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Selected Water-Quality Data from the Cedar River and Cedar Rapids Well Fields, Cedar Rapids, Iowa, 1999–2005

Data Series 494

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

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By Gregory R. Littin and Douglas J. Schnoebelen

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Contents

Figures

Tables

Conversion Factors and Datums

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
cubic foot (ft^3)	0.02832	cubic meter (m^3)
quart (qt)	0.9464	liter (L)
million gallons (Mgal)	3,785	cubic meter (m^3)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
	Mass	
ounce, avoirdupois (oz)	28.35	gram (g)
pound, avoirdupois (lb) per year (yr)	0.4536	kilogram (kg) per year (yr)

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

$$°F=(1.8\times°C)+32$$

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

$$°C=(°F-32)/1.8$$

Vertical coordinate information is referenced to the insert datum name (and abbreviation) here for instance, “North American Vertical Datum of 1988 (NAVD 88).”

Horizontal coordinate information is referenced to the insert datum name (and abbreviation) here for instance, “North American Datum of 1983 (NAD 83).”

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

*Transmissivity: The standard unit for transmissivity is cubic foot per day per square foot times foot of aquifer thickness [(ft3/d)/ft2]ft. In this report, the mathematically reduced form, foot squared per day (ft2/d), is used for convenience.

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

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

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Abstract

The Cedar River alluvial aquifer is the primary source of municipal water in the Cedar Rapids, Iowa area. Municipal wells are completed in the alluvial aquifer at approximately 40 to 80 feet deep. The City of Cedar Rapids and the U.S. Geological Survey have been conducting a cooperative study of the groundwater-flow system and water quality near the well fields since 1992. Previous cooperative studies between the City of Cedar Rapids and the U.S. Geological Survey have documented hydrologic and water-quality data, geochemistry, and groundwater models. Water-quality samples were collected for studies involving well field monitoring, trends, source-water protection, groundwater geochemistry, evaluation of surface and ground-water interaction, assessment of pesticides in groundwater and surface water, and to evaluate water quality near a wetland area in the Seminole well field. Typical water-quality analyses included major ions (boron, bromide, calcium, chloride, fluoride, iron, magnesium, manganese, potassium, silica, sodium, and sulfate), nutrients (ammonia as nitrogen, nitrite as nitrogen, nitrite plus nitrate as nitrogen, and orthophosphate as phosphorus), dissolved organic carbon, and selected pesticides including two degradates of the herbicide atrazine. In addition, two synoptic samplings included analyses of additional pesticide degradates in water samples. Physical field parameters (alkalinity, dissolved oxygen, pH, specific conductance and water temperature) were recorded with each water sample collected. This report presents the results of water quality data-collection activities from January 1999 through December 2005. Methods of data collection, quality-assurance samples, water-quality analyses, and statistical summaries are presented. Data include the results of water-quality analyses from quarterly and synoptic sampling from monitoring wells, municipal wells, and the Cedar River.

Introduction

The city of Cedar Rapids, in Linn County, Iowa, obtains its municipal water supply from a shallow alluvial aquifer adjacent to the Cedar River. Fifty-three vertical wells and four horizontal collector wells are completed at about 40 to 80 feet (ft) deep. Vertical wells gradually are being replaced by higher-yielding horizontal collector wells, but many of the vertical wells remain regularly used or in standby operation. Adequate quantities of generally high-quality water have been obtained from the alluvial aquifer since the resource was developed in 1962; however, increasing population and industrial development have increased the demand for municipal water. Cedar Rapids pumped about 40 million gallons per day (Mgal/d) from the alluvial aquifer in 2005 although peak demands have reached 50 Mgal/d at certain times, typically during the summer months (City of Cedar Rapids Water Department, oral commun., February 2006).

The City of Cedar Rapids and the U.S. Geological Survey (USGS) have been conducting a cooperative study of the groundwater-flow system, surface-water system, and water quality in and near the well fields since 1992. Schulmeyer (1995) analyzed the effect of the Cedar River on the quality of ground water near the municipal well fields. Schnoebelen and Schulmeyer (1996) documented hydrogeologic data collected and compiled from October 1992 to March 1996. Schulmeyer and Schnoebelen (1998) described the hydrogeology near the municipal well fields, documented a groundwater-flow model constructed to simulate regional groundwater flow under steady-state conditions, identified sources of water to the municipal well fields, and assessed temporal and spatial variations of selected water-quality constituents and properties. Boyd (1998) characterized groundwater flow near the municipal well fields with selected environmental isotopes and tracers. Boyd (1999) evaluated the occurrence and distribution of selected pesticide and pesticide degradate concentrations in the alluvial aquifer and Cedar River following springtime application of these pesticides to upstream cropland areas. Boyd and others (1999) further documented hydrogeologic data collected in the Cedar Rapids area from April 1996 to March 1999.

Purpose and Scope

This report presents the results of water quality data-collection activities from January 1999 through December 2005 for the cooperative study between the City of Cedar Rapids,

Iowa, and the USGS. Data presented in this report include results of water-quality analyses and physical field properties of water samples measured during sample collection from the Cedar River and wells in the Cedar Rapids municipal well fields.

Description of the Study Area

Cedar Rapids is within Linn County in east-central Iowa; water for the city of Cedar Rapids is supplied from three well fields (Seminole, East, and West) along the Cedar River (fig. 1). The city of Cedar Rapids has a population of about 121,000 (U.S. Census Bureau, 2000). Several large industries are major water users resulting in a per capita water usage that is nearly three times the national average for a city of this size (Cedar Rapids Water Department, written commun., February 2004). The Cedar River Basin drains an area of about 6,510 square miles (mi^2) upstream from the streamgaging station at Cedar Rapids (Cedar River at Cedar Rapids, USGS station number 05464500). Upstream land use is greater than 90 percent agriculture; corn and soybeans are the major crops. Livestock raised in the area include cattle and hogs. Annual precipitation averages about 36 inches per year (in/yr) in the Cedar Rapids area (National Oceanic and Atmospheric Administration, 1999). Extreme daily mean flows recorded at the streamgaging station during the study were 61,800 cubic feet per second (ft^3/s; May 27, 2004) and 326 ft^3/s (January 12, 2003; Nalley and others, 2005). Extreme daily mean flows recorded during the period of record (1903 to 2005) were 71,500 ft^3/s (March 31, 1961) and 140 ft^3/s (November 18, 1989; Nalley and others, 2006).

Hydrogeologic units in and near the well fields consist of an unconsolidated surficial layer of glacial till, loess, and the Cedar River alluvium (alluvial aquifer), underlain by carbonate bedrock of Devonian and Silurian age. The flood plain ranges from about 1,000 to 3,300 ft wide in the study area. The upland topography is characterized by rolling hills of low relief. Typically, glacial till and loess form upland areas that bound the alluvial aquifer. The alluvial aquifer ranges from 5 to 95 ft thick near the well fields and consists of a sequence of coarse sand and gravel at the base, grading upward to fine sand, silt, and clay near the surface. The thickness of the alluvium decreases as distance from the Cedar River increases; the thinnest alluvium is adjacent to the valley walls. The alluvial valley is bounded by steep bluffs that rise almost 200 ft above the river floodplain and, in places, include bedrock exposures. The bedrock aquifer has a maximum thickness of about 700 ft near the well fields. The bedrock aquifer primarily consists of jointed and fractured limestone and dolomite, with some interbedded chert and shale (Schulmeyer and Schnoebelen, 1998). There are no municipal wells completed in the bedrock aquifer, but it is used locally by private landowners and some industrial users. The unconsolidated surficial layers, carbonate bedrock of Devonian and Silurian age, and deeper hydrogeologic units are described in detail by Hansen (1970), Wahl and Bunker (1986), and Schulmeyer and Schnoebelen (1998).

The alluvial aquifer is recharged by infiltration from the Cedar River, precipitation, and seepage from the underlying bedrock and adjacent hydrogeologic units. In areas affected by municipal pumping, groundwater flow is from the Cedar River toward the well fields; in areas outside the affect of municipal pumping, groundwater flow is toward the Cedar River. The Cedar River is in direct hydraulic connection with the alluvial aquifer (Turco and Buchmiller, 2004). Hansen (1970) calculated an approximate transmissivity of the alluvial aquifer to be about 20,000 feet squared per day (ft^2/d). Subsequent investigations by Schulmeyer (1995) indicate that the transmissivity ranges from about 1,500 to 19,000 ft^2/d, depending on the physical properties of the alluvium. In May 2006, a contractor to the City of Cedar Rapids performed an aquifer test using Seminole well 10 (an abandoned well located on the edge of the river bank). Results of this aquifer test yielded a transmissivity value of approximately 15,000 ft^2/d (Cedar Rapids Water Department, oral commun., March 2007).

Acknowledgments

The authors thank the personnel of the Cedar Rapids Water Department for their assistance in data collection and construction of monitoring wells.

Methods of Study

Samples for water-quality analysis were collected from the Cedar River, monitoring wells within the municipal well fields, municipal wells, and the Cedar Rapids J-Avenue waterworks plant. Data include water-quality analyses and physical parameters measured at the time of sample collection. Well locations used for sampling are shown in figure 1. Statistics (minimum, maximum, mean, and median) were compiled for all water-quality samples. In addition, methods of quality assurance of samples are discussed and data on quality-control samples are presented.

Well Construction and Nomenclature

Wells sampled during the study included 2- and 4-inch (in.) outer-diameter monitoring wells. The monitoring wells were installed using hollow-stem auger drilling techniques and completed with polyvinyl-chloride (PVC) flush-joint casing. Bentonite grout was installed around the casing 6 to 8 ft below land surface and capped with a cement pad at the surface. Well depths ranged from 18 to 47.5 ft. Well construction information for all the monitoring wells is listed in table 1.

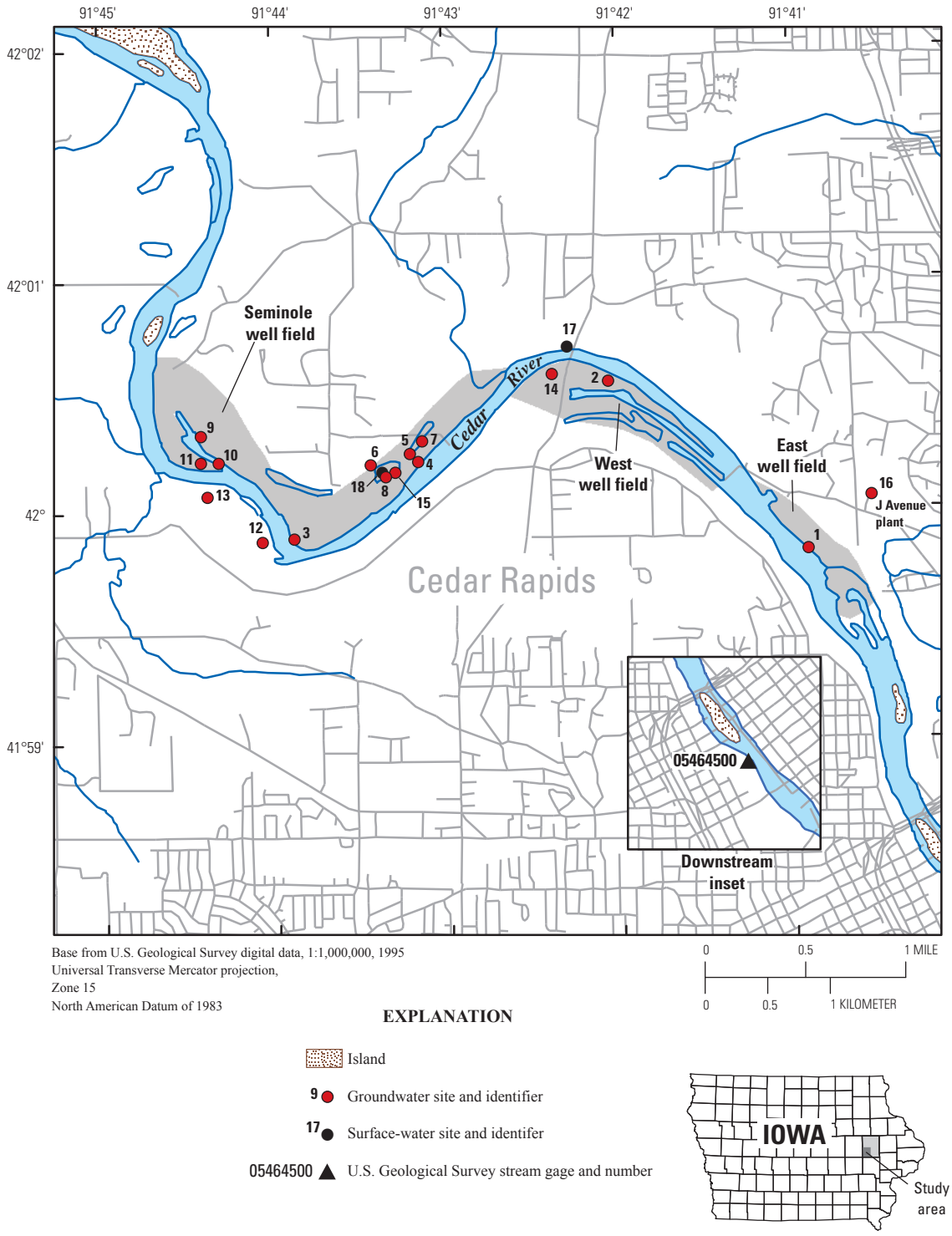

Figure 1. Groundwater and surface-water quality data-collection sites, Cedar Rapids, Iowa.

Table 1. Information for groundwater and surface-water quality data-collection sites, Cedar Rapids, Iowa, calendar years 1999–2005.

[ID, identifier; U, USGS monitor well; A, alluvium; V, vertical well; H, municipal multiple horizontal collector well; M, municipal multiple well composite; S, surface water; W, surface water; --, no data or not applicable]

Map ID	Site name	Site type	Type of water quality samples collected[1]	Number of samples collected	Period of record	Total depth (feet below land surface)	Casing diameter (inches)	Screened interval top/bottom (feet below and surface)	Land-surface elevation (feet above mean sea level)	Geologic unit
1	1993USGS CRM-1	U	C,N,P	17	1999–2003	42.5	4	40.0/42.5	721.26	A
2	1993USGS CRM-2	U	C,N,P	17	1999–2003	42.5	4	40.0/42.5	719.52	A
3	1993USGS CRM-4	U	C,N,P	17	1999–2003	42.5	4	40.0/42.5	726.45	A
4	1998USGS CRM-22	U	C,D,N,P	33	1999–2005	22.5	4	20.0/22.5	720.07	A
5	1998USGS CRM-23	U	C,N,P	30	1999–2005	27.0	4	22.0/27.0	722.07	A
6	1998USGS CRM-25	U	C,N,P	21	1999–2003	18.0	2	8.0/18.0	725.07	A
7	1998USGS CRM-26	U	C,N,P	20	1999–2003	23.0	2	18.0/23.0	722.07	A
8	1998USGS CRM-27	U	C,N,P	20	1999–2003	23.0	2	13.0/23.0	722.07	A
9	1990Seminole 14	V	C,N,P	6	2003–04	59.0	30	44.0/59.0	725.12	A
10	Seminole 17	V	C,D,N,P	11	2003–05	58.0	30	34.0/54.0	717.07	A
11	1991Seminole 18	V	C,N,P	5	2005	52.0	30	32.0/52.0	722.90	A
12	Seminole Ranney 1	H	C,D,N,P	10	2003–05	59.5	--	--	722.60	A
13	Seminole Ranney 2	H	C,N,P	9	2004–05	49.6	--	--	722.60	A
14	Edgewood Ranney	H	C,N,P	13	2003–05	67.0	--	--	721.00	A
15	Seminole Ranney 4	H	C,N,P	13	2003–05	64.0	--	--	720.00	A
16	J-Avenue Waterworks Plant	M	C,N,P	34	1999–2005	--	--	--	745.07	A
17	Cedar River at Edgewood Road	S	C,D,N,P	44	1999–2005	--	--	--	720.07	W
18	Wetland Pond at CRM-27	S	C,N,P	6	2001–03	--	--	--	--	W

[1] C, common ions and trace elements; N, nutrients; P, pesticides; D, herbicide degradates.

The monitoring wells are named according to a convention that includes the year the well was installed (for example, 1993), the agency identifier (USGS), the local project identifier, (CRM, for Cedar Rapids Municipal), and a unique incremental number (beginning with number 1). For example, well 1993 USGS CRM 1 is the first well installed by the USGS in 1993 for CRM. For convenience in this report, the year and agency identifier typically will not be included when referring to a site name.

Municipal wells used by the city of Cedar Rapids are identified with the first letter of the well field name (S, Seminole, E, East, and W, West) then the well number (for example Seminole 1 is S1). In addition, horizontal collector wells that have been added to the well fields during the last 15 years are identified as a "Ranney well".

Water-Quality Sampling and Analysis

Water-quality samples were collected from the Cedar River, 2- and 4-in. diameter monitoring wells, municipal wells, and the J-Avenue waterworks plant (municipal-well raw-water composite). Water-quality samples were collected for various project needs from January 1999 through December, 2005, which included quarterly water samples, synoptic water samples, and water samples documenting groundwater and surface-water interaction near a wetland.

Before collecting water samples, each monitoring well was pumped to remove approximately three borehole volumes of water. Water samples were collected using a stainless-steel submersible pump and chemically inert fluoropolymer tubing. Onsite measurements of air temperature, alkalinity, air pressure, dissolved oxygen, pH, specific conductance and water temperature were performed at the time of sample collection. Measurement of dissolved oxygen, pH, specific conductance, and water temperature were measured in a flow-through chamber for groundwater only. Water samples for analysis of nutrients and major ions were filtered through a 0.45-micrometer (µm) pore size polycarbonate capsule filter in the field. Water samples for pesticide analysis were filtered through a 142-millimeter (mm) diameter, 0.7-µm pore size, borosilicate glass-fiber filter baked at 450 degrees Celsius (ºC), and placed in a stainless steel filter unit. All samples were collected according to USGS protocols (U.S. Geological Survey, 2006). Water samples were kept chilled and shipped by overnight air express to the USGS National Water-Quality Laboratory (NWQL) in Denver, Colorado, for analysis.

Nutrients, dissolved organic carbon, and field parameters tested for in the water-quality samples, the Chemical Abstract Service Registry Number (CASRN), the National Water Information System (NWIS) parameter code, laboratory reporting levels (LRL), and reporting units are listed in table 2. This report contains CAS Registry Numbers®, which is a Registered Trademark of the American Chemical Society. CAS recommends the verification of the CASRNs through CAS Client ServicesSM. The term "nitrate" as used in this report includes the nitrite species as this form of the nitrogen species typically is a small concentration (less than 0.1 mg/L). The major ions and selected pesticides with two pesticide degradate compounds, followed by the CASRN number, NWIS parameter code, and LRLs are listed in tables 3 and 4, respectively. The LRL is used for specifying the lowest quantifiable value for constituents listed tables 2, 3, and 4 (unless footnoted otherwise). The LRLs for many of the constituents varied for the period of record covered by this report. The LRL is defined more rigorously by statistics than the older minimum reporting level (MRL) that it replaces at the NWQL (Oblinger-Childress and others, 1999).

Quality Assurance and Quality Control

To properly interpret water-quality data and to verify that these data are reliable and accurate, quality-assurance (QA) procedures and quality-control (QC) samples are needed. In general, quality assurance includes using correct procedures and protocols, proper documentation (log books and field sheets), and approved analytical methods. The QC samples typically estimate the magnitude of bias and variability of the environmental samples. Bias is systematic error that can "skew" results in either a positive or negative direction. The most common source of positive bias in water-quality studies is contamination of samples from airborne gases and particulates, or inadequately cleaned sampling equipment between uses and locations. Variability is the degree of random error of independent measurements of the sample quantity. Variability may be the result of errors in laboratory analytical procedures or in collection of samples in the field. The QA/QC procedures are required to ensure that the data collected meet standards of reliability and accuracy.

The QA/QC procedures for the study followed USGS protocols (USGS, 2006) and other USGS guidelines (Mueller and others, 1997). Approximately 10 percent of the total samples collected for the study were analyzed for quality control and included equipment blanks, field blanks, and replicates. Generally, blanks are used to estimate sample bias, whereas replicates are used to estimate sample variability.

A blank is a water sample that is intended to be free of the analytes of interest. Blank samples of deionized water guaranteed by the manufacturer to be free of organic compounds and another type of deionized water guaranteed by the manufacturer to be free of inorganic compounds were passed through all sampling equipment at the beginning of the field season. Equipment blank samples are collected in a "clean" environment such as the laboratory to examine the cleanliness of the equipment before sampling. A field blank is a specific type of blank sample collected in the field and used to demonstrate that (1) equipment has been adequately cleaned to remove contamination introduced by samples obtained at the previous site; (2) sample collection and processing have not resulted in contamination; and (3) sample handling, transport, and laboratory analysis have not introduced contamination

Table 2. Nutrients and dissolved organic carbon, field parameters tested for in water-quality samples, and reporting units.

[CASRN, Chemical Abstract Service Registry Number; NWIS, National Water Information System; LRLs, laboratory reporting levels; mg/L, milligrams per liter; --, not applicable; µS/cm, microsiemens per centimeter]

Water-quality constituent	CASRN number	NWIS parameter code	LRLs	Reporting units
Nutrients and dissolved organic carbon				
Nitrogen, ammonia, as N	7664-41-7	00608	0.02–.04	mg/L
Nitrogen, nitrate + nitrite, as N	--	00631	.06–.047	mg/L
Nitrogen, nitrite, as N	14797-65-0	00613	.01–.008	mg/L
Phosphorus, ortho, as P	14265-44-2	00671	.01–.02	mg/L
Dissolved organic carbon	--	00681	.40	mg/L
Field parameters				
Alkalinity	--	39086	--	mg/L
Dissolved oxygen	--	31501	--	mg/L
pH	--	00400	--	Standard units
Specific conductance	--	00095	--	µS/cm
Temperature, water	--	00010	--	Degrees Celsius

Table 3. Major ions tested for in water-quality samples, and reporting units.

[CASRN, Chemical Abstract Service Registry Number; NWIS, National Water Information System; LRLs, laboratory reporting levels; µg/L, micrograms per liter; mg/L, milligrams per liter; --, not applicable; µS/cm, microsiemens per centimeter]

Water-quality constituent	CASRN number	NWIS parameter code	LRLs	Reporting units
Boron	7440-42-8	01020	1.8	µg/L
Bromide	24959-67-9	71870	.2–.01	mg/L
Calcium	7440-70-2	00915	.02	mg/L
Calcium bicarbonate	3983-19-5	00453	.02	mg/L
Calcium carbonate	471-34-1	00442	.02	mg/L
Chloride	16887-00-6	00940	.12	mg/L
Fluoride	16984-48-8	00950	.17–.04	mg/L
Iron	7439-89-6	01046	8.0–6.0	µg/L
Magnesium	7439-95-4	00925	.014	mg/L
Manganese	7439-96-5	01056	3.2–2.2	µg/L
Potassium	7440-09-7	00935	.04	mg/L
Silica	7631-86-9	00955	.018	mg/L
Sodium	7440-23-5	00930	.02	mg/L
Sulfate	14808-79-8	00945	.1	mg/L
Total dissolved solids	--	70300	10	mg/L

Table 4. Selected pesticides and pesticide degradates tested for in water-quality samples, and reporting units.

[CASRN, Chemical Abstract Service Registry Number; NWIS, National Water Information System; LRLs, laboratory reporting levels; µg/L, micrograms per liter]

Water-quality constituent	CASRN number	NWIS parameter code	LRLs	Reporting units
CIAT[1]	6190-65-4	04040	0.05	µg/L
CEAT[1]	1007-28-9	04038	.05	µg/L
Acetochlor	34256-82-1	49260	.05	µg/L
Alachlor	15972-60-8	46342	.05	µg/L
Ametryn	834-12-8	38401	.05	µg/L
Atrazine	1912-24-9	39632	.05	µg/L
Bromacil	314-40-9	04029	.05	µg/L
Butachlor	23184-66-9	04026	.05	µg/L
Butylate	2008-41-5	04028	.05	µg/L
Carboxin	5234-68-4	04027	.05	µg/L
Cyanazine	21725-46-2	04041	.20	µg/L
Cycloate	1134-23-2	04031	.05	µg/L
Diphenamid	957-51-7	04033	.05	µg/L
Hexazinone	51235-04-2	04025	.05	µg/L
Metolachlor	51218-45-2	39415	.05	µg/L
Metribuzin	21087-64-9	82630	.05	µg/L
Prometon	1610-18-0	04037	.05	µg/L
Prometryn	7287-19-6	04036	.05	µg/L
Propachlor	1918-16-7	04024	.05	µg/L
Propazine	139-40-2	38535	.05	µg/L
Simazine	122-34-9	04035	.05	µg/L
Simetryn	1014-70-6	04030	.05	µg/L
Terbacil	5902-51-2	04032	.05	µg/L
Trifluralin	1582-09-8	04023	.05	µg/L
Vernolate	1929-77-7	04034	.05	µg/L

[1] Atrazine degradates: 2-Chloro-4-amino-6-isopropyl-amino-striazine (CIAT) and 2-Chloro-4-ethylamino-6-amino-s-triazine (CEAT).

(Mueller and others, 1997). Field blank samples of the deionized inorganic and organic free water were collected by passing the water through all pumps, filter plates, and filters to verify cleanliness of sampling equipment and technique. Field blank sample concentrations for inorganic and organic constituents typically were below the LRL. Otherwise stated, the blanks were "clean" and did not indicate any contamination from the equipment or sample processing methods. Results signify no cross-contamination of samples from sampling equipment between sample collection.

Replicates are two or more samples collected or processed so that the samples are considered to be essentially identical in composition. Each replicate sample is an aliquot of the native water sample that is processed and prepared in the same way as the environmental sample. A replicate sample set consists of two samples—a regular environmental sample and the replicate environmental sample. For the purposes of this report, the terms "environmental sample" and "replicate sample" are used to identify the particular samples in a replicate pair.

One objective of the replicate samples was to estimate the precision of concentration values from sample processing and analysis. Analysis of organic constituents generally are more variable than analyses of inorganic constituents. Replicate samples were compared by using relative percent differences (RPD). RPD between replicate samples was calculated by the following:

$$RPD = |S1-S2|/(S1+S2/2) \times 100 \quad (1)$$

where

S1 is equal to the concentration in the environmental sample, [given as micrograms per liter (µg/L) or milligrams per liter (mg/L)]

and

S2 is equal to the concentration in the replicate sample (given as same units as S1).

A large relative percent difference can indicate greater variability between samples. Variability for all constituents in the replicate samples generally were within 10 percent of the environmental samples. The median RPD for nutrients, organic carbon, and common ions ranged from 0 to 9.5 percent, and the median RPD for pesticides ranged from 0.1 to 5.3 percent (table 5). It should be noted that when comparing small or low concentrations between some replicate samples, the RPD can appear relatively large, because slight differences (common at the lowest detection levels) can result in higher RPDs. This typcially is the case for individual RPDs that had the largest percentage (10 percent or greater).

Surrogates are added to all environmental and quality-control samples for pesticide analysis before sample preparation in the laboratory. A surrogate has similar physical and chemical properties to the analytes of interest, but is not normally present in environmental samples. Surrogates provide quality control by monitoring matrix effects and gross processing errors (Wershaw and others, 1987), and help control for bias, either positive or negative. Surrogate recoveries of organic chemicals are expressed in percent and typically range from 80 to 120 percent. Surrogate recoveries that consistently are less than 70 percent may indicate that many targeted compounds may be present in greater concentrations than reported. Surrogate recovery rates (median percent recoveries ranging from 78.0 to 86.7 percent) and the mean percent recoveries (ranging from 77.5 to 87.4 percent) are listed in table 6.

Table 5. Summary of replicate water-quality data for nutrients, major ions, pesticides and pesticide degradates, Cedar Rapids, Iowa, calendar years 1999–2005.

[mg/L, milligrams per liter; µg/L, micrograms per liter]

Water-quality constituent	Number of replicate samples	Relative percent difference			
		Minimum	Maximum	Mean	Median
Nutrients					
Ammonia (mg/L as N)	26	0	37.1	3.6	0.5
Nitrite + nitrate (mg/L as N)	26	0	18.5	3.3	1.5
Nitrite (mg/L as N)	26	0	10.5	6.9	0
Orthophosphate (mg/L as P)	26	0	78.2	14.8	6.2
Organic carbon (mg/L)	24	0	28	4.7	3
Major ions					
Boron (µg/L)	25	0.40	17.7	6.0	5.3
Bromide (mg/L)	24	0	69.4	13.2	8.5
Calcium (mg/L)	25	.13	5.1	1.7	1.4
Chloride (mg/L)	25	.16	10.2	1.7	1
Fluoride (mg/L)	25	0	61.3	6.8	2.4
Iron (µg/L)	25	0	40.1	7.7	2.8
Magnesium (mg/L)	25	.12	12	1.7	1.2
Manganese (µg/L)	25	.03	66.6	4.8	.87
Potassium (mg/L)	25	0	12.3	3	2.2
Silica (mg/L)	25	0	6	.9	.46
Sodium (mg/L)	25	.22	34.3	4	2.2
Sulfate (mg/L)	25	.06	10.7	1.1	.57
Residue on evaporation (mg/L)	25	0	14.3	2	1
Pesticides					
Acetochlor (µg/L)	26	0	240	14.7	0
Alachlor (µg/L)	26	0	0	0	0
Ametryn (µg/L)	26	0	93.4	4.3	0
Atrazine (µg/L)	26	0	42	7.8	4.6
Bromacil (µg/L)	26	0	0	0	0
Cyanazine (µg/L)	26	0	0	0	0
Cycloate (µg/L)	26	0	0	0	0
Diphenamid (µg/L)	26	0	0	0	0
Metolachlor (µg/L)	26	0	58.5	8.2	5.3
Metribuzin (µg/L)	26	0	58.4	3.1	0
Prometon (µg/L)	26	0	34.6	4.7	0
Propazine (µg/L)	26	0	21.4	5.4	0
Simazine (µg/L)	26	0	22.9	.94	0
Terbacil (µg/L)	26	0	0	0	0
Trifluralin (µg/L)	26	0	0	0	0
CIAT[1] (µg/L)	26	0	22.3	7.7	5.5
CEAT[1] (µg/L)	26	0	46.2	6.5	0

[1] Atrazine degradates: 2-Chloro-4-amino-6-isopropyl-amino-striazine (CIAT) and 2-Chloro-4-ethylamino-6-amino-s-triazine (CEAT).

Table 6. Surrogate pesticide data for samples from groundwater and surface-water sampling sites with minimum, maximum, median, and mean percent recovery, Cedar Rapids, Iowa, calendar years 1999–2005.

Site name	Minimum	Maximum	Median	Mean
alpha-HCH-d6 surrogate (percent recovery)				
CRM-26	59.7	101.2	84.5	83.7
CRM-22	27.3	150.9	84.5	82.8
CRM-23	30.5	121.9	81.2	82.7
CRM-24	65.9	96.2	85.7	85.0
CRM-27	59.4	106.1	85.1	84.8
CRM-25	62.7	108.0	84.3	83.3
Cedar River	44.1	107.4	82.2	84.1
Wetland pond	55.0	98.4	87.2	80.0
Diazinon-d10 surrogate (percent recovery)				
CRM-26	62.4	113.3	83.6	83.2
CRM-22	29.8	151.2	80.4	78.0
CRM-23	27.0	147.0	78.0	78.5
CRM-24	60.6	89.5	78.9	77.5
CRM-27	67.3	128.2	86.7	87.4
CRM-25	62.0	117.6	82.9	79.9
Cedar River	31.6	123.4	81.4	81.0
Wetland pond	71.2	110.0	87.9	90.3

Water-Quality Data from Cedar River and Cedar Rapids Well Fields

The results of the water-quality samples collected from January 1999 through December 2005 are listed and summarized in tables 7 to 20 at the back of this report. Data compiled are from the Cedar River, water-quality monitoring of the wells from quarterly monitoring, evaluation of groundwater and surface-water interaction studies, and characterization of water quality in shallow groundwater near a wetland area in the Seminole Well Field.

Water-quality data from water samples were used to assess the alluvial aquifer and the Cedar River. The Cedar River is the main affect on water quality in the alluvial aquifer because of induced infiltration from the river because of pumping (Schulmeyer and Schnoebelen, 1998; Boyd, 1999; Turco and Buchmiller, 2004). Agricultural chemicals (nutrients and pesticides) are of concern because of the predominance of agricultural land use (90 percent and greater) in the Cedar River Basin. A 12-mile (mi) reach of the Cedar River upstream from Cedar Rapids, Iowa, is identified on the Total Maximum Daily Load (TMDL) list for nitrate impairment (Iowa Department of Natural Resources, 1994; U.S. Environmental Protection Agency, 2003). Water-quality data sampling efforts have concentrated on nutrients and pesticides with selected major ions and physical parameters.

Physical Parameters, Major Ions, and Nutrients

Physical parameters were measured at each sampling site whenever a sample for water quality was collected. Physical parameters include air pressure, dissolved oxygen, pH (field value and laboratory value), specific conductance, water temperature, air temperature and alkalinity. Summary statistics for physical parameters of water from all sites and from individual sites are shown in tables 7 and 8, respectively.

Major ion data compiled includes calcium, magnesium, potassium, sodium, bromide, chloride, fluoride, silica, sulfate, boron, iron, and manganese. Major ion data are required for characterization of the water chemistry and geochemical modeling. Major ion summary statistics for all sites are shown in table 9. Major ion data for groundwater samples from the alluvium versus surface-water samples from the river are summarized in table 10.

Most of the nutrient data include ammonia, nitrate plus nitrite, nitrite, and orthophosphate. In addition, dissolved organic carbon is summarized with nutrient data. Five samples were analyzed for ammonia plus organic nitrogen (filtered and unfiltered) and phosphorus (filtered and unfiltered). Nutrient summary statistics for water from all sites are shown in table 11. Nutrient data for groundwater samples from the alluvium versus surface-water samples from the river are summarized in table 12. Summary statistics for water from each individual site sampled for major ions, nutrients, and organic carbon are listed in table 13.

Pesticides

Pesticides are used to control unwanted vegetation, insects, and other pests in agricultural and urban areas. Typically, large amounts (thousands of pounds per year) of common herbicides are applied during the growing season in Iowa and in the Cedar River Basin to corn and soybean crops (Schnoebelen and others, 2003). Triazine (atrazine and cyanazine) and chloroacetanilide (acetochlor and metolachlor) herbicides generally are the most extensively used herbicides in eastern Iowa. Insecticides are detected less often in water most likely because of their lower use relative to herbicides, short persistence, and selected application during periods of reduced runoff (Schnoebelen and others, 2003). Pesticide degradates are formed when a parent pesticide compound breaks down or degrades. Pesticide degradates often have been detected at higher concentrations than their parent compounds (Kolpin and others, 2000, Kolpin and others, 2004, and Schnoebelen and others, 2003). The pesticide degradates of atrazine: 2-Chloro-4-ethylamino-6-amino-*s*-triazine (CEAT) and 2-Chloro-4-amino-6-isopropyl-amino-*s*triazine (CIAT) were the only two degradates regularly analyzed. These two degradates (CEAT and CIAT) are included in all tables listing the pesticides. Names of pesticide and pesticide degradates sampled for during the study period and their uses are listed in

table 14. Pesticides and pesticide degradates that were tested for but not detected are listed in tables 15 and 16, respectively.

Pesticide detections for water from all sites are shown in table 17. Pesticide detections for groundwater samples from the alluvium and surface-water samples from the river are shown in table 18. Pesticide detections by individual site are listed in table 19. Seven sites (CRM 22, CRM 23, Seminole 17, Ranney 1, Ranney 4, Waterworks Plant, and Cedar River at Edgewood Road) were sampled for pesticide degradates only; pesticide degradates detected in water from these seven sites are listed in table 20.

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Tables 7–20

Table 7. Physical parameters, summary statistics of groundwater and surface-water quality data combined, Cedar Rapids, Iowa, calendar years 1999–2005.

[mm Hg, millimeters mercury; mg/L milligrams per liter; std, standard; w, water; u, unfiltered; µS/cm, microseimens per centimeter; deg C, degrees Celsius; ±, plus or minus; %, percent]

	Air pressure (00025) (mm Hg)	Dissolved oxygen[1] (00300) (mg/L)	pH, field[2] (00400) (std units)	pH, wu, lab (00403) (std units)	Specific conductance, field[3] (00095) (µS/cm)	Specific conductance, lab (90095) (µS/cm)	Water temperature 00010) (deg C)	Air temperature (00020) (deg C)	Alkalinity (39086) (mg/L as $CaCO_3$)
Number of samples	183	310	313	297	318	298	319	180	240
Maximum	764	18.4	9.2	8.4	1,700	1,506	28.1	41.1	954
Minimum	724	0	6.3	6.6	226	359	0	-17.4	55
Average	746	3	7	8	552	549	13.9	15.2	212

[1] Instrument accuracy for 0 to 20 mg/L was ± 2% of reading or ± 0.2 mg/L, whichever was greater.

[2] Instrument accuracy was ± 0.2 units.

[3] Instrument accuracy was ± 0.5% of reading + 0.001 µS/cm.

Table 8. Physical parameters, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.

[mm Hg, millimeters mercury; mg/L milligrams per liter; std, standard; w, water; u, unfiltered; µS/cm, microseimens per centimeter; deg C, degrees Celsius; <, actual value is known to be less than value shown; --, no data]

Site name		Air pressure (00025) (mm Hg)	Dissolved oxygen (00300) (mg/L)	pH (00400) (std units)	pH, wu, lab (00403) (std units)
1993USGS CRM-1	Number of samples	12	15	17	17
	Maximum	762	.3	7.6	7.7
	Minimum	731	0	6.8	7.2
	Average	748	.1	7.2	7.4
1993USGS CRM-2	Number of samples	13	17	17	16
	Maximum	759	.5	7.9	8
	Minimum	731	<.1	6.8	7.4
	Average	747	.2	7.3	7.7
1993USGS CRM-4	Number of samples	12	17	17	17
	Maximum	760	4	7.7	7.9
	Minimum	731	0	6.6	7.2
	Average	746	.4	7.2	7.5
1998USGS CRM-22	Number of samples	18	31	31	31
	Maximum	764	11.4	7.8	8.1
	Minimum	732	0	6.5	7
	Average	745	1.2	7.4	7.6

Table 8. Physical parameters, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mm Hg, millimeters mercury; mg/L milligrams per liter; std, standard; w, water; u, unfiltered; µS/cm, microseimens per centimeter; deg C, degrees Celsius; <, actual value is known to be less than value shown; --, no data]

Site name		Air pressure (00025) (mm Hg)	Dissolved oxygen (00300) (mg/L)	pH (00400) (std units)	pH, wu, lab (00403) (std units)
1998USGS CRM-23	Number of samples	15	28	28	28
	Maximum	756	9.6	7.5	7.9
	Minimum	733	0	6.6	6.6
	Average	745	.9	7	7.3
1998USGS CRM-25	Number of samples	14	21	21	20
	Maximum	764	9.6	7.1	7.4
	Minimum	732	.1	6.3	6.9
	Average	746	6.1	6.7	7.1
1998USGS CRM-26	Number of samples	13	19	18	20
	Maximum	764	.6	7.4	7.8
	Minimum	735	<.1	6.7	7.2
	Average	747	.2	7.1	7.5
1998USGS CRM-27	Number of samples	14	20	19	20
	Maximum	764	4.7	7.2	7.7
	Minimum	731	0	6.6	7.1
	Average	747	.4	6.9	7.3
1990Seminole 14	Number of samples	1	6	6	4
	Maximum	737	3.5	7.3	7.5
	Minimum	737	.4	7.1	7.3
	Average	737	1.5	7.2	7.4
Seminole 17	Number of samples	5	11	11	11
	Maximum	749	3.8	7.5	7.7
	Minimum	737	.1	6.8	7.1
	Average	744	1.5	7.2	7.5
1991Seminole 18	Number of samples	3	5	5	5
	Maximum	749	6	7.5	7.7
	Minimum	744	.2	7.2	6.7
	Average	746	1.7	7.4	7.3
Seminole Ranney 1	Number of samples	4	10	10	9
	Maximum	747	8.1	7.6	7.7
	Minimum	743	.3	7	7.3
	Average	744	2.1	7.3	7.5

Table 8. Physical parameters, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mm Hg, millimeters mercury; mg/L milligrams per liter; std, standard; w, water; u, unfiltered; µS/cm, microseimens per centimeter; deg C, degrees Celsius; <, actual value is known to be less than value shown; --, no data]

Site name		Air pressure (00025) (mm Hg)	Dissolved oxygen (00300) (mg/L)	pH (00400) (std units)	pH, wu, lab (00403) (std units)
Seminole Ranney 2	Number of samples	2	9	9	9
	Maximum	747	5.1	7.7	7.8
	Minimum	742	.4	7.2	7.3
	Average	745	1.8	7	8
Edgewood Ranney	Number of samples	4	12	13	12
	Maximum	758	3.8	7.5	7.8
	Minimum	744	.2	7	7.2
	Average	750	.8	7.3	7.5
Seminole Ranney 4	Number of samples	5	12	13	11
	Maximum	758	4.2	7.6	8.1
	Minimum	743	.2	7.1	7.2
	Average	747	1.8	7.3	7.5
Cedar Rapids Waterworks	Number of samples	14	28	31	28
	Maximum	761	2.5	7.8	7.7
	Minimum	728	0	6.8	7.1
	Average	746	.7	7.2	7.4
Cedar River at Edgewood Rd.	Number of samples	29	41	41	33
	Maximum	764	18.4	9.2	8.4
	Minimum	724	7.5	7.4	6.7
	Average	745	11.6	8.2	8
Wetland Pond at CRM-27	Number of samples	5	6	6	5
	Maximum	764	17.6	8.9	8.1
	Minimum	732	4.5	7.1	7.5
	Average	745	11	8.1	7.8

Table 8. Physical parameters, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mm Hg, millimeters mercury; mg/L milligrams per liter; std, standard; w, water; u, unfiltered; µS/cm, microseimens per centimeter; deg C, degrees Celsius; <, actual value is known to be less than value shown; --, no data]

Site name		Specific conductance (00095) (µS/cm)	Specific conductance, wu (90095) (µS/cm)	Water temperature (00010) (deg C)	Air temperature (00020) (deg C)	Alkalinity (39086) (mg/L as $CaCO_3$)
[1]1993USGS CRM-1	Number of samples	17	17	17	16	16
	Maximum	1,700	1,506	21	27.1	954
	Minimum	448	438	3.5	-1	143
	Average	647	614	11.5	14.3	284
1993USGS CRM-2	Number of samples	17	16	17	15	16
	Maximum	772	775	24.5	28.5	369
	Minimum	430	434	9	-1.4	169
	Average	553	554	13.8	14.4	220
1993USGS CRM-4	Number of samples	17	17	17	16	16
	Maximum	674	691	24	33.7	276
	Minimum	433	435	9	-1	153
	Average	564	561	13.6	16.9	211.4
1998USGS CRM-22	Number of samples	32	31	32	17	22
	Maximum	715	697	26	29	263
	Minimum	390	365	.3	-4.1	123
	Average	537	523	14.1	16.5	198
1998USGS CRM-23	Number of samples	29	29	30	15	22
	Maximum	644	659	25	30	284
	Minimum	370	379	3.4	-4.1	172
	Average	521	522	14.2	14.6	210
1998USGS CRM-25	Number of samples	21	20	21	15	16
	Maximum	684	678	22	41.1	219
	Minimum	426	425	8.5	-1	132
	Average	504	509	14	16.6	170
1998USGS CRM-26	Number of samples	19	20	19	15	14
	Maximum	747	739	17	29	362
	Minimum	475	487	5	-1.3	164
	Average	581	581	12.9	15.8	234
1998USGS CRM-27	Number of samples	20	20	20	16	16
	Maximum	693	686	19	40.5	304
	Minimum	541	545	8	-.7	200
	Average	618	621	13.3	17.3	260.7

Table 8. Physical parameters, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mm Hg, millimeters mercury; mg/L milligrams per liter; std, standard; w, water; u, unfiltered; µS/cm, microseimens per centimeter; deg C, degrees Celsius; <, actual value is known to be less than value shown; --, no data]

Site name		Specific conductance (00095) (µS/cm)	Specific conductance, wu (90095) (µS/cm)	Water temperature (00010) (deg C)	Air temperature (00020) (deg C)	Alkalinity (39086) (mg/L as $CaCO_3$)
1990Seminole 14	Number of samples	6	4	6	--	2
	Maximum	598	575	17.3	--	226
	Minimum	498	481	9.8	--	183
	Average	565	533	12.9	--	205
Seminole 17	Number of samples	11	11	11	2	8
	Maximum	601	578	19.4	28.4	221
	Minimum	490	417	5.2	-7.9	173
	Average	544	512	13.1	10.3	202.3
1991Seminole 18	Number of samples	5	5	5	2	5
	Maximum	585	560	18.2	28.4	213
	Minimum	497	491	5.7	-9.7	196
	Average	551	535	11.3	9.4	207
Seminole Ranney 1	Number of samples	10	9	10	1	7
	Maximum	623	618	24.2	-16.7	219
	Minimum	444	424	4.6	-16.7	135
	Average	551	533	13.8	-16.7	195
Seminole Ranney 2	Number of samples	9	9	9	2	8
	Maximum	586	578	21.2	27.2	210
	Minimum	470	449	3.4	-14.5	164
	Average	535	512	13.2	6.4	189
Edgewood Ranney	Number of samples	13	11	13	2	9
	Maximum	607	579	23.1	28	228
	Minimum	483	468	7.3	-14.5	182
	Average	560	534	15.1	6.8	205
Seminole Ranney 4	Number of samples	13	11	13	1	7
	Maximum	734	623	28.1	-8.6	238
	Minimum	478	449	6.2	-8.6	176
	Average	567	540	15.3	-8.6	206
Cedar Rapids Waterworks	Number of samples	31	28	31	19	23
	Maximum	721	681	22	29.5	307
	Minimum	284	471	7	-17.4	172
	Average	562	579	14.4	14.6	229

Table 8. Physical parameters, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mm Hg, millimeters mercury; mg/L milligrams per liter; std, standard; w, water; u, unfiltered; µS/cm, microseimens per centimeter; deg C, degrees Celsius; <, actual value is known to be less than value shown; --, no data]

Site name		Specific conductance (00095) (µS/cm)	Specific conductance, wu (90095) (µS/cm)	Water temperature (00010) (deg C)	Air temperature (00020) (deg C)	Alkalinity (39086) (mg/L as $CaCO_3$)
Cedar River at Edgewood Rd.	Number of samples	42	34	42	22	28
	Maximum	724	660	27.1	31	243
	Minimum	234	359	0	1	128
	Average	508	517	14.6	17.1	184
Wetland Pond at CRM-27	Number of samples	6	5	6	4	5
	Maximum	1,125	1,090	27	37.6	205
	Minimum	226	463	3	-1.2	55
	Average	572	668	15.5	17.6	147

[1] Maximum values largely represent concentrations from a sample likely affected by nearby industrial waste.

Table 9. Major ions, summary statistics of groundwater and surface-water quality data combined, Cedar Rapids, Iowa, calendar years 1999–2005.

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; µg/L, micrograms per liter]

Ion or trace element	Number of samples	Maximum concentration[1] (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
Calcium	297	203.3	25.9	72.5
Magnesium	297	61.8	11	20.8
Potassium	297	10.7	1.16	2.7
Sodium	297	26.4	5	11.8
Bromide	287	.72	<.2	<.2
Chloride	299	42.9	8.56	24
Fluoride	297	.4	<.1	.2
Silica	297	26.1	<.04	11.9
Sulfate	297	539.9	<.1	35.3
Boron[2]	292	133.4	12.2	37.7
Iron[2]	297	37,314	<10	668
Manganese[2]	297	6,273	<3	512

[1] Maximum values largely represent concentrations from a groundwater sample likely affected by nearby industrial waste.

[2] Concentrations in ug/L.

Table 10. Major ions, summary statistics of water-quality data for groundwater and surface-water sampling sites, Cedar Rapids, Iowa, calendar years 1999–2005.

[mg/L, milligrams per liter; µg/L, micrograms per liter; <, actual value is known to be less than value shown; E, estimated]

Sample medium	Ion or trace element	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
Groundwater[1]	Calcium	259	203.3	27.7	72.8
	Magnesium	259	61.8	11	20.7
	Potassium	259	10.7	1.16	2.6
	Sodium	259	26.4	5.8	11.9
	Bromide	253	.72	<.2	<.2
	Chloride	259	42.9	10.9	24
	Fluoride	259	.4	<.1	.2
	Silica	259	26.1	<.04	12.4
	Sulfate	259	83.7	<.1	33.4
	Boron[2]	256	133.4	12.2	37.7
	Iron[2]	259	37,314	<10	764
	Manganese[2]	259	6,273	<3	584
Surface water	Calcium	38	166.3	25.9	70.1
	Magnesium	38	295	15.1	21.7
	Potassium	38	5.86	1.65	2.7
	Sodium	38	24.6	5.1	11.6
	Bromide	34	.29	<.6	<.6
	Chloride	40	42.2	8.56	23.9
	Fluoride	38	.3	<.17	.22
	Silica	38	20.3	E.072	8.6
	Sulfate	38	539.9	.12	48.3
	Boron[2]	36	61.9	16.4	31.9
	Iron[2]	38	167.3	<10	13.9
	Manganese[2]	38	383.6	<3	26

[1] Maximum values largely represent concentrations from a sample likely affected by nearby industrial waste.

[2] Concentrations in ug/L.

Table 11. Nutrients, summary statistics of groundwater and surface-water quality data combined, Cedar Rapids, Iowa, calendar years 1999–2005.

[mg/L, milligrams per liter; w, water; f, filtered; u, unfiltered]

Nutrient	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
NH_3+orgN, wf	5	0.62	0.24	0.39
NH_3+orgN, wu	5	3.1	1	1.8
Ammonia	306	22.6	.01	.6
NO_2+NO_3	306	12.6	.02	2.6
Nitrite	306	.443	.003	.02
Orthophosphate	305	.73	.01	.06
Phosphorus, wf	5	.154	.011	.064
Phosphorus, wu	5	.88	.14	.32
Organic carbon	271	12.7	.65	2.4

Table 12. Nutrients, summary statistics of water-quality data for groundwater and surface-water sampling sites, Cedar Rapids, Iowa, calendar years 1999–2005.

[mg/L, milligrams per liter; w, water; f, filtered; u, unfiltered; --, no data]

Sample medium	Nutrient	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
Groundwater	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	262	22.6	0.01	0.6
	NO_2+NO_3	262	11.5	.02	2.2
	Nitrite	262	.443	.003	.02
	Orthophosphate	261	.73	.005	.06
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	236	6.6	.7	2.2
Surface water	NH_3+orgN, wf	5	.62	.24	.39
	NH_3+orgN, wu	5	3.1	1	1.8
	Ammonia	44	5.16	.01	.15
	NO_2+NO_3	44	12.6	.025	5.43
	Nitrite	44	.102	.004	.02
	Orthophosphate	46	.16	.005	.06
	Phosphorus, wf	5	.154	.011	.064
	Phosphorus, wu	5	.88	.138	.32
	Organic carbon	35	12.7	2.12	3.9

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
[1]1993USGS CRM-1	Calcium	17	203	46.3	69
	Magnesium	17	61.8	14.6	22.6
	Potassium	17	10.7	1.16	3.38
	Sodium	17	26.4	8.06	15
	Bromide	17	.72	<.03	.13
	Chloride	17	43	17.6	28
	Fluoride	17	.3	<.17	.2
	Silica	17	26.1	9.1	18
	Sulfate	17	59	E.15	21
	Boron[2]	17	92	14	40
	Iron[2]	17	37,300	3,490	9,978
	Manganese[2]	17	6,270	1,050	2,461
	NH_3orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	16	22.6	.43	5.1
	NO_2+NO_3	16	.03	.025	.03
	Nitrite	16	.014	.003	.006
	Orthophosphate	16	.73	.01	.19
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	15	6.6	1.9	3
1993USGS CRM-2	Calcium	16	95.2	49.9	68.6
	Magnesium	16	31.8	16.6	22.2
	Potassium	16	3.91	1.63	2.5
	Sodium	16	21.5	8.07	13.3
	Bromide	16	.07	.01	.03
	Chloride	16	36.1	16.8	25.3
	Fluoride	16	.3	.1	.2
	Silica	16	17.2	8.02	11.6
	Sulfate	16	47.2	13.6	28.9
	Boron[2]	16	48.3	17.1	27.1
	Iron[2]	16	82.2	5	20
	Manganese[2]	16	1,170	74.5	794
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	16	1.41	.01	.3
	NO_2+NO_3	16	6.07	.025	.78

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
1993USGS CRM-2—Continued	Nitrite	16	0.019	0.003	0.005
	Orthophosphate	15	.06	.02	.03
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	15	3	1.5	2
1993USGS CRM-4	Calcium	17	101	54.8	75.7
	Magnesium	17	24.8	13.8	18.6
	Potassium	17	3.83	1.79	2.6
	Sodium	17	16.1	7.09	10.8
	Bromide	17	.05	.01	.03
	Chloride	17	30.4	18	22.8
	Fluoride	17	.3	.1	.2
	Silica	17	13.3	7.48	9.5
	Sulfate	17	52.3	26.2	38.6
	Boron[2]	17	42.2	16.4	28.2
	Iron[2]	17	6	4	5
	Manganese[2]	17	1,906	1.5	771
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	16	.13	.01	.04
	NO_2+NO_3	16	10.1	.025	2.3
	Nitrite	16	.242	.003	.036
	Orthophosphate	16	.12	.05	.07
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	15	3.1	1.1	1.7
1998USGS CRM-22	Calcium	31	89.4	35.8	62
	Magnesium	31	37.9	14.2	22
	Potassium	31	5.19	1.47	2.7
	Sodium	31	22.5	5.8	12.7
	Bromide	30	.1	.005	.03
	Chloride	31	41.3	11.5	25.2
	Fluoride	31	.3	.09	.2
	Silica	31	25.6	5.52	10.6
	Sulfate	31	61.1	9.2	30.7
	Boron[2]	31	48.1	19	31.3
	Iron[2]	31	507	5	121
	Manganese[2]	31	2,320	1.1	549

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
1998USGS CRM-22—Continued	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	32	7.55	0.01	0.98
	NO_2+NO_3	32	11.5	.025	3.4
	Nitrite	32	.3	.003	.03
	Orthophosphate	32	.48	.06	.14
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	27	4.3	1.5	2.4
1998USGS CRM-23	Calcium	29	92.9	57.2	73.3
	Magnesium	29	25.3	15.2	19
	Potassium	29	4.03	1.35	2.3
	Sodium	29	14.5	6.74	9.3
	Bromide	29	.1	.005	.03
	Chloride	29	30.4	12.7	21.2
	Fluoride	29	.4	.05	.2
	Silica	29	15.4	5.4	12.3
	Sulfate	29	54.6	19.1	31.8
	Boron[2]	29	62.5	12.2	27.4
	Iron[2]	29	312.4	3.2	73.6
	Manganese[2]	29	246	.9	51.9
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	30	.19	.01	.03
	NO_2+NO_3	30	6.79	.02	1.34
	Nitrite	30	.443	.003	.06
	Orthophosphate	30	.14	.028	.1
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	26	3.9	1.5	2.7
1998USGS CRM-25	Calcium	20	99.8	57.8	72.7
	Magnesium	20	17.9	11	13.4
	Potassium	20	2.66	1.67	2.1
	Sodium	20	13.8	7.74	10.2
	Bromide	20	.06	.02	.03
	Chloride	20	21.7	10.9	15.7
	Fluoride	20	.2	.05	.1
	Silica	20	17.4	11.9	14.9

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
1998USGS CRM-25—Continued	Sulfate	20	83.7	0.2	48
	Boron[2]	20	115.6	42.4	93.6
	Iron[2]	20	12.6	4	6
	Manganese[2]	20	5.7	0.3	2
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	21	.07	.01	.02
	NO_2+NO_3	21	7.66	3.05	5.1
	Nitrite	21	.017	.003	.005
	Orthophosphate	21	.1	.06	.1
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	16	1.6	.7	1
1998USGS CRM-26	Calcium	20	113	57	75.6
	Magnesium	20	29.6	15.5	21.1
	Potassium	20	3.43	1.94	2.7
	Sodium	20	16.3	7.46	11.5
	Bromide	20	.06	.02	.03
	Chloride	20	32.3	17.5	23.4
	Fluoride	20	.3	.2	0.2
	Silica	20	16.8	7.7	12
	Sulfate	20	48.2	20.8	32.3
	Boron[2]	20	58.4	16.4	35.3
	Iron[2]	20	230.6	5	34.9
	Manganese[2]	20	1,078	133	612
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	20	.8	.01	.06
	NO_2+NO_3	20	2.75	.025	.48
	Nitrite	20	.055	.003	.01
	Orthophosphate	20	.04	.005	.02
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	16	3.1	1.6	2.1
1998USGS CRM-27	Calcium	20	106.3	77.5	90.1
	Magnesium	20	22.4	17.4	20.5
	Potassium	20	3.65	2.35	3
	Sodium	20	12.4	7	8.3

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
1998USGS CRM-27—Continued	Bromide	20	0.06	0.01	0.02
	Chloride	20	27.8	14.7	19.2
	Fluoride	20	.3	.1	.2
	Silica	20	15	9.9	12.4
	Sulfate	20	57	.05	31
	Boron[2]	20	44.3	16.4	32.3
	Iron[2]	20	85.4	4	11.5
	Manganese[2]	20	1,103	.3	614
	NH_3+orgN, wf	--	--	--	--
	NH_2+orgN, wu	--	--	--	--
	Ammonia	20	.19	.01	.1
	NO_2+NO_3	20	9.46	.025	1.1
	Nitrite	20	.1	.003	.018
	Orthophosphate	20	.05	.01	.02
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	16	3.4	1.9	2.5
1990Seminole 14	Calcium	4	90.5	67.3	81.8
	Magnesium	4	18.9	18	18.4
	Potassium	4	2.84	1.96	2.28
	Sodium	4	14.2	10.7	12.4
	Bromide	4	.08	.03	.06
	Chloride	4	28.8	23.8	25.6
	Fluoride	4	.2	.1	.2
	Silica	4	13.6	11.1	12.5
	Sulfate	4	44.2	34.4	40.7
	Boron[2]	4	30.4	21.3	25.7
	Iron[2]	4	1,489	140	997
	Manganese[2]	4	388	206	299
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	5	.14	.03	.08
	NO_2+NO_3	5	1.5	.97	1.2
	Nitrite	5	.01	.004	.01
	Orthophosphate	5	.01	.01	.01
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	5	2.1	1.4	1.7

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
Seminole 17	Calcium	11	79.6	27.7	69.1
	Magnesium	11	23.7	18.1	21.2
	Potassium	11	3.27	2.04	2.7
	Sodium	11	18.8	10.4	13.3
	Bromide	11	.1	.02	.04
	Chloride	11	33.5	24	27.5
	Fluoride	11	.3	.2	.2
	Silica	11	11.4	.02	9.1
	Sulfate	11	43.1	29.4	36
	Boron[2]	11	34	19.4	27.1
	Iron[2]	11	229	4	132
	Manganese[2]	11	470	3.8	273
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	11	.28	.02	.1
	NO_2+NO_3	11	5.01	.34	2.7
	Nitrite	11	.02	.004	.008
	Orthophosphate	11	.02	.01	.01
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	11	3.4	1.7	2.2
1991Seminole 18	Calcium	5	78.9	64.2	73
	Magnesium	5	25.4	18.5	22.7
	Potassium	5	3.41	2.31	2.7
	Sodium	5	14.2	11.4	12.8
	Bromide	5	.06	.04	.04
	Chloride	5	29.2	26.1	27.4
	Fluoride	5	.3	.2	.2
	Silica	5	9.4	7.65	8.5
	Sulfate	5	40.3	32.5	36.1
	Boron[2]	5	32.6	21.2	27
	Iron[2]	5	191	141	167
	Manganese[2]	5	196	114	144
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	5	.05	.02	.03
	NO_2+NO_3	5	4.8	.91	3.2
	Nitrite	5	.005	.004	.004
	Orthophosphate	5	.01	.01	.01

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
1991Seminole 18—Continued	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	5	2.4	1.7	2.1
Seminole Ranney 1	Calcium	9	90.3	57.4	74.5
	Magnesium	9	26.1	15.3	20.9
	Potassium	9	2.73	1.9	2.4
	Sodium	9	15.9	9.57	12.8
	Bromide	9	.11	.02	.05
	Chloride	9	30.6	23.7	27.6
	Fluoride	9	.3	.2	.2
	Silica	9	14.6	8.51	10.9
	Sulfate	9	44.7	29.2	36.8
	Boron[2]	9	30	20.8	26
	Iron[2]	9	6.9	3	3.5
	Manganese[2]	9	109	25.6	53.7
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	10	.09	.02	.05
	NO_2+NO_3	10	7.05	.74	3.61
	Nitrite	10	.006	.004	.004
	Orthophosphate	10	.04	.01	.02
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	10	2.6	1.5	2
Seminole Ranney 2	Calcium	9	77.6	55.1	68.8
	Magnesium	9	25.8	17.2	22.0
	Potassium	9	3.1	2.09	2.6
	Sodium	9	16.7	9.64	12.5
	Bromide	8	.1	.01	.04
	Chloride	9	31.4	17.7	25.8
	Fluoride	9	.3	.2	.2
	Silica	9	12.1	7.24	9.4
	Sulfate	9	40.4	28.9	34.4
	Boron[2]	9	31.2	21.9	26
	Iron[2]	9	82.2	3	22.5
	Manganese[2]	9	92.9	5.2	41.6
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
Seminole Ranney 2—Continued	Ammonia	9	0.07	0.02	0.03
	NO_2+NO_3	9	8.07	1.39	4.54
	Nitrite	9	.006	.004	.004
	Orthophosphate	9	.05	.01	.03
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	9	2.6	1.7	2
Edgewood Ranney	Calcium	12	84	64.3	73.7
	Magnesium	12	25.3	18.3	21.5
	Potassium	12	3.23	2.39	2.8
	Sodium	12	19.7	9.45	13.5
	Bromide	10	.1	.02	.04
	Chloride	12	38.5	21.6	28.7
	Fluoride	12	.3	.2	.2
	Silica	12	16.8	11.9	14.4
	Sulfate	12	46.3	25.6	32.5
	Boron[2]	12	34	23.4	28.1
	Iron[2]	12	241	3.2	49.1
	Manganese[2]	12	1,370	364	730
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	12	1.74	.2	.7
	NO_2+NO_3	12	7.81	.06	2.7
	Nitrite	12	.014	.004	.008
	Orthophosphate	12	.09	.01	.03
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	12	2.6	1.5	2.2
Seminole Ranney 4	Calcium	11	87	62.9	74.6
	Magnesium	11	27.3	17.1	22
	Potassium	11	2.95	2.4	2.7
	Sodium	11	18.2	10.1	13.4
	Bromide	11	.1	.02	.04
	Chloride	11	34.9	20.3	27.8
	Fluoride	11	.3	.2	.2
	Silica	11	13.3	10.7	11.8
	Sulfate	11	51.9	29.1	38.3
	Boron[2]	11	39.4	23	29.6

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
Seminole Ranney 4—Continued	Iron[2]	11	93.3	3	27
	Manganese[2]	11	663	63.4	335
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	12	1.14	.02	.27
	NO_2+NO_3	12	8.41	.51	2.9
	Nitrite	12	.034	.004	.01
	Orthophosphate	12	.06	.02	.04
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	12	2.6	1.5	2
Cedar Rapids Waterworks	Calcium	28	91.2	61.7	73.3
	Magnesium	28	30	18.3	23.7
	Potassium	28	3.8	2.3	2.8
	Sodium	28	17.4	7.3	13
	Bromide	27	.38	.02	.06
	Chloride	28	34.5	17.7	26.4
	Fluoride	28	.3	.1	.2
	Silica	28	17	11.8	14.5
	Sulfate	28	40.9	24.5	31.5
	Boron[2]	28	133.0	24.4	54.9
	Iron[2]	28	1,223	4.5	486
	Manganese[2]	28	1,134	430	794
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	27	1.68	.42	1.04
	NO_2+NO_3	27	4.96	.22	1.54
	Nitrite	27	.073	.003	.01
	Orthophosphate	27	.05	.01	.02
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	26	2.7	1.3	2
Cedar River at Edgewood Road	Calcium	33	97.7	.01	64
	Magnesium	33	28.5	.002	21
	Potassium	33	3.69	.05	2.5
	Sodium	33	24.6	.03	11
	Bromide	30	.1	.005	0

Table 13. Major ions and nutrients, summary statistics of groundwater and surface-water quality data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[mg/L, milligrams per liter; <, actual value is known to be less than value shown; E, estimated; w, water; f, filtered; u, unfiltered; --, no data; µg/L, micrograms per liter]

Site name	Constituent	Number of samples	Maximum concentration (mg/L)	Minimum concentration (mg/L)	Average (mg/L)
Cedar River at Edgewood Road—Continued	Chloride	35	42.2	0.05	24
	Fluoride	33	.3	.05	.2
	Silica	33	20.3	.025	9
	Sulfate	33	47.1	.05	30
	Boron[2]	31	42	8	30
	Iron[2]	33	167	3	13
	Manganese[2]	33	384	1.5	19
	NH_3+orgN, wf	5	.62	.24	.39
	NH_3+orgN, wu	5	3.1	1	1.8
	Ammonia	39	.24	.01	.03
	NO_2+NO_3	39	12.6	.03	5.9
	Nitrite	39	.076	.004	.02
	Orthophosphate	39	.16	.005	.07
	Phosphorus, wf	5	.154	.011	.06
	Phosphorus, wu	5	.88	.138	.32
	Organic carbon	30	6.1	2.1	3.3
Wetland Pond at CRM-27	Calcium	5	166	63.2	93.3
	Magnesium	5	43.5	16.8	25.2
	Potassium	5	5.86	2.06	4.01
	Sodium	5	16.2	7.95	11.2
	Bromide	4	.29	.01	.08
	Chloride	5	24.1	17.8	21
	Fluoride	5	.3	.1	.2
	Silica	5	8.68	3.27	6.76
	Sulfate	5	540	24.5	162
	Boron[2]	5	61.9	21.5	42
	Iron[2]	5	51.9	4	19.2
	Manganese[2]	5	178	5.2	70
	NH_3+orgN, wf	--	--	--	--
	NH_3+orgN, wu	--	--	--	--
	Ammonia	5	5.16	.02	1.06
	NO_2+NO_3	5	8.88	.03	2
	Nitrite	5	.102	.004	.04
	Orthophosphate	5	.06	.01	.03
	Phosphorus, wf	--	--	--	--
	Phosphorus, wu	--	--	--	--
	Organic carbon	5	12.7	4	7.6

[1] Maximum values largely represent concentrations from a sample likely affected by nearby industrial waste.

[2] Concentrations in µg/L.

Table 14. Information on pesticides and pesticide degradates tested at water-quality sampling sites, Cedar Rapids, Iowa, calendar years 1999–2005.

[NWIS, National Water Information System; CASRN, Chemical Abstract Service Registry Number; --, not available]

NWIS code	NWIS name	Other common names[1]	CASRN	Uses[2]	Chemical class[2]
82660	2,6-Diethylaniline	DEA	71477-82-2	Breakdown product of alachlor	--
62850	EMAOA[3]	--	--	--	--
04040	CIAT[4]	Deethylatrazine (DEA)	6190-54-4	Breakdown product of atrazine	Triazine
04038	CEAT[5]	Deisopropylatrazine (DIA)	1007-28-9	Breakdown product of atrazine	Triazine
46342	Alachlor	Alanox, Lasso, Metachlor	[2]15972-60-8	Herbicide	Chloroacetanilide
62849	Alachlor ESA SA	--	--	Breakdown product of alachlor	--
50009	Alachlor ESA	--	--	Breakdown product of alachlor	--
61031	Alachlor OA	--	--	Breakdown product of alachlor	--
62848	Alachlor SAA	--	--	Breakdown product of alachlor	--
49260	Acetochlor	Harness, Nevirex	[2]34256-82-1	Herbicide	Chloroacetanilide
61029	Acetochlor ESA	--	--	Breakdown product of acetochlor	--
61030	Acetochlor OA	--	--	Breakdown product of acetochlor	--
62847	Acetochlor SAA	--	--	Breakdown product of acetochlor	--
62676	OIAT[6]	Deethylhydroxyatrazine (DHEA)	--	Breakdown product of atrazine	Triazine
50355	OIET[7]	Hydroxyatrazine (HA)	2160-68-0	Breakdown product of atrazine	Triazine
62678	OEAT[8]	Deisopropylhydroxyatrazine (DIHA)	--	Breakdown product of atrazine	Triazine
34253	alpha-HCH	alpha-BHC, Agrocide, Ben-Hex, Hexatox	[2]319-84-6	Insecticide	Organochlorine
38401	Ametryn	Topazol, Trinatox D	834-12-8	Herbicide	Triazine
39632	Atrazine	Fenatrol, Herbatoxol, Weedex	93616-39-8	Herbicide	Triazine
82686	Azinphos-methyl	Carfene, Crysthyon 2L, Metazintox	86-50-0	Insecticide	Organophosphorous
82673	Benfluralin	Benefex, Emblem, Quilan	[2]1861-40-1	Herbicide	2,6-Dinitroaniline
04029	Bromacil	Du Pont herbicide 976, Nalkil, Rout G-8	[2]314-40-9	Herbicide	Uracil
04026	Butachlor	Machete, Weedout	23184-66-9	Herbicide	Chloroacetanilide
04028	Butylate	Tomahawk	2008-41-5	Herbicide	Thiocarbamate
82680	Carbaryl	Bug master, Karbaspray, Vioxan	63-25-2	Insecticide, plant growth regulator, nematicde	N-methyl carbamate
82674	Carbofuran	Furadan, Pillarfuran	1563-66-2	Insecticide, nematicide	N-methyl carbamate
04027	Carboxin	Enhance, Germate Plus	5234-68-4	Fungicide	Carboxamide
62674 and 04039	CAAT[9]	Deethyldeisopropyl-atrazine, Didealkyatrazine (DDA)	3397-62-4	Breakdown product of atrazine	Triazine
38933	Chlorpyrifos	Killmaster, Lock-on, Radar	[2]2921-88-2	Insecticide, nematicide	Organophosphorous
82687	cis-Permethrin	Corsair, Dragon, Ectiban, Nix	61949-76-6	Stereoisomer of permethrin[10]	--
04041	Cyanazine	Bladex, Cynex, Fortrol	21725-46-2	Herbicide	Triazine
61745	Cyanazine acid	CAC	--	Breakdown product of cyanazine	Triazine
50010 and 61709	Cyanazine amide	CAM	--	Breakdown product of cyanazine	Triazine

Table 14. Information on pesticides and pesticide degradates tested at water-quality sampling sites, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[NWIS, National Water Information System; CASRN, Chemical Abstract Service Registry Number; --, not available]

NWIS code	NWIS name	Other common names[1]	CASRN	Uses[2]	Chemical class[2]
04031	Cycloate	Ro-Neet, Ronit	[2]1134-23-2	Herbicide	Thiocarbamate
82682	DCPA	Dicyclopentenyl acrylate, Fatal, Tetral, Rid [10]	[2]1861-32-1	Herbicide	Alkyl Phthalate
63778	Dechloroacetochlor	--	--	Breakdown product of acetochlor	--
63777	Dechloroalachlor	--	--	Breakdown product of alachlor	--
63779	Dechlorodimethenamid	--	--	Breakdown product of dimethenamid	--
63780	Dechlorometolachlor	--	--	Breakdown product of alachlor	--
61749	Deethylcyanazine	--	--	Cyanazine metabolite	--
61750	Deethylcyanazine acid	--	--	Cyanazine metabolite	--
61751	Deethylcyanazine amide	--	--	Cyanazine metabolite	--
61755	DMFM[11]	--	--	Breakdown product of fluometuron	Urea
39572	Diazinon	Knox Out, Terminator, Spectracide	[2]333-41-5	Insecticide	Organophosphate
39381	Dieldrin	Aldrin, Entrex, Oktanex	60-57-1	Insecticide, breakdown product	Organochloride
61588	Dimethenamid	Frontier Herbicide	87674-68-8	Herbicide	Amide
61951	Dimethenamid ESA	--	--	Breakdown product of dimethenamid	--
62482	Dimethenamid OA	--	--	Breakdown product of dimethenamid	--
04033	Diphenamid	Fenam, Rideon	957-51-7	Herbicide	Amide
82677	Disulfoton	Dithiosystox, Solvirex	[2]298-04-4	Insecticide, nematicide	Organophosphate
50374	Diuron	Drexel, Durashield, Herbatox	330-54-1	Herbicide	Urea
82668	EPTC	Eradicane, Knoxweed	759-94-4	Herbicide	Thiocarbamate
82663	Ethalfluralin	Somilan, Sonalen	55283-68-6	Herbicide	2,6-Dinitroaniline
82672	Ethoprop	Jolt, Mocap	[2]13194-48-4	Insecticide, nematicide	Organophosphorous
62481	Flufenacet	Thiafluamide	142459-58-3	Herbicide	Anilide
61952	Flufenacet ESA	--	--	Breakdown product of flufenacet	--
62483	Flufenacet OA	--	--	Breakdown product of flufenacet	--
38811	Fluometuron	Cotogard, Cottonex	2164-17-2	Herbicide	Urea
04095	Fonofos	Difonate, Doubledown	944-22-9	Insecticide	Organophosphorous
04025	Hexazinone	Velpar, Pronone	[2]51235-04-2	Herbicide	Triazinone
63784	Hydroxyacetochlor	--	--	Breakdown product of acetochlor	--
63783	Hydroxyalachlor	--	56681-55-1	Breakdown product of alachlor	--
64045	Hydroxydimethenamid	--	--	Breakdown product of dimethenamid	--
63785	Hydroxymetolachlor	--	--	Breakdown product of metolachlor	--
63154	Hydroxysimazine	--	2599-11-3	Breakdown product of simazine	--
39341	Lindane	Agrocide, Detmol Extract, Omnitox	[2]58-98-9	Insecticide, rodenticide	Organochlorine

Table 14. Information on pesticides and pesticide degradates tested at water-quality sampling sites, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[NWIS, National Water Information System; CASRN, Chemical Abstract Service Registry Number; --, not available]

NWIS code	NWIS name	Other common names[1]	CASRN	Uses[2]	Chemical class[2]
38478 and 82666	Linuron	Premalin, Rotalin, Lorox Weed Killer	[2]330-55-2	Herbicide	Urea
39532	Malathion	Kill-A-Mite, Ortho Malathion	121-75-5	Insecticide	Organophosphorous
82667	Methyl parathion	Metacide, Metron, Nitrox	[2]298-00-0	Insecticide, nematicide	Organophosphorous
39415	Metolachlor	Dual Magnum, Pennant, Primextra	[2]51218-45-2	Herbicide	Chloroacetanilide
61043	Metolachlor ESA	--	--	Breakdown product of metolachlor	Unclassified
61044	Metolachlor OA	--	--	Breakdown product of metolachlor	Unclassified
82630	Metribuzin	Lexone, Zenkor	21087-64-9	Herbicide	Triazinone
82671	Molinate	Felan, Molinate	2212-67-1	Herbicide	Thiocarbamate
82684	Napropamide	Racemic devrinol, Waylay	15299-99-7	Herbicide	Amide
34653	p,p'-DDE	DDE, DDT dehydrochloride	72-55-9	Breakdown product of DDT	Organochlorine
39542	Parathion	Paradust, Rodiatox,Viran	[2]56-38-2	Insecticide	Organophosphorous
82669	Pebulate	Tillam	1114-71-2	Herbicide	Thiocarbamate
82683	Pendimethalin	Pay-off, Prowl, Sipaxol, Stomp	[2]40487-42-1	Herbicide	2,6-Dinitroaniline
82664	Phorate	Rampart, Terrathion, Thimenox	[2]298-02-2	Insecticide, nematicide	Organophosphorous
04037	Prometon	Ontrack, Primatol	[2]1610-18-0	Herbicide	Triazine
04036	Prometryn	Primatol, Selectin, Mercazin	[2]7287-19-6	Herbicide	Triazine
82676	Propyzamide	Clanex, Rapier	[2]23950-58-5	Herbicide	Amide
04024	Propachlor	Croptex, Orange, Ramrod, Sentinel	[2]1918-16-7	Herbicide	Chloroacetanilide
62766	Propachlor ESA	--	--	Breakdown product of propachlor	--
62767	Propachlor OA	--	--	Breakdown product of propachlor	--
82679	Propanil	Rogue, Stampede, Supernox, Wham	[2]709-98-8	Herbicide	Anilide
82685	Propargite	Comite, Uniroyal DO14	[2]2312-35-8	Insecticide	Unclassified
38535	Propazine	Maxx 90, Propazine	139-40-2	Herbicide	Triazine
04035	Simazine	Azotop, Herbex, Radocon, Weedex	[2]122-34-9	Herbicide	Triazine
04030	Simetryn	Gy-Bon, Simetryn	1014-70-6	Herbicide	Triazine
82670	Tebuthiuron	Bushwacker, Brush bullet	[2]34014-18-1	Herbicide	Urea
82665 and 04032	Terbacil	Sinbar, Terbacil	5902-51-2	Herbicide	Uracil
82675	Terbufos	Contravan, Counter, Terbufos	13071-79-9	Insecticide, nematicide	Organophosphorous
90730 and 04022	Terbuthylazine	ChlorCaragard, Gardoprim	5915-41-3	Algaecide, herbicide, microbiocide	Triazine
82681	Thiobencarb	Carbamic acid, Saturn	28249-77-6	Herbicide	Thiocarbamate
82678	Triallate	Dipthal, Far-Go	2303-17-5	Herbicide	Thiocarbamate

Table 14. Information on pesticides and pesticide degradates tested at water-quality sampling sites, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[NWIS, National Water Information System; CASRN, Chemical Abstract Service Registry Number; --, not available]

NWIS code	NWIS name	Other common names[1]	CASRN	Uses[2]	Chemical class[2]
82661 and 04023	Trifluralin	Heritage, Trifloran, Trigard, Tristar	21582-09-8	Herbicide	2,6-Dinitroaniline
04034	Vernolate	PPTC, Surpass, Vernolate	1929-77-7	Herbicide	Thiocarbamate

[1] From http://www.chemindustry.com (unless otherwise noted).

[2] From http://www.pesticideinfo.org/Index.html.

[3] 2-[(2-Ethyl-6-methylphenyl)amino]-2-oxoethanesulfonic acid (EMAOA, the abbreviation given is the author's).

[4] 2-Chloro-4-isopropylamino-6-amino-s-triazine (CIAT).

[5] 2-Chloro-6-ethylamino-4-amino-s-triazine (CEAT).

[6] 2-Hydroxy-4-isopropyl-6-amino-s-triazine (OIAT).

[7] 2-Hydroxy-4-isopropylamino-6-ethylamino-s-triazine (OIET).

[8] 2-Hydroxy-6-ethylamino-4-amino-s-triazine (OEAT).

[9] Chlorodiamino-s-triazine (CAAT).

[10] From http://webbook.nist.gov/.

[11] Demethylfluometuron (DMFM).

Table 15. Pesticides that were not detected in water-quality samples, Cedar Rapids, Iowa, calendar years 1999–2005.

[NWIS, National Water Inventory System; LRL, laboratory reporting level; µg/L, micrograms per liter]

NWIS parameter code	Pesticides (not detected)	LRL (µg/L)
04024	Propachlor	0.05
04025	Hexazione	.05
04026	Butachlor	.05
04027	Carboxin	.05
04028	Butaylate	.05
04030	Simetryn	.05
04034	Vernolate	.05
04036	Prometryn	.05

Table 16. Pesticide degradates that were not detected in water-quality samples, Cedar Rapids, Iowa, calendar years 1999–2005.

[NWIS, National Water Inventory System; LRL, laboratory reporting level; µg/L, micrograms per liter]

NWIS parameter code	Pesticides (not detected)	LRL (µg/L)
38478	Linuron	0.2
38811	Fluometuron	.2
50374	Diuron	.2
61588	Dimethenamid	.2
61709	Cyanazine amide	.025
61745	Cyanazine acid	.025
61749	Deethyl cyanazine	.2
61751	Deethyl cyanazine amide	.025
61755	Demethyl fluometuron	.2
61952	Flufenacet ethanesulfonic acid	.02
62481	Flufenacet	.02
62482	Dimethenamid oxanilic acid	.02
62483	Flufenacet oxanilic acid	.02
62676	2-Hydroxy-4-isopropylamino-6-amino-s-triazine (OIAT)	.025
62766	Propachlor ethanesulfonic acid	.05
62767	Propachlor oxanilic acid	.02
63154	Hydroxysimazine	.025
63777	Decholoroalachlor	.02
63778	Dechloroacetochlor	.02
63779	Dechlorodimethnenamid	.02
63781	2-Chloro-N-(2,6-diethylphenyl) acetamide (Alachlor 2nd amide)	.02
63782	2-Chloro-N-(2-ethyl-6-methyl-phenyl)acetamide (Acetochlor 2nd amide)	.02
63783	Hydroxyalachlor	.02
63784	Hydroxyacetochlor	.02
63785	Hydroxymetolachlor	.02
64045	Hydroxydimethenamid	.02

Table 17. Selected pesticides and pesticide degradates, frequency of detections for groundwater and surface-water samples combined, Cedar Rapids, Iowa, calendar years 1999–2005.

[LRL, laboratory reporting level; µg/L, micrograms per liter; max, maximum; <, actual value is known to be less than value shown]

Pesticide	Number of dections/samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
						Max	Median
Atrazine	305/307	0.05	284	21	99.4	4.5	0.13
CIAT[3]	303/307	.05	373	30	98.7	.62	.08
Metolachlor	275/307	.05	118	157	89.6	.89	<.05
Acetochlor	74/307	.06	40	34	24.1	1	<.06
CEAT[3]	69/305	.3	2	67	22.6	.3	<.3
Propazine	50/305	.05	1	49	16.4	.05	<.05
Prometon	36/306	.05	0	36	11.8	<.05	<.05
Simazine	28/307	.05	0	28	9.1	<.05	<.05
Metribuzin	20/306	.05	2	18	6.5	.05	<.05
Ametryn	17/303	.05	0	17	5.6	<.05	<.05
Alachlor	8/307	.05	4	4	2.6	.11	<.05
Cyanazine	7/307	.2	0	7	2.3	<.2	<.2
Trifluralin	6/294	.05	0	6	2.0	<.05	<.05
Terbacil	4/295	.05	0	4	1.4	<.05	<.05
Bromacil	2/299	1.0	0	2	.7	<1	<1
Cycloate	1/299	.05	0	1	.3	<.05	<.05
Diphenamid	1/298	.05	0	1	.3	<.05	<.05

[1] Highest laboratory reporting level for period of record.

[2] Includes both quantifiable and unquantifiable (estimated) concentrations. Quantifiable detections exist for concentrations that exceeded lower laboratory reporting levels during period of record.

[3]Atrazine degradates: 2-Chloro-4-amino-6-isopropyl-amino-striazine (CIAT) and 2-Chloro-4-ethylamino-6-amino-s-triazine (CEAT).

Table 18. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples, Cedar Rapids, Iowa, calendar years 1999–2005.

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Sample medium	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
Groundwater	Atrazine	260/262	0.05	243	17	99.2	1.8	0.12
	CIAT[3]	258/262	.05	230	28	98.5	.50	.08
	Metolachlor	231/262	.05	190	41	88.2	.44	<.05
	Acetochlor	56/262	.05	28	28	21.4	.30	<.05
	CEAT[3]	55/262	.2	1	54	21.0	.19	<.06
	Propazine	40/262	.05	0	40	15.3	<.05	<.05
	Prometon	31/262	.05	0	31	11.8	<.05	<.05
	Simazine	24/262	.05	0	24	9.2	<.05	<.05
	Metribuzin	15/262	.05	1	14	5.7	<.05	<.05
	Ametryn	14/262	.05	0	14	5.3	<.05	<.05
	Trifluralin	5/258	.05	0	5	1.9	<.05	<.05
	Terbacil	3/258	.05	0	3	1.2	<.05	<.05
	Cyanazine	2/262	.2	0	2	0.7	<.2	<.2
	Bromacil	1/258	1.0	0	1	0.4	<1	<1
	Alachlor	0/262	.05	0	0	0.0	--	--
	Cycloate	0/258	.05	0	0	0.0	--	--
	Diphenamid	0/258	.05	0	0	0.0	--	--
Surface water	Atrazine	45/45	.05	41	4	100	4.50	.156
	[3]CIAT	45/45	.05	43	2	100	.62	.097
	Metolachlor	44/45	.05	28	16	97.8	.89	.072
	Acetochlor	18/45	.06	16	2	40	1	<.06
	[3]CEAT	14/43	.3	1	13	32.6	.3	<.3
	Propazine	10/43	.05	1	9	23.3	<.05	<.05
	Alachlor	8/45	.05	3	5	17.8	.11	<.05
	Prometon	5/44	.05	0	5	11.4	<.05	<.05
	Metribuzin	5/44	.05	1	4	11.4	<.05	<.05
	Cyanazine	5/45	.2	0	5	11.1	<.2	<.2
	Simazine	4/45	.05	0	4	8.9	<.05	<.05

Table 18. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Sample medium	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
Sufrace water—Continued	Ametryn	3/42	0.05	0	0 3	7.1	<0.05	<0.05
	Trifluralin	1/38	.05	0	1	2.6	<.05	<.05
	Terbacil	1/38	.05	0	1	2.6	<.05	<.05
	Bromacil	1/38	1.0	0	1	2.6	<1	<1
	Cycloate	1/38	.05	0	1	2.6	<.05	<.05
	Diphenamid	1/38	.05	0	1	2.6	<.05	<.05

[1] Highest laboratory reporting level for period of record.

[2] Includes both quantifiable and unquantifiable (estimated) concentrations. Quantifiable detections exist for concentrations that exceeded lower laboratory reporting levels during period of record.

[3] Atrazine degradates: 2-Chloro-4-amino-6-isopropyl-amino-striazine (CIAT) and 2-Chloro-4-ethylamino-6-amino-s-triazine (CEAT).

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
1993USGS CRM-1	Atrazine	15/16	0.05	12	3	93.8	0.86	0.07
	CIAT[3]	14/16	.05	12	2	87.5	.25	.08
	Metolachlor	14/16	.05	5	9	87.5	.18	<.05
	CEAT[3]	5/16	.2	1	4	31.2	<.2	<.2
	Propazine	3/16	.05	0	3	18.8	<.05	<.05
	Ametryn	3/16	.05	0	3	18.8	<.05	<.05
	Acetochlor	2/16	.05	2	0	12.5	.23	.14
	Metribuzin	2/16	.05	0	2	12.5	<.05	<.05
	Simazine	2/16	.05	0	2	12.5	<.05	<.05
	Prometon	1/16	.05	0	1	6.2	<.05	<.05
	Alachlor	0/16	.05	0	0	0	--	--
	Cyanazine	0/16	.2	0	0	0	--	--
	Bromacil	0/16	1.0	0	0	0	--	--
	Cycloate	0/16	.05	0	0	0	--	--
	Diphenamid	0/16	.05	0	0	0	--	--
	Terbacil	0/16	.05	0	0	0	--	--
	Trifluralin	0/16	.05	0	0	0	--	--
1993USGS CRM-2	Atrazine	16/16	.05	16	0	100	.83	.12
	CIAT[3]	16/16	.05	15	1	100	.26	.08
	Metolachlor	15/16	.05	3	12	93.8	.19	<.05
	CEAT[3]	5/16	.05	4	1	31.2	.19	.11
	Acetochlor	3/16	.05	1	2	18.8	.3	<.05
	Prometon	2/16	.05	0	2	12.5	<.05	<.05
	Propazine	2/16	.05	0	2	12.5	<.05	<.05
	Simazine	2/16	.05	0	2	12.5	<.05	<.05
	Metribuzin	1/16	.05	0	1	6.2	<.05	<.05
	Terbacil	1/16	.05	0	1	6.2	<.05	<.05
	Trifluralin	1/16	.05	0	1	6.2	<.05	<.05
	Alachlor	0/16	.05	0	0	0	--	--
	Cyanazine	0/16	.2	0	0	0	--	--
	Ametryn	0/16	.05	0	0	0	--	--
	Bromacil	0/16	1.0	0	0	0	--	--
	Cycloate	0/16	.05	0	0	0	--	--
	Diphenamid	0/16	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
1993USGS CRM-4	Atrazine	16/16	0.05	15	1	100	0.608	0.173
	CIAT[3]	16/16	.05	14	2	100	.192	.095
	Metolachlor	15/16	.05	5	10	93.8	.312	<.05
	CEAT[3]	4/16	.1	2	2	25	.111	.056
	Propazine	4/16	.05	0	4	25	<.05	<.05
	Acetochlor	3/16	.05	0	3	18.8	<.05	<.05
	Prometon	3/16	.05	0	3	18.8	<.05	<.05
	Simazine	3/16	.05	0	3	18.8	<.05	<.05
	Metribuzin	2/16	.05	0	2	12.5	<.05	<.05
	Cyanazine	1/16	.2	0	1	6.2	<.2	<.2
	Ametryn	1/16	.05	0	1	6.2	<.05	<.05
	Terbacil	1/16	.05	0	1	6.2	<.05	<.05
	Alachlor	0/16	.05	0	0	0	--	--
	Bromacil	0/16	1.0	0	0	0	--	--
	Cycloate	0/16	.05	0	0	0	--	--
	Diphenamid	0/16	.05	0	0	0	--	--
	Trifluralin	0/16	.05	0	0	0	--	--
1998USGS CRM-22	Atrazine	31/31	.05	30	1	100	.92	.12
	CIAT[3]	31/31	.05	30	1	100	.25	.09
	Metolachlor	30/31	.05	14	16	96.8	.2	<.05
	Acetochlor	9/31	.05	2	7	29	.25	<.05
	CEAT[3]	7/31	.05	4	3	22.6	.12	.06
	Propazine	5/31	.05	0	5	16.1	<.05	<.05
	Prometon	3/31	.05	0	3	9.7	<.05	<.05
	Metribuzin	2/31	.05	0	2	6.4	<.05	<.05
	Simazine	2/31	.05	0	2	6.4	<.05	<.05
	Terbacil	1/31	.05	0	1	3.2	<.05	<.05
	Trifluralin	1/31	.05	0	1	3.2	<.05	<.05
	Alachlor	0/31	.05	0	0	0	--	--
	Cyanazine	0/31	.2	0	0	0	--	--
	Ametryn	0/31	.05	0	0	0	--	--
	Bromacil	0/31	1.0	0	0	0	--	--
	Cycloate	0/31	.05	0	0	0	--	--
	Diphenamid	0/31	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
1998USGS CRM-23	Atrazine	29/29	0.05	27	2	100	0.92	0.92
	CIAT[3]	28/29	.05	19	9	96.6	.25	.07
	Metolachlor	28/29	.05	8	20	96.6	.13	<.05
	Acetochlor	6/29	.05	2	4	20.7	.09	<.05
	CEAT[3]	5/29	.05	5	0	17.2	.12	.08
	Propazine	5/29	.05	0	5	17.2	<.05	<.05
	Metribuzin	3/29	.05	1	2	10.3	<.05	<.05
	Prometon	3/29	.05	0	3	10.3	<.05	<.05
	Simazine	3/29	.05	0	3	10.3	<.05	<.05
	Ametryn	3/29	.05	0	3	10.3	<.05	<.05
	Cyanazine	1/29	.2	0	1	3.4	.2	.2
	Alachlor	0/29	.05	0	0	0	--	--
	Bromacil	0/29	1	0	0	0	--	--
	Cycloate	0/29	.05	0	0	0	--	--
	Diphenamid	0/29	.05	0	0	0	--	--
	Terbacil	0/29	.05	0	0	0	--	--
	Trifluralin	0/29	.05	0	0	0	--	--
1998USGS CRM-25	Atrazine	20/20	.05	13	7	100	1.34	.09
	CIAT[3]	20/20	.05	20	0	100	.5	.24
	CEAT[3]	6/20	.05	2	4	30	.1	.06
	Metolachlor	3/20	.05	1	2	15	.21	<.05
	Metribuzin	3/20	.05	0	3	15	<.05	<.05
	Prometon	2/20	.05	0	2	10	<.05	<.05
	Acetochlor	1/20	.05	1	0	5	.06	.06
	Propazine	1/20	.05	0	1	5	<.05	<.05
	Simazine	1/20	.05	0	1	5	<.05	<.05
	Trifluralin	1/20	.05	0	1	5	<.05	<.05
	Alachlor	0/20	.05	0	0	0	--	--
	Cyanazine	0/20	.2	0	0	0	--	--
	Ametryn	0/20	.05	0	0	0	--	--
	Bromacil	0/20	1	0	0	0	--	--
	Cycloate	0/20	.05	0	0	0	--	--
	Diphenamid	0/20	.05	0	0	0	--	--
	Terbacil	0/20	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
1998USGS CRM-26	Atrazine	20/20	0.05	17	3	100	1.02	0.1
	CIAT[3]	19/20	.05	18	1	95	.24	.07
	Metolachlor	19/20	.05	3	16	95	.44	<.05
	CEAT[3]	3/20	.05	2	1	15	.12	.11
	Acetochlor	2/20	.05	1	1	10	.27	<.05
	Prometon	2/20	.05	0	2	10	<.05	<.05
	Propazine	2/20	.05	0	2	10	<.05	<.05
	Ametryn	2/20	.05	0	2	10	<.05	<.05
	Trifluralin	1/20	.05	0	1	5	<.05	<.05
	Metribuzin	1/20	.05	0	1	5	<.05	<.05
	Simazine	1/20	.05	0	1	5	<.05	<.05
	Alachlor	0/20	.05	0	0	0	--	--
	Bromacil	0/20	1	0	0	0	--	--
	Cyanazine	0/20	.2	0	0	0	--	--
	Cycloate	0/20	.05	0	0	0	--	--
	Diphenamid	0/20	.05	0	0	0	--	--
	Terbacil	0/20	.05	0	0	0	--	--
1998USGS CRM-27	Atrazine	20/20	.05	20	0	100	.35	0.2
	CIAT[3]	20/20	.05	18	2	100	.17	.09
	Metolachlor	19/20	.05	3	16	95	.15	<.05
	Acetochlor	5/20	.05	3	2	25	.22	.05
	Propazine	5/20	.05	0	5	25	<.05	<.05
	CEAT[3]	3/20	.05	1	2	15	.08	<.05
	Ametryn	2/20	.05	0	2	10	<.05	<.05
	Prometon	2/20	.05	0	2	5	<.05	<.05
	Trifluralin	1/20	.05	0	1	5	<.05	<.05
	Alachlor	0/20	.05	0	0	0	--	--
	Bromacil	0/20	1.0	0	0	0	--	--
	Cyanazine	0/20	.2	0	0	0	--	--
	Cycloate	0/20	.05	0	0	0	--	--
	Diphenamid	0/20	.05	0	0	0	--	--
	Metribuzin	0/20	.05	0	0	0	--	--
	Simazine	0/20	.05	0	0	0	--	--
	Terbacil	0/20	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
1990Seminole 14	Atrazine	5/5	0.05	5	0	100	0.33	0.14
	CIAT[3]	5/5	.05	3	2	100	.1	.06
	Metolachlor	4/5	.05	1	3	80	.06	<.05
	Acetochlor	1/5	.05	0	1	20	<.05	<.05
	Prometon	1/5	.05	0	1	20	<.05	<.05
	CEAT[3]	0/5	.05	0	0	0	--	--
	Alachlor	0/5	.05	0	0	0	--	--
	Ametryn	0/5	.05	0	0	0	--	--
	Bromacil	0/5	1.0	0	0	0	--	--
	Cyanazine	0/5	.2	0	0	0	--	--
	Cycloate	0/5	.05	0	0	0	--	--
	Diphenamid	0/5	.05	0	0	0	--	--
	Metribuzin	0/5	.05	0	0	0	--	--
	Propazine	0/5	.05	0	0	0	--	--
	Simazine	0/5	.05	0	0	0	--	--
	Terbacil	0/5	.05	0	0	0	--	--
	Trifluralin	0/5	.05	0	0	0	--	--
Seminole 17	Atrazine	11/11	.05	11	0	100	.76	.17
	CIAT[3]	11/11	.05	10	1	100	.16	.07
	Metolachlor	10/11	.05	7	3	90.9	.16	.06
	Acetochlor	3/11	.05	1	2	27.3	.05	<.05
	CEAT[3]	2/11	.05	1	1	18.2	.06	<.05
	Prometon	1/11	.05	0	1	9.1	<.05	<.05
	Propazine	1/11	.05	0	1	9.1	<.05	<.05
	Simazine	1/11	.05	0	1	9.1	<.05	<.05
	Alachlor	0/11	.05	0	0	0	--	--
	Ametryn	0/11	.05	0	0	0	--	--
	Bromacil	0/11	1.0	0	0	0	--	--
	Cyanazine	0/11	.2	0	0	0	--	--
	Cycloate	0/11	.05	0	0	0	--	--
	Diphenamid	0/11	.05	0	0	0	--	--
	Metribuzin	0/11	.05	0	0	0	--	--
	Terbacil	0/11	.05	0	0	0	--	--
	Trifluralin	0/11	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
1991Seminole 18	Atrazine	5/5	0.05	5	0	100	0.199	0.086
	CIAT[3]	5/5	.05	4	1	100	.086	.056
	Metolachlor	5/5	.05	3	2	100	.094	.060
	CEAT[3]	0/5	.05	0	0	0	--	--
	Acetochlor	0/5	.05	0	0	0	--	--
	Alachlor	0/5	.05	0	0	0	--	--
	Ametryn	0/5	.05	0	0	0	--	--
	Bromacil	0/5	.05	0	0	0	--	--
	Cyanazine	0/5	.2	0	0	0	--	--
	Cycloate	0/5	.05	0	0	0	--	--
	Diphenamid	0/5	.05	0	0	0	--	--
	Metribuzin	0/5	.05	0	0	0	--	--
	Prometon	0/5	.05	0	0	0	--	--
	Propazine	0/5	.05	0	0	0	--	--
	Simazine	0/5	.05	0	0	0	--	--
	Terbacil	0/5	.05	0	0	0	--	--
	Trifluralin	0/5	.05	0	0	0	--	--
Seminole Ranney 1	Atrazine	10/10	.05	10	0	100	1.040	.128
	CIAT[3]	10/10	.05	9	1	100	.25	.06
	Metolachlor	9/10	.05	6	3	90	.2	.06
	Acetochlor	3/10	.05	1	2	30	.06	<.05
	CEAT[3]	2/10	.05	1	1	20	.08	<.05
	Prometon	1/10	.05	0	1	10	<.05	<.05
	Propazine	1/10	.05	0	1	10	<.05	<.05
	Simazine	1/10	.05	0	1	10	<.05	<.05
	Alachlor	0/10	.05	0	0	0	--	--
	Ametryn	0/10	.05	0	0	0	--	--
	Bromacil	0/10	1.0	0	0	0	--	--
	Cyanazine	0/10	.2	0	0	0	--	--
	Cycloate	0/10	.05	0	0	0	--	--
	Diphenamid	0/10	.05	0	0	0	--	--
	Metribuzin	0/10	.05	0	0	0	--	--
	Terbacil	0/10	.05	0	0	0	--	--
	Trifluralin	0/10	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
Seminole Ranney 2	Atrazine	9/9	0.05	9	0	100	1.1	0.13
	CIAT[3]	9/9	.05	7	2	100	.21	.07
	Metolachlor	9/9	.05	5	4	100	.17	.07
	CEAT[3]	3/9	.06	1	2	33.3	.07	<.05
	Acetochlor	3/9	.05	1	2	33.3	.07	<.05
	Propazine	2/9	.05	0	2	22.2	<.05	<.05
	Simazine	2/9	.05	0	2	22.2	<.05	<.05
	Prometon	1/9	.05	0	1	11.1	<.05	<.05
	Alachlor	0/9	.05	0	0	0	--	--
	Ametryn	0/9	.05	0	0	0	--	--
	Bromacil	0/9	.05	0	0	0	--	--
	Cyanazine	0/9	.2	0	0	0	--	--
	Cycloate	0/9	.05	0	0	0	--	--
	Diphenamid	0/9	.05	0	0	0	--	--
	Metribuzin	0/9	.05	0	0	0	--	--
	Terbacil	0/9	.05	0	0	0	--	--
	Trifluralin	0/9	.05	0	0	0	--	--
Edgewood Ranney	Atrazine	12/12	.05	12	0	100	1.75	.15
	CIAT[3]	12/12	.05	12	0	100	.27	.06
	Metolachlor	11/12	.05	6	5	91.7	.26	.06
	Acetochlor	3/12	.05	3	0	25	.22	.1
	Prometon	3/12	.05	0	3	25	<.05	<.05
	Propazine	2/12	.05	0	2	16.7	<.05	<.05
	Simazine	2/12	.05	0	2	16.7	<.05	<.05
	CEAT[3]	1/12	.05	1	0	8.3	.1	.1
	Alachlor	0/12	.05	0	0	0	--	--
	Ametryn	0/12	.05	0	0	0	--	--
	Bromacil	0/12	1.0	0	0	0	--	--
	Cyanazine	0/12	.2	0	0	0	--	--
	Cycloate	0/12	.05	0	0	0	--	--
	Diphenamid	0/12	.05	0	0	0	--	--
	Metribuzin	0/12	.05	0	0	0	--	--
	Terbacil	0/12	.05	0	0	0	--	--
	Trifluralin	0/12	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
Seminole Ranney 4	Atrazine	11/11	0.05	11	0	100	0.97	0.13
	CIAT[3]	11/11	.05	11	0	100	.2	.06
	Metolachlor	10/11	.05	6	4	90.9	.2	.05
	CEAT[3]	2/11	.05	1	1	18.2	.07	<.05
	Acetochlor	2/11	.05	2	0	18.2	.1	.08
	Prometon	2/11	.05	0	2	18.2	<.05	<.05
	Propazine	2/11	.05	0	2	18.2	<.05	<.05
	Simazine	1/11	.05	0	1	9.1	<.05	<.05
	Alachlor	0/11	.05	0	0	0	--	--
	Ametryn	0/11	.05	0	0	0	--	--
	Bromacil	0/11	1.0	0	0	0	--	--
	Cyanazine	0/11	.2	0	0	0	--	--
	Cycloate	0/11	.05	0	0	0	--	--
	Diphenamid	0/11	.05	0	0	0	--	--
	Metribuzin	0/11	.05	0	0	0	--	--
	Terbacil	0/11	.05	0	0	0	--	--
	Trifluralin	0/11	.05	0	0	0	--	--
Cedar Rapids Water-works	CIAT[3]	31/31	.05	28	3	100	.22	.07
	Atrazine	30/31	.05	30	0	96.8	1.3	.16
	Metolachlor	30/31	.05	14	16	96.8	.26	<.05
	Acetochlor	10/31	.05	8	2	32.3	.24	.09
	CEAT[3]	7/31	.2	0	7	22.6	<.2	<.2
	Propazine	5/31	.05	0	5	16.1	<.05	<.05
	Prometon	4/31	.05	0	4	12.9	<.05	<.05
	Simazine	3/31	.05	0	3	9.7	<.05	<.05
	Ametryn	3/31	.05	0	3	9.7	<.05	<.05
	Bromacil	1/27	1.0	0	1	3.7	<1	<1
	Metribuzin	1/31	.05	0	1	3.2	<.05	<.05
	Alachlor	0/31	.05	0	0	0	--	--
	Cyanazine	0/31	.2	0	0	0	--	--
	Cycloate	0/27	.05	0	0	0	--	--
	Diphenamid	0/27	.05	0	0	0	--	--
	Terbacil	0/27	.05	0	0	0	--	--
	Trifluralin	0/27	.05	0	0	0	--	--

Table 19. Selected pesticides and pesticide degradates, frequency of detections in groundwater and surface-water samples by site, Cedar Rapids, Iowa, calendar years 1999–2005.

[LRL, laboratory reporting level; µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, not applicable]

Site name	Pesticide	Number of detections/ samples	LRL[1] (µg/L)	Number of detectable concentrations at or above LRL	Number of detectable concentrations below LRL[2]	Percentage of samples with detectable concentrations[2]	Detectable concentrations (µg/L)	
							Maximum	Median
Cedar River at Edgewood Road	Atrazine	40/40	0.05	36	4	100	4.50	0.20
	CIAT[3]	40/40	.05	39	1	100	.62	.1
	Metolachlor	39/40	.05	26	13	97.5	.89	.07
	Acetochlor	15/40	.05	13	2	37.5	1.0	.18
	CEAT[3]	12/38	.05	11	1	31.6	.3	<.3
	Propazine	9/38	.05	1	8	23.7	<.05	<.05
	Alachlor	8/40	.05	3	5	20	.11	<.05
	Prometon	5/39	.05	0	5	12.8	<.05	<.05
	Cyanazine	5/40	.05	0	5	12.5	<.05	<.2
	Metribuzin	4/39	.05	1	3	10.3	.05	<.05
	Simazine	4/40	.05	0	4	10	<.05	<.05
	Ametryn	3/31	.05	0	3	9.7	<.05	<.05
	Bromacil	1/27	1.0	0	1	3.7	<1	<1
	Cycloate	0/27	.05	0	0	0	--	--
	Diphenamid	0/27	.05	0	0	0	--	--
	Terbacil	0/27	.05	0	0	0	--	--
	Trifluralin	0/27	.05	0	0	0	--	--
Wetland Pond at CRM-27	Atrazine	5/5	.05	5	0	100	.53	.24
	CIAT[3]	5/5	.05	5	0	100	.21	.11
	Metolachlor	5/5	.05	2	3	100	.21	<.05
	Acetochlor	3/5	.05	3	0	60	.22	.08
	Ametryn	3/5	.05	0	3	60	<.05	<.05
	CEAT[3]	2/5	.05	2	0	40	.13	.1
	Metribuzin	1/5	.05	0	1	20	<.05	<.05
	Propazine	1/5	.05	0	1	20	<.05	<.05
	Terbacil	1/5	.05	0	1	20	<.05	<.05
	Alachlor	0/5	.05	0	0	0	--	--
	Bromacil	0/5	1.0	0	0	0	--	--
	Cyanazine	0/5	.05	0	0	0	--	--
	Cycloate	0/5	.05	0	0	0	--	--
	Diphenamid	0/5	.05	0	0	0	--	--
	Prometon	0/5	.05	0	0	0	--	--
	Simazine	0/5	.05	0	0	0	--	--
	Trifluralin	0/5	.05	0	0	0	--	--

[1] Highest laboratory reporting level for period of record.

[2] Includes both quantifiable and unquantifiable (estimated) concentrations. Quantifiable detections exist for concentrations that exceeded lower laboratory reporting levels during period of record.

[3] Atrazine degradates: 2-Chloro-4-amino-6-isopropyl-amino-striazine (CIAT) and 2-Chloro-4-ethylamino-6-amino-s-triazine (CEAT)

Table 20. Pesticide degradates data by site, Cedar Rapids, Iowa, calendar years 1999–2005.

[µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, no data]

Site name	Date (year, month, day)	Time (24-hour)	Record number	Acetochlor ESA (61029) (ug/L)	Acetochlor OA (61030) (ug/L)	Acetocholor SAA (62847) (ug/L)	Alachlor ESA (50009) (ug/L)
1998USGS CRM-22	20050809	1210	0050046701	0.3	0.1	0.02	0.02
1998USGS CRM-23	20050809	1330	0050046801	.4	.1	<.02	<.02
Seminole 17	20050809	1650	0050047001	.7	.3	.02	.02
Seminole Ranney 1	20050811	1200	0050037901	.3	.1	<.02	.03
Seminole Ranney 4	20050809	1515	0050046901	.5	.1	<.02	.02
Waterworks Plant	19990615	1045	9990176201	1.1	.9	--	--
	19990629	1050	9990176701	1.2	.7	--	--
	19990715	1200	9990109001	.9	.7	--	--
	19990817	0910	9990177201	1.1	.6	--	--
Cedar River at Edgewood Road	19990615	0945	9990176101	2.6	2.7	--	--
	19990629	1135	9990176501	1.2	.6	--	--
	19990715	1045	9990176901	1	1.1	--	--
	19990817	1025	9990177101	.8	.3	--	--
	20031024	1500	0040001601	<.02	<.02	<.02	.02
	20050809	1050	0050047201	.3	.1	<.02	.02

Table 20. Pesticide degradates data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, no data]

Site name	Date (year, month, day)	Time (24-hour)	Record number	Alachlor ESA SA (628499) (ug/L)	Alachlor OA (61031) (ug/L)	Alachlor SAA (62848) (ug/L)	CAAT (62674) (ug/L)
1998USGS CRM-22	20050809	1210	0050046701	0.3	0.04	<0.02	--
1998USGS CRM-23	20050809	1330	0050046801	.4	.10	<.02	--
Seminole 17	20050809	1650	0050047001	.3	.04	<.02	.16
Seminole Ranney 1	20050811	1200	0050037901	.3	.03	<.02	.2
Seminole Ranney 4	20050809	1515	0050046901	.3	.04	<.02	.17
Waterworks Plant	19990615	1045	9990176201	1	<.2	--	--
	19990629	1050	9990176701	.9	<.2	--	--
	19990715	1200	9990109001	.8	<.2	--	--
	19990817	0910	9990177201	1	<.2	--	--
Cedar River at Edgewood Road	19990615	0945	9990176101	.9	.3	--	--
	19990629	1135	9990176501	.9	<.2	--	--
	19990715	1045	9990176901	.9	<.2	--	--
	19990817	1025	9990177101	1.1	<.2	--	--
	20031024	1500	0040001601	.89	.03	.15	--
	20050809	1050	0050047201	.3	.04	<.02	.19

Table 20. Pesticide degradates data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, no data]

Site name	Date (year, month, day)	Time (24-hour)	Record number	Dechlorometolchlor (63780) (ug/L)	Deethyl-cyanazine (61750) (ug/L)	Dimethe-namid ESA (61951) (ug/L)	Metolachlor ESA (61043) (ug/L)
1998USGS CRM-22	20050809	1210	0050046701	<0.02	0.04	0.03	1.2
1998USGS CRM-23	20050809	1330	0050046801	.02	.04	.03	1.2
Seminole 17	20050809	1650	0050047001	<.02	<.025	.05	1.3
Seminole Ranney 1	20050811	1200	0050037901	<.02	<.025	.03	1
Seminole Ranney 4	20050809	1515	0050046901	<.02	.04	.04	1.3
Waterworks Plant	19990615	1045	9990176201	--	--	--	3.1
	19990629	1050	9990176701	--	--	--	3
	19990715	1200	9990109001	--	--	--	2.5
	19990817	0910	9990177201	--	--	--	3.3
Cedar River at Edgewood Road	19990615	0945	9990176101	--	--	--	3.9
	19990629	1135	9990176501	--	--	--	3.3
	19990715	1045	9990176901	--	--	--	2.8
	19990817	1025	9990177101	--	--	--	3.1
	20031024	1500	0040001601	--	<.025	<.02	0.97
	20050809	1050	0050047201	<.02	<.025	.02	1.1

Table 20. Pesticide degradates data by site, Cedar Rapids, Iowa, calendar years 1999–2005.—Continued

[µg/L, micrograms per liter; <, actual value is known to be less than value shown; --, no data]

Site name	Date (year, month, day)	Time (24-hour)	Record number	Metolachlor OA (61044) (ug/L)	N(Ethmetphen)ox (62850) (ug/L)	OEAT (62678) (ug/L)	OIET (50355) (ug/L)
1998USGS CRM-22	20050809	1210	0050046701	0.2	0.08	<0.025	0.07
1998USGS CRM-23	20050809	1330	0050046801	.2	.1	<.025	.19
Seminole 17	20050809	1650	0050047001	.3	.12	<.025	.07
Seminole Ranney 1	20050811	1200	0050037901	.2	.09	<.025	<.025
Seminole Ranney 4	20050809	1515	0050046901	.2	.09	<.025	.11
Waterworks Plant	19990615	1045	9990176201	.5	--	--	<.200
	19990629	1050	9990176701	.7	--	--	<.200
	19990715	1200	9990109001	.6	--	--	<.200
	19990817	0910	9990177201	.7	--	--	<.200
Cedar River at Edgewood Road	19990615	0945	9990176101	.9	--	--	.56
	19990629	1135	9990176501	.6	--	--	<.200
	19990715	1045	9990176901	.6	--	--	<.200
	19990817	1025	9990177101	.5	--	--	<.200
	20031024	1500	0040001601	.11	.11	.03	.05
	20050809	1050	0050047201	.1	.08	<.025	.08

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