13	<.2	<.2	<.2	<.2	.6	<.2	.4	<.2
IL26	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2
IL35	25.0	<.2	<.2	<.2	<.2	<.2	<.2	<.2
IL63	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2
Iowa								
IA27	.5	<.2	<.2	<.2	<.2	<.2	<.2	<.2
IA28	.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2
Minnesota								
MN15	.7	<.2	.3	.4	<.2	<.2	<.2	<.2
MN26	<.2	0.2	<.2	<.2	<.2	<.2	<.2	<.2
MN28	<.2	.9	<.2	<.2	<.2	.6	<.2	5.3
Missouri								
MO04	1.7	<.2	<.2	<.2	<.2	<.2	<.2	<.2
Nebraska								
NE08	<.2	<.2	<.2	<.2	<.2	<.2	<.2	<.2
NE22	<.2	<.2	<.2	<.2	<.2	.7	<.2	<.2
NE34	<.2	0.2	<.2	<.2	<.2	<.2	<.2	<.2
North Dakota								
ND01	<.2	<.2	<.2	<.2	0.3	12.0	<.2	<.2

ethylvinylether (1.0), Acrolein (20), Acrylonitrile (20), Bromobenzene (0.2), Bromochloromethane (0.2), Carbontetrachloride (0.2), Chlorobenzene (0.2), Chloroethane (0.2), Cis-1,2-dichloroethene (0.2), Cis-1,3-dichloropropene (0.2), Dibromochloropropane (1.0), Dibromomethane (0.2), Dichlorodifluoromethane (0.2), Trichlorotrifluoroethane (0.5), Hexachlorobutadiene (0.2), Isopropylbenzene (0.2), Methylbromide (0.2), Methyltertbutylether (1.0), N-Butylbenzene (0.2), N-propylbenzene (0.2), Naphthalene (0.2), P-isopropyltoluene (0.2), Sec-butylbenzene (0.2), Styrene (0.2), Tert-butylbenzene (0.2), Trans-1,3-dichloropropene (0.2), Trichlorofluoromethane (0.2), Vinyl chloride (0.2)

Table 10. Water–quality data from field measurements and laboratory analyses for inorganic nutrients, 1994

[°C, degrees Celsius; µs/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; —, no data; <, less than]

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temperature (°C)	Specific conductance (µS/cm)	pH (standard units)	Dissolved oxygen (mg/L)	Nitrite, dissolved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammonium, dissolved (mg/L as N)	Phosphorus ortho, dissolved (mg/L as P)
Illinois										
IL09	7–01	—	12.0	678	7.4	2.5	<0.01	30	0.02	<0.01
IL14	7–01	—	11.5	835	6.8	.0	<.01	<.05	.45	<.01
IL17	7–14	—	12.5	650	6.9	.1	<.01	.75	.09	<.01
IL26	7–11	—	14.5	342	7.7	1.4	<.01	3.1	<.01	.05
IL32	6–30	—	13.0	482	7.6	5.1	<.01	14	<.01	.03
IL34	6–30	—	13.0	520	7.1	.1	<.01	.45	.14	.02
IL35	7–12	—	23.0	332	6.8	6.5	<.01	.94	<.01	.02
IL36	7–11	—	14.5	800	6.8	1.0	<.01	.08	.02	<.01
Iowa										
IA13	7–13	7.00	11.0	756	6.9	—	<.01	<.05	.14	.01
IA16	7–12	—	13.5	681	7.1	1.7	.02	2.2	.04	.11
IA18	6–30	—	11.5	411	6.2	9.9	<.01	<.05	.45	<.01
IA23	7–01	—	11.0	758	7.1	.5	<.01	<.05	.09	<.01
IA25	7–19	—	9.0	763	7.2	.6	<.01	.30	.14	.05
IA36	7–13	17.00	13.0	641	7.4	2.8	<.01	3.2	.04	.04
Kansas										
KS01	7–26	—	14.5	1090	6.7	.3	<.01	.08	.87	.02
Minnesota										
MN15	8–16	—	10.0	1220	7.0	.1	<.01	<.05	.30	.03
MN26	8–16	—	14.0	1180	6.8	.0	<.01	17	.10	<.01
MN27	8–15	9.07	12.5	1190	7.0	.3	<.01	<.05	.11	<.01
MN28	8–16	—	12.5	1750	6.9	.0	<.01	.59	.25	.01

Table 10. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1993—Continued

Site identifier (figs. 1–2)	Date sampled (month, day)	Water level (feet)	Water temper-ature (°C)	Specific conduc-tance (µS/cm)	pH (stan-dard units)	Dis-solved oxygen (mg/L)	Nitrite, dis-solved (mg/L as N)	Nitrite plus nitrate, dissolved (mg/L as N)	Ammo-nium, dis-solved (mg/L as N)	Phospho-rus ortho, dissolved (mg/L as P)
Missouri										
MO04	6–28	—	19.0	837	7.5	.8	.05	.05	<.01	.01
MO05	7–22	41.00	15.5	696	7.4	3.7	<.01	<.05	.13	<.01
MO06	7–18	—	14.5	830	7.1	.3	<.01	<.05	.30	<.01
MO07	7–22	—	14.0	881	7.2	1.5	.02	4.2	.15	.02
MO08	7–19	—	7.0	930	7.2	.2	<.01	<.05	.72	<.01
MO09	7–22	—	15.5	716	7.2	.2	.02	3.5	.06	.01
MO15	6–28	—	15.0	744	7.1	.0	<.01	.05	.20	.02
Nebraska										
NE11	7–29	—	16.0	623	6.9	4.9	<.01	6.7	.02	.20
NE14	7–29	—	11.0	657	7.3	.2	.01	.17	.16	.17
NE18	7–26	—	12.0	714	7.0	.8	<.01	2.3	.07	.20
NE25	7–25	—	12.0	937	7.6	.1	.02	.89	.05	.34
NE28	7–29	—	12.0	592	7.1	5.3	<.01	2.9	.03	.22
NE29	7–28	—	12.5	584	7.3	5.8	<.01	10	.03	.17
NE31	7–25	—	14.0	903	7.5	.2	.01	1.5	.04	.02
NE33	8–09	—	14.5	2060	6.9	.8	<.01	.13	.02	.05
NE36	6–28	—	12.5	688	6.7	3.8	<.01	15	.04	.42
South Dakota										
SD01	9–02	4.50	11.0	822	7.0	6.5	<.01	.29	.09	.02
SD02	7–12	2.44	11.0	816	7.5	.1	.05	1.9	.04	.03
Wisconsin										
WI02	6–24	—	6.0	204	7.1	10.5	<.01	5.5	.02	.13

Table 11. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1994

[Samples were analyzed for the compounds acetochlor, ametryn, deethylcyanazine amide, deethylcyanazine, prometryn, propazine, and terbutryn, but those compounds were not detected above the 0.05 µg/L reporting limit. µg/L, micrograms per liter; Alachlor-ESA, alachlor ethanesulfonic acid; <, less than]

Site identifier (figs. 1–2)	Alachlor (µg/L)	Atrazine (µg/L)	Cyanazine (µg/L)	Cyanzine Amide (µg/L)	Deisopropylatrazine (µg/L)	Deethylatrazine (µg/L)	Alachlor-ESA (µg/L)	Metolachlor (µg/L)	Metribuzin (µg/L)	Prometon (µg/L)	Simazine (µg/L)
Illinois											
IL09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.8	<0.05	<0.05	<0.05	<0.05
IL14	<.05	<.05	<.05	<.05	<.05	<.05	.47	<.05	<.05	<.05	<.05
IL17	<.05	<.05	<.05	<.05	<.05	<.05	.34	<.05	<.05	.06	<.05
IL26	<.05	<.05	<.05	<.05	<.05	.14	.29	<.05	<.05	<.05	<.05
IL32	<.05	<.05	<.05	<.05	<.05	<.05	1.6	<.05	<.05	<.05	<.05
IL34	<.05	<.05	<.05	<.05	<.05	<.05	.73	<.05	<.05	<.05	<.05
IL35	<.05	.65	<.05	<.05	<.05	.05	.90	.17	<.05	<.05	<.05
IL36	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Iowa											
IA13	<.05	<.05	<.05	<.05	<.05	<.05	.43	<.05	<.05	<.05	<.05
IA16	<.05	.78	.06	.47	.14	.14	.33	.19	<.05	<.05	<.05
IA18	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA23	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
IA25	<.05	<.05	<.05	<.05	<.05	<.05	3.6	<.05	<.05	.07	<.05
IA36	<.05	<.05	<.05	<.05	<.05	<.05	.89	<.05	<.05	<.05	<.05
Kansas											
KS01	<.05	<.05	<.05	<.05	<.05	<.05	.15	<.05	<.05	<.05	<.05
Minnesota											
MN15	<.05	<.05	<.05	<.05	<.05	<.05	.15	<.05	<.05	<.05	<.05
MN26	<.05	<.05	<.05	.49	<.05	<.05	8.6	<.05	<.05	<.05	<.05
MN27	<.05	<.05	<.05	<.05	<.05	<.05	2.8	<.05	<.05	<.05	<.05
MN28	<.05	<.05	<.05	<.05	<.05	<.05	.29	<.05	<.05	<.05	<.05

Table 11. Water-quality data from laboratory analyses of water samples for selected herbicides and herbicide metabolites, 1994—Continued

Site identifier (figs. 1–2)	Ala-chlor (µg/L)	Atra-zine (µg/L)	Cyan-azine (µg/L)	Cyanzine Amide (µg/L)	Deiso-propyl-atrazine (µg/L)	De-ethyl-atrazine (µg/L)	Ala-chlor-ESA (µg/L)	Metol-achlor (µg/L)	Metri-buzin (µg/L)	Pro-meton (µg/L)	Sim-azine (µg/L)
Missouri											
MO04	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MO05	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MO06	.40	<.05	<.05	<.05	<.05	<.05	.24	<.05	<.05	<.05	<.05
MO07	<.05	<.05	<.05	<.05	<.05	<.05	.26	<.05	<.05	<.05	<.05
MO08	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
MO09	<.05	<.05	<.05	<.05	<.05	<.05	.38	<.05	<.05	<.05	<.05
MO15	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
Nebraska											
NE11	<.05	.16	<.05	<.05	<.05	.05	<.01	<.05	<.05	<.05	<.05
NE14	<.05	.46	.13	.22	.10	.11	.79	.05	<.05	<.05	.07
NE18	<.05	<.05	<.05	<.05	<.05	<.05	.11	<.05	<.05	<.05	<.05
NE25	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	.68	<.05
NE28	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
NE29	<.05	.12	<.05	<.05	<.05	<.05	.20	<.05	<.05	<.05	<.05
NE31	<.05	<.05	<.05	<.05	<.05	.18	<.10	<.05	<.05	<.05	<.05
NE33	<.05	.10	<.05	<.05	<.05	.28	1.5	<.05	<.05	<.05	<.05
NE36	<.05	<.05	<.05	<.05	<.05	.05	<.10	<.05	<.05	<.05	<.05
South Dakota											
SD01	<.05	<.05	<.05	<.05	<.05	<.05	<.10	<.05	<.05	<.05	<.05
SD02	<.05	.51	<.05	.13	.12	.10	1.1	<.05	<.05	<.05	<.05
Wisconsin											
WI02	<.05	<.05	<.05	<.05	<.05	<.05	.79	<.05	<.05	<.05	<.05

REFERENCES CITED

Aga, D.S., Thurman, E.M. and Pomes, M.L. 1994, Determination of alachlor and its sulfonic acid metabolite in water by solid-phase extraction and enzyme-linked immunosorbent assay: Analytical Chemistry, v. 66, p. 1,495–1,499.

Burkart, M.R., and Kolpin, D.W., 1993, Hydrologic and land-use factors associated with herbicides and nitrate in near-surface aquifers: Journal of Environmental Quality, v. 22, p. 646–656.

Burkhardt, M.R., Cinotto, P.J., Frahm, G.W., Woodworth, M.T., and Pritt, J.W., 1995, Methods for analysis by the U.S. Geological Survey National Water Quality Laboratory—Determination of methylene blue active substances by spectrophotometry: U.S. Geological Survey Open-File Report 95–189, 16 p.

Fishman, M.J., and Friedman, L.C., eds., 1989, Methods for the determination of inorganic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water Resources Investigations, book 5, chap. A1, 545 p.

Gianessi, L.P., and Puffer, C.M., 1990, Herbicide use in the United States: Washington, D.C., Resources for the Future, Inc., Quality of the Environment Division, 127 p. [revised 1991]

Gianessi, L.P., and Puffer, C.M., 1992, Insecticide use in the United States: Washington, D.C., Resources for the Future, Inc., Quality of the Environmental Division, 209 p.

Goolsby, D.A., Scribner, E.A., Thurman, E.M., Pomes, M.L., and Meyer, M.T., 1995, Data on selected herbicides and two triazine metabolites in precipitation of the midwestern and northeastern United States, 1990–1991: U.S. Geological Survey Open-File Report 95–469, 341 p.

Kolpin, D.W., and Burkart, M.R., 1991, Work plan for regional reconnaissance for selected herbicides and nitrate in ground water of the mid-continental United States, 1991: U.S. Geological Survey Open-File Report 91–59, 18 p.

Kolpin, D.W., Burkart, M.R., and Thurman, E.M., 1993, Hydrogeologic, water-quality, and land-use data for the reconnaissance of herbicides and nitrate in near-surface aquifers of the midcontinental United States, 1991: U.S. Geological Survey Open-File Report 93–114, 61 p.

Kolpin, D.W., Burkart, M.R., and Thurman, E.M., 1994, Herbicides and nitrate in near-surface aquifers in the Midcontinental United States, 1991: U.S. Geological Survey Water-Supply Paper 2413, 34 p.

Kolpin, D.W., Goolsby, D.A., Aga, D.S., Iverson, J.L., and Thurman, E.M., 1993, Pesticides in near-surface aquifers: Results of the midcontinental United States ground-water reconnaissance, 1991–92, *in* Goolsby, D.A., and others eds., Selected papers on agricultural chemicals in water resources of the midcontinental United States, U.S. Geological Survey Open-File Report 93–418, p. 64–74.

Kolpin, D.W., and Goolsby, D.A., 1995, A regional monitoring network to investigate the occurrence and distribution of agricultural chemicals in near-surface aquifers of the midcontinental USA, *in* Proceedings of Conference on Groundwater Quality: Remediation and Protection, Prague, Czech Republic, May 15–18, 1995, International Association of Hydrological Sciences Publication No. 225. p. 13–20.

Kolpin, D.W., Goolsby, D.A., and Thurman, E.M., 1995, Pesticides in near-surface aquifers: An assessment using highly sensitive analytical methods and tritium: Journal of Environmental Quality, v. 24, no. 6, p. 1,125–1,132.

Kolpin, D.W., and Thurman, E.M., 1995, Postflood occurrence of selected agricultural chemicals and volatile organic compounds in near-surface unconsolidated aquifers in the Upper Mississippi River Basin, 1993: U.S. Geological Survey Circular 1120–G, 20 p.

Kolpin, D.W., Nations, B.K., Goolsby, D.A., and Thurman, E.M., 1996, Acetochlor in the hydrologic system in the Midwestern United States: Environmental Science and Technology, v. 30, n. 5, p. 1,459–1,464.

Kolpin, D.W., Thurman, E.M., and Goolsby, D.A., 1996, Occurrence of selected pesticides and their metabolites in near-surface aquifers of the midwestern United States: Environmental Science and Technology, v. 30, no. 1, p. 335–340.

Meyer, M.T., 1994, Geochemistry of cyanazine and its metabolites: Indicators of contaminant transport in surface water of the midwestern United States: University of Kansas, Lawrence, Kansas, Ph.D. thesis, 362 p.

Meyer, M.T., Mills, M.S., and Thurman, E.M., 1993, Automated solid-phase extraction of herbicides from water for gas chromatography/mass spectrometry analyses: Journal of Chromatography, v. 629, p. 55–59.

Scribner, E.A., Thurman, E.M., Goolsby, D.A., Meyer, M.T., Mills, M.S., and Pomes, M.L., 1993, Reconnaissance data for selected herbicides, two atrazine metabolites, and nitrate in surface water of the midwestern United States, 1989–90: U.S. Geological Survey Open-File Report 93–457, 77 p.

Scribner, E.A., Goolsby, D.A., Thurman, E.M., Meyer, M.T., and Pomes, M.L., 1994, Concentrations of selected herbicides, two triazine metabolites, and nutrients in storm runoff from nine stream basins in the midwestern United States, 1990–92: U.S. Geological Survey Open-File Report 94–396, 144 p.

Thurman, E.M., Meyer, Michael, Pomes, Michael, Perry, C.A., and Schwab, A.P., 1990, Enzyme-linked immunosorbent assay compared with gas chromatography/mass spectrometry for the determination of triazine herbicides in water: Analytical Chemistry, v. 62, no. 18, p. 2,043–2,048.

U.S. Environmental Protection Agency, 1990, County-level fertilizer sales data: Washington, D.C., U.S. Environmental Protection Agency, Office of Policy Planning and Evaluation, September, 1990, computer disk.

———1992, Drinking water regulations and health advisories: Washington, D.C., U.S. Environmental Protection Agency, Office of Water, April 1992, 13 p.

U.S. Geological Survey, 1985, National water summary—1984 Hydrologic events, selected water-quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, 467 p.

Wershaw, R.L., Fishman, M.J., Grahbe, R.R., and Lowe, L.E., 1987, Methods for the determination of organic substances in water and fluvial sediments: U.S. Geological Survey Techniques of Water-Resources Investigations, book 5, chap. A3.

Zaugg, S.D., Sandstrom, M.W., Smith, S.G., and Fehlberg, K.M., 1995, Methods of analysis by the U.S. Geological Survey Nation Water Quality Laboratory—Determination of pesticides in water by C-18 solid-phase extraction and capillary-column gas chromatography/mass spectrometry with selected-ion monitoring: U.S. Geological Survey Open-File Report 95–181, 49 p.