
TABLES 1–26

Table 1. Representative concentrations of selected elements from various background sources
[mg/kg, milligrams per kilogram; mg/L, milligrams per liter; 0.X indicates order of magnitude known; <, less than; --, no data]

Element	Representative concentrations								
	United States			Upper Illinois River Basin		Upper Mississippi River Basin		Illinois River	
	Carbonate rocks ¹ (mg/kg)	Sandstone and shale ¹ (mg/kg)	Soils and surficial material ¹ (mg/kg)	Plant ash ² (mg/kg)	Bulk precipitation ³ (mg/L)	Total recoverable ⁴ (mg/L)	Dissolved ⁶ (mg/L)	Streambed sediment, unsieved ⁵ (mg/kg)	Stream water, dissolved ⁶ (mg/L)
Aluminum	1,700-20,000	4,300-92,000	9,000-65,000	200-39,000	--	--	--	--	--
Antimony	7.2	9.4-1.5	--	--	--	--	--	--	--
Arsenic	.74-2.5	1.1-9.0	5.5-13.0	--	<0.0001-0.001	<0.0001-0.015	<0.0001-0.004	82-14	--
Barium	5.6-160	38-510	63-810	15-11,000	.003-.005	--	--	--	--
Beryllium	.9.X	.80-1.7	.76-1.3	.64-2.0	<.0005	--	--	--	--
Boron	29-31	18-110	18-63	37-600	--	--	--	--	--
Cadmium	.035	9.0X-.3	9.<.5	.37-20	<.001-.023	0-.01	0-.004	.23-.53	.0001-.0002
Chromium	2.7-29	2.0-130	11-78	.42-22	--	0-.11	0-.01	3.4-7.4	.002-.0047
Cobalt	1.3-71	1.1-13	1.0-14	.50-400	<.003-.004	0-.06	0-.003	4.1-8.4	.0007-.0012
Copper	.84-12	1.2-130	8.7-39	21-270	<.01-.04	0-.8	0-.071	3.5-11.2	.0001-.0002
Iron	1,100-21,000	900-45,000	4,700-43,000	600-9,300	.013-.049	.24-23	0-.5	8,200-20,400	--
Lead	4-18	5-24	2.6-25	7.1-480	.003-.006	0-.32	0-.41	12.9-27.1	.0001-.0005
Manganese	83-910	29-420	61-1,100	96-14,000	.009-.02	.02-1.5	0-1.8	160-3,000	--
Mercury	.022-.03	.0079-.34	.045-.160	--	<.0001-.0001	0-.0015	0-.0006	.007-.2	--
Molybdenum	.79	.2-26	--	.76-20	<.01	--	--	--	--
Nickel	2.3-16	1.2-110	1.8-23	.81-130	<.001-.011	--	--	10-22.2	.001-.0022
Phosphorus	40-600	10-100	40-800	7,100-220,000	--	--	--	--	--
Selenium	.16-.31	.09-.11	.27-.74	.01-.42	<.0001	0-.013	0-.007	--	--
Silver	.X	.18	--	--	--	--	--	--	--
Strontium	100-990	13-220	3.6-160	14-5,300	.0017-.0038	--	--	--	--
Vanadium	3.9-40	5.5-400	15-110	2.6-23	<.006	--	--	--	--
Zinc	6.3-24	5.2-82	25-68	170-1,900	.009-.029	.01-.15	0-.2	18-41	.019-.026
Carbon, total organic	1,000-2,800	2,700-3,500	7,000-28,000	--	--	--	--	--	--

¹Data from Conner and Shacklette (1975) unless otherwise noted.

²Data from Conner and Shacklette (1975).

³Data from Peters and Bonelli (1982).

⁴Data from Britton and others (1983).

⁵Data from Mathis and Cummings (1970) unless otherwise noted. Data from Mathis and Cummings (1970) are from three nonindustrial-use tributaries to the middle Illinois River Basin.

⁶Data from Mathis and Cummings (1970).

⁷Data from Turekian (1971). Data for the world.

⁸Data from Kelly and Hite (1984).

⁹Data from Gilkeson and others (1977). Data for Ogle County, Ill.

Table 2. Concentrations of selected elements in materials related to domestic sewage treatment in the upper Illinois River Basin

[All concentrations in milligrams per liter. No data available for aluminum, cobalt, molybdenum, strontium, and vanadium. 0, below the minimum reporting level; --, no data available]

Element	Concentration range of annual means of raw sewage entering Calumet, West-Southwest, and North Side treatment plants, 1989	Concentration range of annual means of Calumet TARP ¹ raw sewage, 1988–90	Concentration range of monthly means of final effluent for Calumet, West-Southwest, and North Side treatment plants, 1988
Antimony	0	0	--
Arsenic	0	0	0–0
Barium	0	0	0–04
Beryllium	0	0	--
Cadmium	0–03	.01–.02	0–.02
Chromium	.06–.33	.02	0–.05
Copper	.07–.23	.04–.05	0–.10
Iron	.8–6.1	2.2–2.4	0–.42
Lead	.01–.09	.2–.4	0–.03
Manganese	.05–.19	.10–.11	0–.13
Mercury	.0001–.00297	.00013–.00016	0–.00021
Nickel	0	0	0–.06
Phosphorus	3.2–12.5	1.93–3.55	.175–3.19
Selenium	0	0–.02	0–.11
Silver	0–.01	0	0–0
Zinc	.1–.8	.1–1.9	0–.15

¹TARP refers to the Chicago Tunnel And Reservoir Plan (Metropolitan Water Reclamation District of Greater Chicago, 1990).

Table 3. Total releases of selected elements from wastewater-treatment plants in the Chicago Metropolitan area and in Illinois, and percentage of release from Illinois to the atmosphere and to streams

[Data are from Illinois Environmental Protection Agency (1991). No data available for beryllium, boron, iron, and strontium. Other releases are to wastewater-treatment plants, underground injection, land or other offsite transfers, or a combination thereof; <, less than]

Element	Total releases (pounds)		Percentage of Illinois releases	
	Chicago metropolitan area	Illinois	To surface water	To air
Aluminum and related compounds	772,602	3,164,323	<1	6
Antimony and related compounds	4,688	24,368	<1	12
Arsenic and related compounds	3,969	23,806	<1	13
Barium and related compounds	226,509	4,945,174	<1	1
Cadmium and related compounds	13,388	40,250	0	22
Chromium and related compounds	868,613	1,900,204	1	4
Cobalt and related compounds	12,670	34,454	3	10
Copper and related compounds	2,012,288	3,288,829	1	6
Lead and related compounds	709,637	2,171,248	1	4
Manganese and related compounds	2,493,419	7,454,842	<1	2
Mercury and related compounds	0	4	0	100
Molybdenum and related compounds	19,113	19,113	0	19
Nickel and related compounds	992,407	1,895,396	<1	6
Selenium and related compounds	5,655	5,655	0	18
Silver and related compounds	2,996	2,996	0	67
Vanadium and related compounds	0	93	0	100
Zinc and related compounds	3,599,814	19,682,493	<1	5

Table 4. Freshwater acute and chronic water-quality criteria, fish-consumption advisory levels, and Maximum Contaminant Levels for primary drinking water regulations for 15 elements

[*, insufficient data to develop criteria—value presented is lowest observed effect level; +, criteria are dependent on hardness of water (100 milligrams per liter used for table); MCL, Maximum Contaminant Level; mg/L, milligrams per liter; ng/L, nanograms per liter; µg/L, micrograms per liter; --, no criteria or level available]

Element	Priority pollutant	Carcinogen	Freshwater-quality criteria ¹		Fish consumption advisory levels (units as noted)	Drinking water MCL ² (mg/L)
			Acute (µg/L)	Chronic (µg/L)		
Antimony	Yes	No	*9,000	*1,600	45 mg/L	--
Arsenic	Yes	Yes	--	--	17.5 ng/L	0.05
Arsenic(V)	Yes	Yes	*850	*48	--	--
Arsenic(III)	Yes	Yes	360	190	--	--
Barium	No	No	--	--	--	1.0
Cadmium	Yes	No	+3.9	+1.1	117 mg/L	.01
Beryllium	Yes	Yes	*130	*5.3	--	--
Chromium(VI)	Yes	No	16	11	3,433 mg/L	.05
Chromium(III)	No	No	+1,700	+210	--	.05
Copper	Yes	No	+18	+12	--	1.3
Iron	No	No	--	1,000	--	.3
Lead	Yes	No	+82	+3.2	--	.015
Manganese	No	No	--	--	100 µg/L	--
Mercury	Yes	No	2.4	.012	146 mg/l	.002
Nickel	Yes	No	+1,400	+160	100 µg/L	--
Selenium	Yes	No	260	35	--	.01
Silver	Yes	No	+4.1	.12	--	.05
Zinc	Yes	No	+120	110	--	³ 5.0

¹U.S. Environmental Protection Agency, 1986.

²U.S. Environmental Protection Agency, 1988.

³Recommended goal, not legally enforceable.

Table 5. Guidelines for pollutional classification of sediments

[All values in micrograms per gram; <, less than; >, greater than; --, data not available; USEPA, U.S. Environmental Protection Agency; OMEE, Ontario Ministry of Environment and Energy]

Element	USEPA ¹			OMEE ²	
	Nonpolluted	Moderately polluted	Heavily polluted	Lowest effect level	Severe effect level
Arsenic	<3	3–8	>8	6	33
Barium	<20	20–60	>60	--	--
Cadmium	Lower limits not established		>6	.6	10
Chromium	<25	25–75	>75	26	110
Copper	25	25–50	>50	16	110
Iron	<17,000	17,000–25,000	>25,000	2	4
Lead	<40	40–60	>60	31	250
Manganese	<300	300–500	>500	460	1,100
Mercury	>1 is unacceptable for open lake disposal			.2	2
Nickel	<20	20–50	>50	16	75
Zinc	<90	90–200	>200	120	820

¹ Guidelines from U.S. Environmental Protection Agency, 1977.

² Guidelines from Persaud and others, 1993.

Table 6. Sites sampled in the upper Illinois River Basin for elements in water, sediment, and biota, 1978–90

[BS, streambed sediment; SS, suspended sediment; USGS, U.S. Geological Survey; IEPA, Illinois Environmental Protection Agency; --, not determined]

Site number (fig. 5)	USGS station number	Site name	Latitude longitude	Predominant land use	Drainage area (square miles)	Component sampled	Agency	Period of record
2	05515480	Mill Creek at Hwy 39 near Kingsford Heights, Ind.	41°27' 04"	Agricultural	--	Water	USGS	1990
			86°44' 14"			BS		
6	05517120	Pitner Ditch at State Highway 8 near La Crosse, Ind.	41°19' 13"	Agricultural	--	Biota	USGS	1990
			86°50' 48"			Water		
9	05517725	Crooked Creek at 100 South Road near Wanatah, Ind.	41°25' 12"	Agricultural	--	Biota	USGS	1990
			86°57' 46"			Water		
11	05518000	Kankakee River at Shelby, Ind.	41°10' 58"	Agricultural	1,779	Biota	USGS	1990
			87°20' 33"			Biota		
14	05520500	Kankakee River at Momence, Ill. ¹	41°09' 36"	Agricultural	2,294	Water	IEPA	1978–86
			87°40' 07"		do.		
20	05525000	Iroquois River at Iroquois, Ill.	40°49' 25"	Agricultural	686	SS	USGS	1987–90
			87°34' 55"			BS		
22	05525500	Sugar Creek at Milford, Ill.	40°37' 50"	Agricultural	446	Biota	USGS	1987–90
			87°43' 25"			Water		
24	05525555	Spring Creek near Delrey, Ill.	40°37' 49"	Agricultural	47.4	BS	USGS	1990
			88°00' 22"			Biota		
25	05525570	Spring Creek at Road 730 East near Onarga, Ill.	40°41' 52"	Agricultural	146	Water	USGS	1990
			87°59' 09"			BS		
						Biota	USGS	1990

Table 6. Sites sampled in the upper Illinois River Basin for elements in water, sediment, and biota, 1978–90—Continued

Site number (fig. 5)	USGS station number	Site name	Latitude longitude	Predominant land use	Drainage area (square miles)	Component sampled	Agency	Period of record
27	05525680	Langan Creek at Road 1300 East near Clifton, Ill.	40°58' 08" 87°53' 04"	Agricultural	94.2	Water	USGS	1990
						BS	USGS	1990
28	05526000	Iroquois River near Chebanse, Ill. ¹	41°00' 32" 87°49' 27"	Agricultural	2,091	Biota Water	USGS IEPA	1990 1978–86
					do.	USGS	1987–90
						SS BS	USGS USGS	1987–90 1987–90
31	05527500	Kankakee River near Wilmington, Ill.	41°20' 48" 88°11' 11"	Agricultural	5,150	Biota Water	USGS IEPA	1990 1978–90
32	05527800	Des Plaines River at Russell, Ill.	42°29' 22" 87°55' 32"	Agricultural	123	Water	IEPA	1978–90
33	05528000	Des Plaines River near Gurnee, Ill.	42°20' 39" 87°56' 18"	Agricultural	232	Water	IEPA	1978–90
34	05529000	Des Plaines River near Des Plaines, Ill.	42°04' 55" 87°53' 25"	Urban	360	Water	IEPA	1978–90
35	05530590	Des Plaines River near Schiller Park, Ill.	41°57' 11" 87°51' 15"	Urban	444	Water	IEPA	1978–90

Table 6. Sites sampled in the upper Illinois River Basin for elements in water, sediment, and biota, 1978–90—Continued

Site number (fig. 5)	USGS station number	Site name	Latitude longitude	Predominant land use	Drainage area (square miles)	Component sampled	Agency	Period of record
38	05531500	Salt Creek at Western Springs, Ill.	41°49' 35"	Urban	115	Water	IEPA	1978–90
			87°54' 00"			BS		
39	05532000	Addison Creek at Bellwood, Ill.	41°52' 48"	Urban	17.9	Biota	USGS	1989–90
			87°52' 07"			Water		
40	05532500	Des Plaines River at Riverside, Ill. ¹	41°49' 20"	Urban	630	Water	USGS	1987–90
			87°49' 15"			SS		
42	05534050	Des Plaines River at Lockport, Ill.	41°35' 47"	Urban	700	BS	USGS	1987–90
			88°04' 07"			Biota		
43	05534500	North Branch Chicago River at Deerfield, Ill.	42°09' 10"	Urban	19.7	Water	IEPA	1978–90
			87°49' 07"			BS		
45	05536000	North Branch Chicago River at Niles, Ill.	42°00' 44"	Urban	100	Water	IEPA	1978–90
			87°47' 45"		do.		
46	05536107	North Shore Channel at Touhy Avenue at Chicago, Ill.	42°00' 42"	Urban	--	BS	USGS	1987–90
			87°42' 37"			Biota		
49	05536195	Little Calumet River at Munster, Ind.	41°34' 07"	Urban	90.0	Water	IEPA	1978–90
			87°31' 18"			BS		
50	05536275	Thorn Creek at Thornton, Ill.	41°34' 05"	Urban	104	Water	IEPA	1979–90
			87°36' 30"			BS		
52	055363252	Little Calumet River at Halsted Avenue at Harvey, Ill.	41°37' 45"	Urban	254	Water	USGS	1990
			87°38' 30"			BS		

Table 6. Sites sampled in the upper Illinois River Basin for elements in water, sediment, and biota, 1978-90—Continued

Site number (fig. 5)	USGS station number	Site name	Latitude longitude	Predominant land use	Drainage area (square miles)	Component sampled	Agency	Period of record
53	05536366	Little Calumet River at Calumet Park, Ill.	41°39' 26" 87°38' 29" "	Urban	24.3	Biota Water BS	USGS USGS USGS	1989-90 1990 1990
54	05536700	Calumet Sag Channel at Sag Bridge, Ill.	41°41' 45" 87°56' 11" "	Urban	389	Biota Water	USGS IEPA	1989-90 1978-90
55	05536995	Chicago Sanitary and Ship Canal at Romeoville, Ill. ¹	41°38' 26" 88°03' 38" "	Urban	739	Water SS	USGS	1987-90 1987-90
56	05537000	Chicago Sanitary and Ship Canal at Lockport, Ill.	41°34' 11" 88°04' 42" "	Urban	740	Water BS	IEPA	1978-90 1987
57	05537980	Des Plaines River at Route 53 at Joliet, Ill.	41°32' 12" 88°04' 57" "	Urban	1,502	Water BS	IEPA USGS	1981-90 1987
58	05538008	Des Plaines River above Brandon Road Dam at Joliet, Ill.	41°30' 24" 88°05' 49" "	Urban	1,506	BS Biota	USGS USGS	1990 1989-90
60	05539000	Hickory Creek at Joliet, Ill.	41°31' 10" 88°04' 10" "	Urban	107	Water	IEPA	1979-90
62	05539900	West Branch Du Page River near West Chicago, Ill.	41°54' 39" 88°10' 44" "	Urban	28.5	Water BS	IEPA USGS	1979-90 1987
63	05540066	West Branch Du Page River at Mack Road near West Chicago, Ill.	41°50' 33" 88°11' 56" "	Urban	80.6	Water BS	USGS USGS	1990 1990
64	05540095	West Branch Du Page River near Warrenville, Ill.	41°49' 22" 88°10' 23" "	Urban	90.4	Biota Water	USGS IEPA	1990 1978-90
65	05540210	East Branch Du Page River at Route 34 Bridge at Lisle, Ill.	41°48' 02" 88°04' 53" "	Urban	51.4	Water	IEPA	1978-90
66	05540258	East Branch Du Page River at Naperville, Ill.	41°42' 52" 88°06' 44" "	Urban	--	Water BS	USGS USGS	1989-90 1990

Table 7. Element concentrations that exceeded U.S. Environmental Protection Agency freshwater chronic and acute criteria for total recoverable concentration, 1978–86

[Format: number of observations - number of times chronic criteria was exceeded - number of times acute criterion was exceeded. NA, criteria not available; No obs., no observations; U.S. Environmental Protection Agency criteria do not exist for elements not shown, except nickel, which had no exceedances]

Site number (fig. 5)	Element							
	Cadmium	Chromium	Copper	Iron	Lead	Mercury	Silver	Zinc
14	44- 4- 0	94- 7- 4	No obs.	61-36-NA	44- 1- 0	87- 8- 1	44- 7- 0	44- 1- 1
20	31- 3- 0	55- 2- 1	No obs.	56-35-NA	31- 1- 0	No obs.	31- 5- 0	No obs.
22	33- 7- 0	55- 8- 3	33- 1- 1	57-30-NA	No obs.	No obs.	33- 6- 0	33- 2- 1
28	30- 5- 0	57- 5- 0	29- 1- 1	61-40-NA	30- 1- 0	No obs.	30- 9- 0	No obs.
31	73- 6- 0	91- 6- 6	77- 3- 0	93-35-NA	74-16- 0	66-17- 0	51- 6- 0	No obs.
32	43- 3- 0	72- 3- 1	42- 0- 1	67-33-NA	No obs.	No obs.	42- 3- 0	41- 2- 2
33	57-16- 1	89-10- 7	75- 1- 0	98-47-NA	75-17- 2	17- 9- 0	44- 4- 0	75- 1- 0
34	42- 2- 0	67- 3- 0	42- 1- 0	66-41-NA	No obs.	19- 1- 0	41- 1- 0	No obs.
35	49- 1- 0	87- 4- 0	49- 5- 2	58-34-NA	49- 1- 0	82-14- 0	48- 2- 0	No obs.
38	46- 3- 0	89- 9- 6	46- 7- 5	62-37-NA	46- 2- 0	88- 5- 0	46- 3- 0	45- 2- 2
39	41- 4- 2	56-16-14	46- 7- 5	62-37-NA	42- 5- 3	No obs.	41- 2- 0	41- 4- 3
42	42- 2- 0	67- 7- 1	No obs.	60-31-NA	No obs.	No obs.	No obs.	41- 1- 1
43	32- 2- 0	65- 4- 3	32- 1- 1	64-42-NA	No obs.	12- 2- 0	32- 1- 0	No obs.
45	49- 1- 1	90- 5- 4	48- 7- 6	60-23-NA	49- 1- 1	89-11- 0	49- 2- 1	49- 2- 2
46	37- 2- 0	68- 4- 4	37- 3- 1	40-28-NA	No obs.	68-23- 0	36- 4- 0	No obs.
27	27- 2- 0	54- 6- 0	No obs.	54-18-NA	No obs.	8- 2- 0	No obs.	No obs.
54	44- 2- 0	63- 6- 5	45- 3- 2	53-33-NA	45- 2- 0	59- 7- 0	44- 2- 0	44- 7- 7
56	45- 3- 0	94-25-11	45- 1- 0	61- 9-NA	No obs.	92-10- 0	No obs.	45- 1- 0
57	40- 3- 0	41-15- 5	40- 4- 1	41- 7-NA	40- 1- 0	42- 2- 0	40- 4- 0	40- 3- 1
60	42- 4- 0	56- 4- 2	42- 2- 1	53-14-NA	42- 1- 0	12- 1- 0	42- 4- 0	No obs.
62	41- 5- 0	54- 4- 1	No obs.	52-34-NA	No obs.	10- 1- 0	41- 4- 0	No obs.
64	73- 4- 0	86-10- 6	73- 2- 0	95-57-NA	73-13- 0	14- 8- 0	42- 3- 0	72- 1- 1
65	38- 1- 0	62- 3- 1	No obs.	59-20-NA	39- 1- 0	No obs.	39- 4- 1	No obs.
67	No obs.	62- 2- 1	No obs.	61-21-NA	43- 1- 0	No obs.	43- 2- 0	No obs.
69	No obs.	61- 1- 1	No obs.	61-22-NA	No obs.	19- 2- 0	43- 2- 0	No obs.
72	No obs.	56- 2- 0	No obs.	75-20-NA	No obs.	73- 4- 0	No obs.	22- 1- 1
74	No obs.	61- 1- 1	No obs.	93-36-NA	No obs.	84- 8- 0	23- 1- 0	No obs.
76	74- 8- 0	102-39-31	80-18- 8	102-49-NA	71-16- 0	94-32- 0	62- 6- 0	58- 2- 1
84	48- 1- 0	97- 2- 1	48- 5- 3	61-16-NA	No obs.	86-10- 1	48- 5- 0	48- 2- 2
86	42- 2- 0	65- 4- 2	42- 3- 1	65-18-NA	42- 1- 0	No obs.	42- 6- 0	No obs.
88	37- 1- 0	54- 2- 2	No obs.	52- 5-NA	No obs.	No obs.	37- 2- 0	No obs.
89	No obs.	65- 1- 0	38- 1- 1	65- 9-NA	39- 1- 0	14- 1- 0	39- 1- 0	No obs.
90	No obs.	85- 5- 1	No obs.	94-31-NA	55-17- 0	10- 6- 0	22- 0- 2	No obs.
91	39- 1- 0	61- 2- 0	40- 1- 0	60-10-NA	40- 1- 0	16- 1- 0	39- 2- 0	38- 1- 1
92	46- 2- 0	90- 4- 3	46- 3- 3	61-24-NA	No obs.	86- 4- 0	45- 2- 0	45- 1- 1
93	33- 2- 0	60- 1- 1	No obs.	63-38-NA	No obs.	No obs.	33- 3- 0	33- 1- 1
96	38- 1- 0	50- 1- 1	No obs.	50-12-NA	No obs.	No obs.	38- 5- 0	36- 2- 1
99	48- 3- 0	95- 5- 2	48- 4- 3	94-35-NA	No obs.	93- 8- 0	48- 2- 0	47- 1- 1

Table 8. Comparison of total recoverable yields of selected elements in water and in atmospheric deposition in the upper Illinois River Basin

[All yields in tons per square mile per year. Numbers in parentheses following stream names are site numbers. If a range of numbers is given for yields, the numbers represent the range in values when censored values were replaced with 0 and the minimum reporting level.
-- no data available]

Element	Atmospheric deposition ¹	Yields (total recoverable)				
		Urban				Agricultural
		Chicago Sanitary and Ship Canal (55)	Thorn Creek (50)	Des Plaines River (40)	Addison Creek (39)	Iroquois River (28)
Aluminum	0.4	1.4	3.5	1.6	8.8	3.5
Cadmium	.0008	.0045	--	.0006	.0006–.004	3.0001–.0003
Cobalt	<.001	--	.001–.006	--	--	--
Copper	.007	.03–.04	.01–.03	.02–.03	.03	.007–.009
Iron	.20	2.2–2.4	4.4–4.7	2.3	3.1	3.8–4.5
Lead	.05	.06–.07	.02–.05	.02–.04	.02–.06	.002–.008
Manganese	.05	.19	.14	.10	.18	.08
Zinc	.07	.4–.5	.008–.11	.09–.11	.15–.66	.006–.05

¹Data from Eisenreich (1980); for southern Lake Michigan.

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90

[Correlations not shown if majority of concentrations for an element were below the minimum reporting level (MRL). Correlations were done twice, first with concentrations less than the MRL set to the MRL, and second with those values set to zero. If two coefficients are shown, the first represents the correlation where values below the MRL were set to the MRL, and the coefficient in bold represents the correlation where values below the MRL were set to zero. Elements with greater than 50 percent of observations below the MRL are not included in this table. --, correlations with $p > 0.10$]

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Stronium, total	Stronium, dissolved
All 40 sites														
Aluminum, total	1	0.31 .3	--	0.28 .29	--	0.07	0.06	0.88	0.57	0.06	0.24	0.15	-0.06	-0.07 -.08
Arsenic, total	.31 .30	1	0.64 .63	-- .07	-0.15 -.13	.17 16.07	.14 .13	.35 .33	.47 .45	--	.26 .24	.11 .09	--	--
Arsenic, dissolved	--	.64 .63	1	-.19 .10	-.2 -.13	.39 .28	.38 .26	--	.16 .17	-.13 -.17	.3 .20	.18 .09	.29 .30	.29 .31
Barium, total	.28 .29	-- .07	-.19 .1	1	.87	-.33	-.33	.3	.26	-.27	-.24	-.32	-.05	-.06 -.07
Barium, dissolved	--	-.15 -.13	-.2 .13	.87	1	-.31 -.30	-.29	--	--	-.25 -.26	-.35	-.36 -.35	--	--
Boron, total	.07	.17 .16	.39 .28	-.33	-.31 -.30	1	.99	--	--	.37	.81	.84	.53	.53
Boron, dissolved	.06	.14 .13	.38 .26	-.33	-.29	.99	1	--	--	.37	.8	.83	.54	.54
Iron, total	.88	.35 .33	--	.3	--	--	--	1	.69	.14	.23	.13	-.14	-.15
Manganese, total	.57	.47 .45	.16 .17	.26	--	--	--	.69	1	.4	.17	--	--	--
Manganese, dissolved	.06	--	-.13 -.17	-.27	-.25 -.26	.37	.37	.14	.4	1	.32	.4	--	--
Phosphorus, total	.24	.26 .24	.3 .2	-.24	-.35	.81	.8	.23	.17	.32	1	.94	.43	.42
Phosphorus, dissolved	.15	.11 .09	.18 .09	-.32	-.36	.84	.83	.13	--	.4	.94	1	.38	.37

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
All 40 sites—Continued														
Strontium, total	-0.06	--	0.29 .11	-0.05	--	0.53	0.54	-0.14	--	--	0.43	0.38	1	1
Strontium, dissolved	-.07 -.08	--	.29	-.06 -.07	--	.53	.54	-0.15	--	--	.42	.37	1	1
Discharge	--	-0.09 -.1	-0.28 --	-0.06 -.05	-0.19	-0.37	-0.38	0.07	-0.1	-0.4	-0.14	-0.22	-0.34	-0.34
Specific conductance	-0.13	-0.07	.14 .13	-0.19	--	0.68	0.69	-0.18	-0.06	0.39	0.5	0.58	0.63	0.63
pH	-0.16	-.09 .08	-- .12	.23	.3	-.15 -.16	-0.14	-0.2	-0.12	-0.37	-0.22	-0.27	0.12	0.14
Temperature	.32	.51 .5	.58 --	.13	.05 .06	.1	.1	.3	.31	-0.15	.14	.05	-0.08	-0.07
Dissolved oxygen	-0.34	-.42 -.40	-0.35 .06	.12	.25	-0.22	-0.21	-0.38	-0.33	-0.23	-0.29	-0.27	0.14	0.14
Hardness	-0.22	-.41 -.39	-0.33 .13	.24	.47	.07	.09	-0.26	-0.19	0.09	-0.16	-0.05	0.29	0.31
Alkalinity, total	-0.67	--	--	--	.76	.37	.37	-0.62	-0.51	--	--	--	0.69	0.73
Alkalinity, dissolved	-0.44	-.54 -.52	-- -.25	.35	.77	--	--	-0.51	-0.46	-0.22	-0.17	--	0.59	0.54
Calcium, total	-0.1	-.4 -.39	-0.45 -.42	.17	.35	.12	.14	-0.1	-.1 -.09	.22	-0.07	0.05	0.2	0.21
Calcium, dissolved	-0.17	-.43 -.41	-0.42 -.40	.11	.33	.14	.17	-0.17	-0.15	.24	-0.08	0.06	0.19	0.21
Magnesium, total	-0.19	-.15 -.12	-- .09	.38	.54	--	--	-0.28	-0.13	-0.16	-0.19	-0.18	0.39	0.39
Magnesium, dissolved	-0.25	-.18 -.16	-- .09	.34	.54	--	--	-0.33	-0.18	-0.15	-0.21	-0.19	0.38	0.39

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Sodium, total	Sodium, dissolved	Strontium, total	Strontium, dissolved
All 40 sites—Continued																
Sodium, total	--	--	0.26 .15	-0.31 -.32	-0.26	0.84	0.84	-0.07	--	0.4	0.75	0.77	0.61	0.61		
Sodium, dissolved	--	--	.26 .16	-.32	-.26	.85	.85 .84	-.07	--	.39	.75	.77 .78	.61	.61		
Potassium, total	0.12	0.22 .2	.3 .20	-.27	-.32	.88	.87	.11	0.11	.37	.87	.87	.55	.54		
Potassium, dissolved	--	.15 .13	.31 .20	-.32	-.31	.89	.89	--	--	.37	.84	.86	.58	.57		
Chloride, dissolved	--	--	.15 --	-.18	-.1 -.09	.74	.74	-.05	--	.47	.65	.7	.51	.5		
Solids, residue on evaporation at 180°C	-.18	-.24	--	-.1 -.09	.17	.65	.67 .66	-.25	-.38	.18	.46	.56	.51	.51		
Solids, total suspended	.73	.4 .39	.18 .24	.31	.05 .06	--	--	.74	.57	--	.19	.05	--	--		
Solids, volatile	.53 .54	.44 .43	.29 .33	.3	.08 .09	--	--	.53	.5	-.08	.19	--	.13	.13		
Carbon, total organic	.1	.46 .44	.37 .15	.18	--	--	--	-.08	--	.32	-.16 -.15	.12	-.14	.39	.36	

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
8 NAWQA sites																	
Aluminum, total	1	0.36 .34	0.07 .09	0.43	0.06	-0.02	-0.04	0.09 .18	0.15	0.87	0.54	-0.18	0.02	0.14	0.03	-0.16	-0.19
Arsenic, total	.36 .34	1	.64 .63	.08 .10	-.19 -.16	.07	.04	.12 .20	.13	.39 .36	.55 .53	-.11	.09 .11	.16 .13	-.02	.01	--
Arsenic, dissolved	.07 .09	.64 .63	1	-.18 -.11	-.2	.38	.36	.1 .17	.02	--	.16 .17	-.16 -.20	.11	.29 .19	.18 .10	.29 .30	.3 .31
Barium, total	.43	.08 .1	-.18 -.11	1	.81 .80	-.31	-.3	-.22 -.17	-.12	.43	.36	-.43	-.42	-.25	-.35 -.34	.13 .14	.12
Barium, dissolved	.06	-.19	-.2	.81	1	-.23	-.19	-.34 -.36	-.23	.05	--	-.38 -.4	-.55	-.37	-.34 -.33	.3 .31	.32 .33
Boron, total	-.02	.07	.38 .26	-.31	-.23 -.22	1	1	.21	.11	-.16	-.29	.2	.3 .28	.83 .84	.85	.4	.39 .40
Boron, dissolved	-.04	.04	.36 .25	-.3	-.19	1	1	.18 .19	.11	-.19	-.31 -.32	.2	.28 .26	.82	.84	.43	.42 .43
Cadmium, total	.09 .18	.12 .2	.1 .17	-.22 -.17	-.34 -.36	.21	.18 .19	1	.28	.04	-.07 .23	.19 .13	.38 .28	.32	.26	-.11 -.15	-.14 -.16
Chromium, total	.15	.13	.02	-.12	-.23	.11	.11	.28	1	.08	.04	.21 .22	.5	.2	.15	-.17 -.18	-.2
Iron, total	.87	.39 .36	--	.43	.05 --	-.16	-.19	.04 .26	.08 .09	1	.72	-.04 --	--	.01 --	-.1	-.34	-.36
Manganese, total	.54	.55 .53	.16 .17	.36	--	-.29	-.31 -.32	-.07 .23	.04	.72	1	.07 .08	-.05 --	-.15 -.16	-.33	-.28	-.29 .30
Manganese, dissolved	-.18	-.11	-.16 -.20	-.43	-.38 -.40	.2	.2	.19 .13	.21 .22	-.04	.07	1	.38 .37	.21	.32	-.34	-.35
Nickel, total	.02	.09 .11	.11 --	-.42	-.55	.3 .28	.28 .26	.38 .28	.5	--	-.05	.38 .37	1	.41 .40	.41 .38	-.25 -.24	-.27 .26
Phosphorus, total	.14	.16 .13	.29 .19	-.25	-.37	.83 .84	.82	.32	.2	.01	-.15 -.16	.21	.41 .40	1	.91	.28	.26 .27

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Phosphorus, total	Phosphorus, dissolved	Strontium, total	Strontium, dissolved
8 NAWQA sites—Continued																	
Phosphorus, dissolved	0.03 --	-0.02 --	0.18 .1	-0.35 .34	-0.34 .33	0.85	0.84	0.26	0.15	-0.1	-0.33 .33	0.32	0.41 .38	0.91	1	0.23	0.21
Strontium, total	-.16	.01	.29 .3	.13 .14	.3 .31	.4	.43	-.11 .15	-.17 .18	-.34	-.28	-.34	-.25 .24	.28	.23	1	.99
Strontium, dissolved	-.19	--	.3 .31	.12	.32 .33	.39 .4	.42 .43	-.14 .16	-.2	-.36	-.29 .30	-.35	-.27 .26	.26 .27	.21	.99	1
Discharge	.07 --	-.08 .09	-.26 .24	-.33 .34	-.49 .50	-.34	-.36 .35	.29 .26	.23	.13	.06 --	.23 .24	.4	-.11	-.12	-.62	-.62
Specific conductance	-.25 .14	-.15 .11	.15	-.21	.04 --	.68	.69	.03 .09	-.05 --	-.37	-.39	.16	.02 --	.52	.61	.67	.67
pH	-.18 .14	-.13 --	-.02	.32	.48 .49	-.14	-.14	-.26 .35	-.27 .28	-.2	-.11 .10	-.41	-.39 .38	-.26	-.3	.34	.32
Temperature	.36	.58 .55	.59 .50	.1	-.05 --	.16	.15	.05 .12	.14	.29	.33	-.27	.05 .10	.16	.02 --	-.12	-.08
Dissolved oxygen	-.36	-.44 .42	-.36 .29	.13	.36	-.14	-.12	-.28 .30	-.16 .17	-.37	-.27	-.14	-.28 .32	-.31	-.24	.31	.28
Hardness	-.21	-.45 .42	-.33 .28	.3	.64	.07 --	.12	-.31 .37	-.26	-.19	-.28	--	-.4 .42	-.13	.03 --	.4	.41
Alkalinity, total	-.65	.02	-.01	.06	.76	.35 --	.35 --	-.39 .55	-.78	-.6	-.51	-.31	-.71 .68	-.12 --	.22 --	.68	.73
Alkalinity, dissolved	-.43	-.55 .52	-.16 .25	.32	.77	.05 --	.1	-.39 .45	-.15 --	-.48	-.46	-.19	-.36 .41	-.17	-.06 --	.59	.54
Calcium, total	-.13	-.48 .45	-.45 .42	.19	.46	.06 --	.09	-.22 .32	-.17 .16	-.05 --	-.2	.23	-.24 .26	-.1	.1 --	.06	.07
Calcium, dissolved	-.2	-.5 .47	-.42 .40	.09	.41	.1	.13	-.21 .33	-.17 .16	-.12	-.27	.27	-.22 .24	-.09	.13 --	.06	.07
Magnesium, total	-.11	-.09	.03	.49	.67	.08	.11	-.36 .25	-.3	-.2	-.11	-.43	-.51 .52	-.05 --	-.1	.75	.75 .74

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Phosphorus, total	Phosphorus, dissolved	Sodium, total	Sodium, dissolved
8 NAWQA sites—Continued																	
Magnesium, dissolved	-0.19 -0.11	-0.13 .08	0.04 .08	0.43	0.67	0.09	0.12	-0.37 -0.28	-0.32	-0.27	-0.18	-0.41	-0.52	-0.08 --	-0.1	0.76	0.76
Sodium, total	-.11 --	-.03 .15	.26 .15	-.3	-.19 -.18	.9	.9	.19 .18	.11	-.26	-.33 -.34	.21	.26 .24	.82	.81	.54	.52 .53
Sodium, dissolved	-.12 --	-.04 .15	.25 .15	-.31	-.19 -.18	.89	.9	.18	.09 .10	-.27	-.36	.2	.25 .23	.82	.81	.54	.52 .53
Potassium, total	.04 --	.12 .09	.29 .19	-.23	-.26 -.25	.89	.88 .89	.24	.18	-.08	-.2 .21	.23	.36 .33	.89	.85	.38	.35
Potassium, dissolved	-.08 --	.03 --	.3 .19	-.3	-.23 -.22	.91	.91	.2	.14	-.2	-.32 -.33	.21	.33 .22	.85	.84	.43	.42
Chloride, dissolved	-.09 -.11	-.09 .10	.19	-.21	-.09	.83	.83	.14 .12	.1	-.26	-.35 -.36	.15	.21 .18	.78	.76	.6	.59
Solids, residue on evaporation at 180 °C	-.16	-.24	-.01 --	-.09	.18	.65	.67	-.01 -.13	-.02 --	-.25	-.37	.21	-.02 --	.47	.57	.52	.51
Solids, total suspended	.54 .40	.41 .24	.18 .24	.28 .29	.08	-.05 --	-.05 --	-.08 --	.25 .26	.47	.46 .45	-.2	--	.03 --	-.12 --	-.02 --	-.03 --
Solids, volatile	.43 .44	.5 .49	.3 .33	.29	.1	.01 --	.02 --	-.01 .10	.21 .22	.35 .36	.41	-.29	.01 --	.07 --	-.13 --	.11	.11 .10
Carbon, total organic	.12 .43	.46 .35	.38 .35	.1 .11	-.12	-.05 --	-.06 --	.08 .09	.11	.04	.33	-.19	.03 --	.08	-.16	.37	.34

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Kankakee River at Momence, Ill. (site 14)													
Aluminun, total	1	0.45	0.69 .68	--	0.78	--	0.88	0.81	--	0.8	0.42	-0.51	-0.58
Aluminum, dissolved	.45	1	--	--	.29	--	--	--	--	.33	--	--	--
Arsenic, total	.69 .68	--	1	0.37 --	.53 .52	--	.76	.74 .75	-0.38 -.37	.62 .61	.33 .32	-0.43 -.42	-0.48 .47
Arsenic, dissolved	--	--	.37 --	1	--	--	--	.3 --	-.45 --	--	--	-0.26 --	--
Barium, total	.78	.29	.53 .52	--	1	0.36	.76	.67	--	.7	.37	-0.35	-0.4
Barium, dissolved	--	--	--	--	.36	1	--	--	--	--	--	--	.34
Iron, total	.88	--	.76	--	.76	--	1	.84	--	.8	.46 .44	-0.35	-0.47
Manganese, total	.81 --	--	.74 .75	.3 --	.67	--	.84	1	--	.65	.25 --	-0.31	-0.41
Manganese, dissolved	--	--	-.38 -.37	-0.45 --	--	--	--	--	1	-0.26	-- --	--	--
Phosphorus, total	.8	.33	.62 .61	--	.7	--	.8	.65	-0.26	1	.51 .53	-0.41	-0.5
Phosphorus, dissolved	.42	--	.33 .32	--	.37 .34	--	.46 .44	.25	--	.51 .53	1	--	-- -.25
Strontium, total	-0.51	--	-.43 -.42	-0.26 --	-.35	--	-.35	-.31	--	-.41	--	1	.94
Strontium, dissolved	-0.58	--	-.48 -.47	--	-.4	.34	-.47	-.41	--	-.5	-- -.25	.94	1

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Sodium, total	Sodium, dissolved
Kankakee River at Momence, Ill. (site 14)—Continued													
Discharge	--	--	--	-0.46 --	0.33	--	0.32	--	0.59	--	--	--	--
Specific conductance	-0.37	-0.3	--	.28 .30	-.37	--	-.24	--	--	-0.35	--	0.42	0.46
pH	-.24	--	-0.25 -.28	--	-.27	--	-.38	-0.34	--	--	--	--	--
Temperature	.5	--	.63 .62	.58 --	.38	--	.4	.61	-.53	.48	--	-.3	-.29
Dissolved oxygen	-.58	--	-.69 -.70	-.32 --	-.45	--	-.64	-.71	--	-.5	-0.32	.34	.33
Hardness	-.67	-.26	-.48 -.47	--	-.56	--	-.53	-.53	--	-.59	-.25 -.26	.63	.7
Alkalinity, dissolved	--	--	--	--	--	--	--	--	--	-.53	--	.64	.83
Calcium, total	-.63	-.25	-.46 -.45	--	-.52	--	-.47	-.49	--	-.6	-.26 -.28	.66	.69
Calcium, dissolved	-.69	-.27	-.5 -.48	--	-.56	--	-.52	-.58	.26	-.56	--	.65	.72
Magnesium, total	-.42	-.26	--	--	-.33	--	-.37	--	--	-.44	--	.49	.49
Magnesium, dissolved	-.56	--	-.38 -.36	--	-.46	--	-.53	-.38	--	-.54	-.24 -.26	.48	.54
Sodium, total	--	--	--	.46 .32	--	--	--	.29	-.34	--	--	--	--
Sodium, dissolved	--	--	--	.42 .32	--	--	--	.3	-.3	--	--	--	--

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Kankakee River at Momence, Ill. (site 14)—Continued													
Potassium, total	0.45	0.43	--	0.27 .29	0.27	--	0.34	0.26	--	0.25	0.26 .25	-0.25	-0.28
Potassium, dissolved	.39	.32	--	.31 --	--	--	.25	--	--	.25	--	-0.27	-0.26
Chloride, dissolved	-.38	--	-0.49 -.48	--	-.42	--	-.38	-.34	--	-.35	-- .24	.44	.43
Solids, residue on evaporation at 180°C	-.3	--	--	--	-.44	-0.28	--	--	--	-.34	--	.41	.47
Solids, total suspended	.7	.39	.55	--	.59	--	.64	.7	--	.58	--	-0.37	-0.45
Solids, volatile	.62 .63	.32	.55	.27 --	.51 .53	--	.54 .55	.66 .67	--	.53 .54	--	-0.35 .36	-0.42 .43
Carbon, total organic	.35	.36	--	--	.4	--	.36	--	0.32	.27	-- --	-0.28	-0.37

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium, total	Iron, total	Manganese, total	Manganese, dissolved	Selenium, dissolved	Phosphorus, total	Phosphorus, dissolved	Srtrontium, total	Srtrontium, dissolved
Iroquois River near Chebanse, Ill. (site 28)																	
Aluminum, total	1	0.37	0.61 .55	0.74	-0.33	--	--	0.32	0.42 .43	0.99	0.83	-0.37	-- -0.34	0.87	0.69	-0.62	-0.71
Aluminum, dissolved	.37	1	.31 .41	.33	--	--	--	--	.47	.34	.33	.24 .25	--	.32	.3	--	-.26
Arsenic, total	.61 .55	.31 .41	1	.75 .68	--	0.37 .29	0.44 .34	.48 .41	.41 .35	.62 .54	.78 .68	--	-.49 .29	.54 .52	.42 .39	--	--
Barium, total	.74	.33	.75 .68	1	--	--	--	.39 .11	.32	.74	.76	-.26	-.53 .50	.67	.53	--	--
Barium, dissolved	-.33	--	--	--	1	.62	.69	-- -.28	--	-.34	--	--	-.44 .29	-.31	-.34	.7	.73
Boron, total	--	--	.37 .29	--	.62	1	.97	--	--	--	--	--	-.52 .26	-.23	--	.59	.54
Boron, dissolved	--	--	.44 .34	--	.69	.97	1	--	--	--	--	--	-.55 .33	-.28	--	.62	.6
Cadmium, total	.32	--	.48 .41	.39	-- -.28	--	--	1	--	.38 .36	.37 .32	--	--	.41 .24	.34 .28	-- .26	-.25 .37
Chromium, total	.42 .43	.47	.41 .35	.32	--	--	--	--	1	.44 .46	.49 .50	--	-- .26	.38 .39	.26 .28	-.26 .27	-.26
Iron, total	.99	.34	.62 .54	.74	-.34	--	--	.38 .36	.44 .46	1	.83	-.36	-- .35	.86	.67	-.6	-.7
Manganese, total	.83	.33	.78 .68	.76	--	--	--	.37 .32	.49 .50	.83	1	--	-.47 .49	.71	.64	-.34	-.43
Manganese, dissolved	-.37	.24 .25	--	-.26	--	--	--	--	--	-.36	--	1	--	-.26 .25	--	--	--
Phosphorus, total	.87	.32	.54 .52	.67	-.31	-.23	-.28	.41 .24	.38 .39	.86	.71	-.26 .25	--	1	.84	-.6	-.65
Phosphorus, dissolved	.69	.3	.42 .39	.53	-.34	--	--	.34 .28	.26 .28	.67	.64	--	--	.84	1	-.55	-.55

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium, total	Iron, total	Manganese, total	Manganese, dissolved	Selenium, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontium, total	Strontium, dissolved
Iroquois River near Chebanse, Ill. (site 28)—Continued																	
Selenium, dissolved	-- -0.34	-- -0.29	-0.49 -0.50	-0.53 -0.50	-0.44 -0.29	-0.52 -0.26	-0.55 -0.33	-- -0.26	-- -0.26	-- -0.35	-0.47 -0.49	-- --	1	-- --	-- --	-- --	
Strontium, total	-.62	--	--	--	.7	.59	.62	-- -0.26	-- -0.27	-.6	-.34	--	--	-0.6 -0.55	1	0.97	
Strontium, dissolved	-.71	-0.26	--	--	.73	.54	.6	-0.25 -0.37	-- -0.26	-.7	-.43	--	--	-.65 -.55	.97	1	
Discharge	.36	.32	--	--	-.68	-.81	-.85	--	--	.34	--	--	.54 .28	.41	.28	-.63	-.62
Specific conductance	-.62	--	-0.42 .39	-.35	.44	--	--	-0.37 .39	-.35	-.62	-.56	--	.24 --	-.66	-.67	.76	.74
pH	-.4	-.32	-- -.31	--	.42	.29	.31	--	-.39	-.39	-.3	--	--	-.35	-.33	.42	.38
Temperature	.44	--	.68 .53	.43	.28	.46	.58	-- .27	.24	.43	.64	-0.37 .51	.29	--	--	--	
Dissolved oxygen	-.66	--	-0.49 .43	-.52	--	--	--	--	--	-.63	-.59	.44 .45	--	-.61	-.45	.36	.38
Hardness	-.6	--	-0.63 .55	-.46	.33	--	--	-0.48 .40	-.36	-.6	-.67	-- .33	-.6	-.65	.58	.63	
Alkalinity, dissolved	-.72	--	-0.63 .72	--	.9	.69	.57	-0.56 .72	-.69	-.72	-.69	--	--	-.78	-.65	.96	.95
Calcium, total	-.47	--	-0.65 .59	-.39	.28	--	--	-0.45 .42	-.32	-.47	-.6	--	.44 .36	-.48	-.58	.5	.49
Calcium, dissolved	-.56	--	-0.71 .63	-.46	.32	--	--	-0.47 .52	-.39	-.56	-.68	--	.44 .39	-.53	-.58	.47	.53
Magnesium, total	-.44	--	--	-.26	.38	.26	.33	-0.24 --	--	-.43	-.32	--	--	-.57	-.57	.7	.68
Magnesium, dissolved	-.58	--	--	-.37	.42	.27	.31	-0.32 .27	--	-.58	-.44	.26	--	-.64	-.61	.72	.75

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium, total	Iron, total	Manganese, total	Manganese, dissolved	Selenium, dissolved	Phosphorus, total	Phosphorus, dissolved	Sodium, total	Sodium, dissolved	Strontium, total	Strontium, dissolved
Iroquois River near Chebanse, Ill. (site 28)—Continued																			
Sodium, total	-0.48	-0.26	--	--	0.65	0.83	0.87	--	--	-0.46	--	--	-0.42 --	-0.53	-0.4	0.78	0.76		
Sodium, dissolved	-.51	-.24	--	--	.6	.77	.84	--	-- -0.27	-.5	--	--	-.38 --	-.54	-.39	.74	.72		
Potassium, total	.41	--	0.59 .55	0.62	--	.35	.4	0.38 --	.28 .25	.42	0.57	--	-.62 -.46	.44	.46	--	--		
Potassium, dissolved	--	--	.41 .36	.43	.28	.44	.52	--	--	--	.36	--	-.61 -.40	--	.31	--	--		
Chloride, dissolved	-.67	-.29	--	-.3	.53	.7	.73	--	-.26 -.28	-.66	-.28	0.29 .30	--	-.63	-.45	.8	.8		
Solids, residue on evaporation at 180°C	-.65	--	-.46 -.41	-.48	.29	--	--	-.32 -.30	-.49 -.50	-.65	-.7	--	.36 -.40	-.65	-.71	.61	.6		
Solids, total suspended	.67	.43	.51 .48	.38	-.45	-.32	-.34	--	.45	.66	.51	--	--	.6	.46	-.45	-.49		
Solids, volatile	.69 .70	.35 .34	.59 .56	.42 .43	-.41	-.26	-.26	--	.42 .44	.68 .70	.54 .55	-.24	--	.65 .66	.45	-.45	-.5 -.51		
Carbon, total organic	.51	.3	.7 .61	.67	--	.25	--	.36 .31	.36 .33	.53	.65	--	-.47 -.31	.51	.5	--	-.29		

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Cadmium, dissolved	Chromium, total	Copper, total	Iron, total	Lead, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Des Plaines River at Riverside, Ill. (site 40)																						
Aluminum, total	1	--	0.52	--	0.53 .44	--	--	--	0.33 .32	--	0.33 .31	0.36 .39	0.97	0.74	0.48	--	--	-0.26 --	--	-0.26	-0.36	-0.43
Aluminum, dissolved	--	1	--	--	--	--	--	--	--	-0.32	--	--	--	--	--	--	--	--	--	--	--	
Arsenic, total	.52	--	1	0.53 .52	-- .30	-0.28	0.36	0.29	--	--	.4 .41	--	.57	.55	.28	--	0.3 .42	--	0.46	.32	--	--
Arsenic, dissolved	--	--	.53 .52	1	--	--	.77 .78	.74	--	--	--	--	.27	--	.26	--	-0.43 -.44	--	.67 .66	.62 .61	.61 .60	.6
Barium, total	.53 .44	--	-- .30	--	1 .52	.55 .52	--	--	--	-0.32 -.29	.34 -.41	--	.49 .39	.43 .45	.62 .61	--	.26 .36	--	-0.38 -.30	-0.31 --	-0.29	
Barium, dissolved	--	--	-0.28	--	.55 .52	1	--	--	-0.42 -.44	-0.34 -.33	--	-0.31 -.40	--	--	--	--	--	-0.3 --	--	--		
Boron, total	--	--	.36	.77 .78	--	--	1	.99	--	--	--	--	--	--	--	--	--	.85	.84	.9	.89	
Boron, dissolved	--	--	.29	.74	--	--	.99	1	-0.26	--	--	--	--	--	--	--	--	.83	.84	.88	.88	
Cadmium, total	.33 .32	--	--	--	--	-0.42 -.44	--	-0.26	1	.5 .51	--	.34 .35	.38 .37	.38 .37	--	--	--	--	--	--	-0.36	
Cadmium, dissolved	--	-0.32	--	--	-0.32 -.29	-0.34 -.33	--	--	.5 .51	1	--	--	--	--	-0.28 --	--	--	--	--	--	--	
Chromium, total	.33 .31	--	.4 .41	--	.34 .41	--	--	--	--	1	.4 .35	.34 .32	.35 .33	.55 .56	.3 .32	.46 .56	--	--	--	--	--	
Copper, total	.36 .39	--	--	--	--	-0.31 -.40	--	--	.34 .35	--	.4 .35	1	.39 .41	.55 .41	.35 .36	--	.33 --	--	--	-0.28 --	-0.28	
Iron, total	.97	--	.57	--	.49 .39	--	--	--	.38	--	.34 .32	.39 .41	1	.8	.48	--	--	--	--	-0.38 -.29	-0.43	
Lead, total	.74	--	.55	.27 .26	.43 .45	--	--	--	.38 .37	--	.35 .33	.55 .57	.8	1	.57	--	.33 .43	--	--	--	-0.28 --	

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Cadmium, dissolved	Chromium, total	Copper, total	Iron, total	Lead, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved	
Des Plaines River at Riverside, Ill. (site 40)—Continued																							
Manganese, total	0.48	--	0.28	--	0.62 .61	--	--	--	--	--	0.55 .56	0.35 .36	0.48	0.57	1	0.31	0.36 .40	--	--	--	--		
Manganese, dissolved	--	--	--	-0.43 -.44	--	--	--	--	--	-0.28 --	.3 .32	--	--	--	.31	1	--	--	--	--	--		
Nickel, total	--	--	.3 .42	--	.26 .36	--	--	--	--	--	.46 .56	.33 --	-- .29	.33 .43	.36 .4	--	1	0.48 .28	--	--	--		
Nickel, dissolved	-.26 --	--	--	--	--	--	--	--	--	--	--	--	--	--	--	.48	1	--	--	--	--		
Phosphorus, total	--	--	.46	.67 .66	--	-0.3	0.85	0.83	--	--	--	--	--	--	--	--	--	.28	--	1	0.92	0.78	0.76
Phosphorus, dissolved	-.26	--	.32	.62 .61	-.38 -.3	--	.84	.84	--	--	--	--	--	--	--	--	--	--	.92	1	.83	.81	
Strontium, total	-.36	--	--	.61 .60	-.31 --	--	.9	.88	--	--	--	-.28	-.38	--	--	--	--	--	.78	.83	1	1	
Strontium, dissolved	-.43	--	--	.6	-.29 --	--	.89	.88	-0.36	--	--	-.28 --	-.43	-.28	--	--	--	--	.76	.81	1	1	
Discharge	.31	--	--	-.66	.39 .28	--	-.88	-.89	.27	--	.26 --	.26 .27	.29	--	.26	--	--	--	-.73	-.82	-.89	-.91	
Specific conductance	-.55	--	-.28	--	-.33 -.30	.26 .31	--	--	-.36	--	--	-.36	-.63	-.71	-.32	.27	--	--	--	.32	.56	.61	
pH	--	-0.31	--	--	-.29 --	--	--	--	--	--	--	--	--	--	-.33	-.35	--	.43 .28	--	--	--		
Temperature	.38	--	.52	.61	.34 .45	--	.34	.38	--	--	--	--	.4	.68	.49	-.38 -.37	.30	--	.32	--	--	--	
Dissolved oxygen	-.51	--	-.45	-.31	-.34 -.32	--	--	--	--	--	--	-.32 -.34	-.53	-.7	-.41	--	--	--	--	--	--	--	
Hardness	-.64	--	-.59	--	--	.55 .49	--	--	-.41	--	-.41 -.38	-.38 -.39	-.72	-.73	-.39	--	--	--	--	.29	.29		

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Cadmium, dissolved	Chromium, total	Copper, total	Iron, total	Lead, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Des Plaines River at Riverside, Ill. (site 40)—Continued																						
Alkalinity, dissolved	-0.69	--	--	--	--	--	--	--	--	--	--	-0.69	-0.58	--	--	--	--	--	--	--	--	
Calcium, total	-0.62	--	-0.58	--	--	0.53 .48	--	--	-0.41	--	-0.37 -.34	-0.37	-.69	-.73	-0.34	--	--	--	--	0.29	0.31	
Calcium, dissolved	-0.64	--	-0.58	--	--	.5 .44	--	--	-.4	--	-.39 -.36	-.36	-.71	-.72	-.39	--	--	--	--	.33	.33	
Magnesium, total	-.6	--	-0.58	--	--	.62 .56	--	--	-.41	--	-.4 -.37	-.39	-.67	-.68	-.29	--	--	--	--	--	--	
Magnesium, dissolved	-0.63	--	-0.6	--	--	.59 .53	--	--	-.41	--	-.43 -.40	-.4	-.7	-.7	-.35	--	--	--	--	--	--	
Sodium, total	-0.37	--	--	--	--	-- .28	0.31	0.29	-.33	--	-- -.36	-.37	-.46	-.58	--	0.37 .38	--	--	0.36	.61	.68	
Sodium, dissolved	-0.41	--	--	--	--	.4 .44	.35	.36	-.36	-0.29	--	-.36 -.35	-.48	-.56	--	.36	--	--	.37	.64	.7	
Potassium, total	--	--	.33	0.65 .64	-0.31 --	--	.91	.89	--	--	--	--	--	--	--	--	--	0.84	.85	.92	.94	
Potassium, dissolved	-0.27	--	.31	.65 .64	-.36 -.27	--	.92	.91	--	--	--	--	-.26	--	--	--	--	.85	.88	.96	.97	
Chloride, dissolved	-0.45	--	--	--	--	-- .27	--	--	--	--	--	-.26	-.53	-.61	--	.46 .47	--	--	--	.46	.52	
Solids, residue on evaporation at 180°C	-0.49	--	--	--	--	.31 .39	.27	.27	-.33	--	--	-.26	-.57	-.58	--	.26	--	--	.3	.57	.64	
Solids, total suspended	.47	0.3	.49	.35 .36	.38 .43	--	--	--	--	-.3	.29 .31	--	.43	.33	.44	--	0.28	--	--	--	--	
Solids, volatile	.38	.32	.54	.45	.33 .43	--	.28	.28	--	--	.3 .32	--	.35	.34	.43	--	.26	--	.26	--	--	
Carbon, total organic	.31	--	.47	.35	-- .37	--	--	--	--	--	.27 .29	--	.27	.43	.63	--	.4 .28	--	--	--	--	

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium, total	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Chicago Sanitary and Ship Canal at Romeoville, Ill. (site 55)																			
Aluminum, total	1	0.22	--	0.75	0.42	--	--	0.49	0.46	0.39	0.8	0.24	--	--	--	0.28	--	--	
Arsenic, total	.22	1	0.4	--	--	0.21	0.22	--	.22 .21	.36 .37	.27	--	--	--	--	.39	--	--	
Arsenic, dissolved	--	.4	1	--	--	.25	--	--	--	--	--	--	--	--	0.26	.34	0.28	--	
Barium, total	.75	--	--	1	.77	--	--	.5	.37	-- .22	.57	--	--	--	--	.32	--	--	
Barium, dissolved	.42	--	--	.77	1	--	--	.41 .47	--	--	--	-0.25	--	--	--	--	--	--	
Boron, total	--	.21	.25	--	--	1	.97	--	--	--	--	.3	--	.22	.56	.71	0.7	.69	
Boron, dissolved	--	.22	--	--	--	.97	1	--	--	--	--	.21	.37	--	--	.5	.66	.68	
Cadmium, total	.49	--	--	.5	.41	--	--	1	.36	-- .60	.34 .39	-- .80	-0.25 .69	0.23 .22	--	.44 --	-- -.26	--	--
Chromium, total	.46	.22 .21	--	.37	--	--	--	.36	1	.34 .36	.35	--	--	.25 .24	--	.3	--	--	
Copper, total	.39 .40	.36 .37	--	-- .22	--	--	--	-- .60	.34 .36	1	.47	.62 .59	.41 .38	.2	--	-- -.25	--	--	
Iron, total	.8	.27	--	.57	--	--	--	.34 .39	.35	.47	1	.52	.23	--	--	-.3	--	--	
Manganese, total	.24	--	--	--	-.2	--	.21	-- .80	--	.62 .59	.52	1	.81	--	-- -.21	--	--	.37	
Manganese, dissolved	--	--	--	--	-.25	.3	.37	-.25 .69	--	.41 .38	.23	.81	1	--	--	--	.53	.45 .48	

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium, total	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Chicago Sanitary and Ship Canal at Romeoville, Ill. (site 55)—Continued																			
Nickel, total	--	--	--	--	--	--	--	0.23 .22	0.25 .24	0.2 .24	--	--	--	1	0.7	--	--	--	
Nickel, dissolved	--	--	0.26	--	--	0.22	--	--	--	--	--	--	--	.7	1	0.33 .30	--	--	
Phosphorus, total	0.28	0.39	.34	0.32	--	.56	0.5	.44 --	.3	--	--	--	--	.33	1	.62	0.21	0.22	
Phosphorus, dissolved	--	--	.28	--	--	.71	.66	-- .26	--	-.28 -.25	-0.3	--	--	--	.31 .30	.62	1	.32 .34	
Strontium, total	--	--	--	--	--	.7	.68	--	--	--	--	0.37	0.53	--	--	.21	.32	1 .95	
Strontium, dissolved	--	--	--	--	--	.7 .69	.7	--	--	--	--	.32 .34	.45 .48	--	--	.22 .33	.34 .96	.95	
Discharge	.38	--	--	--	--	-.37	-.34	-- .49	.27 .28	.5 .49	.44	.39	--	--	--	-.47	--	--	
Specific conductance	--	--	--	--	0.32	.78	.78	--	--	--	--	.36	.68	--	--	.39	.93	0.92	
pH	--	--	--	--	--	--	--	--	--	--	--	--	--	.26 .27	--	--	--	--	
Temperature	--	--	--	--	--	-.79	-.79	--	--	--	--	-.3	-.61	--	--	-.37	-.5	-.79	
Dissolved oxygen	--	--	--	--	--	.51	.47	--	--	--	--	--	.28	--	--	.26	.35	.62	
Hardness	--	--	--	--	--	.54	.61	-.22 .37	--	--	--	.56	.72	--	--	--	.85	.83 .85	
Alkalinity, dissolved	--	--	--	.66	.82	.69	.86	--	--	--	--	.78	.7	--	--	--	.86	.8	
Calcium, total	--	--	--	--	--	.52	.57	-.21 .41	--	.21	--	.62	.72	--	--	--	.86	.8 .82	

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Chromium, total	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Chicago Sanitary and Ship Canal at Romeoville, Ill. (site 55)—Continued																			
Calcium, dissolved	--	--	--	--	--	0.52	0.61	-0.22 .38	--	--	--	0.54	0.71	--	--	--	--	0.85	0.83 .85
Magnesium, total	--	--	--	--	--	.46	.5	-0.24 .50	--	0.27 .24	0.26	.69	.75	--	--	--	--	.81	.76 .78
Magnesium, dissolved	--	--	--	--	--	.49	.56	-0.24 .42	--	--	--	.6	.74	--	--	--	--	.81	.81 .83
Sodium, total	--	--	--	--	--	.78	.78	--	--	--	--	.32	.49	--	--	0.28	0.41	.92	.87 .88
Sodium, dissolved	--	--	--	--	--	.77	.8	--	--	--	--	.29	.45	--	--	.3	.4	.9	.89 .90
Potassium total	--	--	--	--	--	.77	.74	--	--	--	--	--	.38	--	0.22	.37	.55	.81	.78
Potassium, dissolved	--	--	--	--	--	.78	.77	--	--	--	--	--	.39	--	--	.34	.57	.78	.79
Chloride, dissolved	--	--	--	0.25	0.28	.65	.67	--	--	--	--	.34	.47	--	--	.24	.24	.91	.86 .88
Solids, residue on evaporation at 180°C	--	--	--	--	--	.71	.7	--	--	--	--	.35	.54	--	--	.23	.39	.91	.86 .87
Solids, total suspended	0.44	--	--	.32	--	--	--	--	0.32	--	.46	--	.39	--	-0.42 -.43	--	--	.26	--
Solids, volatile	.41 .42	--	--	--	--	--	--	--	.27 .27	--	.3 .28	.4 .41	--	.38	--	-0.33 -.31	--	--	--
Carbon, total organic	--	--	--	--	--	.26	.32	--	.29 .40	.29	.29	.21	.59	.51	--	--	--	.48	.43 .45

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Du Page River at Shorewood, Ill. (site 69)															
Aluminum, total	1	0.22	-0.24 .22	0.79	--	-0.55	-0.58	0.67 .63	0.95	0.86	--	-0.31	0	-0.68	-0.69
Arsenic, total	.22 --	1	.54 .53	--	-0.34 .33	--	--	.32 .22	.21	.32 .26	--	.36 .30	--	--	--
Arsenic, dissolved	-0.24 .22	.54 .53	1	-0.27 .33	--	.55 .44	.54 .44	--	-0.25 .22	--	--	.5 .34	.43 .27	.47 .40	.47 .40
Barium, total	.79	--	-0.27 .33	1	.37	-0.47	-0.52	.55 .50	.81	.79	--	-0.32	-.6	-.61	-.62
Barium, dissolved	--	-.34 .33	--	.37	1	--	--	--	--	--	--	-.23	-.34	--	--
Boron, total	-.55	--	.55 .44	-.47	--	1	.99	-.31 .34	-.59	-.55	--	.61	.71	.89	.9
Boron, dissolved	-.58	--	.54 .44	-.52	--	.99	1	-.37 .41	-.64	-.59	--	.57	.7	.91	.92
Copper, total	.67 .63	.32 .22	--	.55 .50	--	-.31 .34	-.37 .41	1	.67 .65	.57 .52	--	--	-.36 .32	-.36 .40	-.38 .42
Iron, total	.95	.21	-0.25 .22	.81	--	-0.59	-0.64	.67 .65	1	.9	--	-0.32	-0.61	-0.75	-0.76
Manganese, total	.86	.32 .26	--	.79	--	-0.55	-0.59	.57 .52	.9	1	--	-0.36	-0.68	-0.69	-0.7
Manganese, dissolved	--	--	--	--	-0.23	--	--	--	--	--	1	--	--	--	--
Phosphorus, total	-.31	.36 .30	.5 .34	-.32	-.34	.61	.57	--	-.32	-.36	--	1	.77	.55	.54

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Sodium, total	Sodium, dissolved
Du Page River at Shorewood, Ill. (site 69)—Continued															
Phosphorus, dissolved	-0.61	--	0.43 .27	-0.6	--	0.71	0.7	-0.36 -.32	-0.61	-0.68	--	0.77	1	0.73	0.72
Strontium, total	-.68	--	.47 .40	-.61	--	.89	.91	-.36 -.40	-.75	-.69	--	.55	.73	1	1
Strontium, dissolved	-.69	--	.47 .40	-.62	--	.9	.92	-.38 -.42	-.76	-.7	--	.54	.72	1	1
Discharge	.69	--	-.57 -.46	.67	--	-.85	-.85	.44 .45	.72	.7	--	-.6	-.79	-.87	-.86
Specific conductance	-.73	--	.48 .45	-.63	--	.7	.69	-.38 -.45	-.75	-.68	--	.49	.7	.77	.76
pH	-.49	--	.3 .26	-.31	--	.46	.47	-.33 -.39	-.51	-.39	--	--	--	.44	.42
Temperature	.24	0.64	.61 .61	.55	--	--	.25 .26	.26 .27	--	.23	.36	--	--	--	--
Dissolved oxygen	-.55	-.31 -.24	--	-.52	--	--	--	-.32 -.35	-.61	-.57	--	--	--	.36	.33
Hardness	-.77	-.31 -.23	--	-.52	.28	.64	.64	-.49 -.50	-.78	-.72	--	.25	.53	.76	.75
Alkalinity, total	-.86	--	--	--	--	--	--	--	-.9	-.86	--	--	--	--	--
Alkalinity, dissolved	-.73	--	.56	-.52	--	.78	.77	--	-.72	-.81	-0.61	.68	.78	.86	.84
Calcium, total	-.68	-.37 -.29	--	-.43	.3	.55	.55	-.42 -.45	-.7	-.66	--	.2	.48	.69	.67
Calcium dissolved	-.74	-.39 -.31	--	-.53	.29	.58	.58	-.49 -.50	-.77	-.74	--	.22	.51	.71	.7

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Du Page River at Shorewood, Ill. (site 69)—Continued															
Magnesium, total	-0.75 --	-0.27 --	--	-0.51	0.25	0.68	0.68	-0.46 -.47	-0.76	-0.68	--	0.29	0.55	0.79	0.77
Magnesium, dissolved	-.78	-.27 .21	.22 --	-.56	.26	.69	.69	-.52	-.8	-.73	--	.28	.55	.8	.79
Sodium, total	-.69	--	.37 .36	-.62	--	.81	.82	-.35 -.39	-.76	-.68	0.21	.47	.66	.95	.94
Sodium, dissolved	-.7	--	.37 .36	-.65	--	.82	.83	-.39 -.41	-.76	-.7	--	.47	.65	.95	.94
Potassium, total	-.49	.21 --	.55 .47	-.46	--	.9	.89	-- -.24	-.55	-.49	--	.7	.74	.89	.91
Potassium, dissolved	-.64	--	.52 .45	-.64	--	.91	.93	-.34 -.39	-.7	-.66	--	.62	.78	.95	.96
Chloride, dissolved	-.77	--	.42 .43	-.75	--	.68	.7	-.46 -.48	-.83	-.76	.28	.55	.71	.86	.85
Solids, residue on evaporation at 180°C	-.77	--	.47	-.77	--	.73	.75	-.45 -.49	-.82	-.78	.21	.51	.72	.86	.85
Solids, total suspended	.38	.33 .30	-- .36	--	--	--	--	--	.34	.37	--	--	--	--	--
Solids, volatile	.43 .44	.55 .54	.33 .44	.32	--	--	--	.32 .31	.41 .42	.54 .55	.38 .37	--	--	--	--
Carbon, total organic	.24	.62 .59	.34 .41	--	-.47	--	--	.37 .38	--	.24	.27	.36	--	--	--

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Cadmium, dissolved	Chromium, total	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphate, total	Phosphorus, dissolved	Sodium, total	Sodium, dissolved	Strontium, total	Strontium, dissolved
Illinois River at Marseilles, Ill. (site 76)																						
Aluminum, total	1	0.36 .35	--	0.51	--	-0.41	-0.41	-- .23	-0.27	--	0.27 .26	0.88	0.66	--	-0.23 --	-0.35 -.31	--	-0.4	-0.5	-0.59		
Arsenic, total	.36 .35	1	0.54 .63	--	-0.28 -.26	--	--	.24 --	--	0.32	.23 .21	.31 .30	--	-0.52 .50	--	--	0.43 .42	--	-0.39 -.38	-0.44 -.43		
Arsenic, dissolved	--	.54 .63	1	-0.46 -.41	-0.45 -.44	.55 .47	.54 .46	-- .39	--	--	.25 .29	--	-0.26 .29	-0.48 -.45	-- .27	.27 .34	.37 .39	.37 .34	--	--		
Barium, total	.51	--	-0.46 -.41	1	.79	-0.76	-0.77	--	-0.24 --	--	--	.53	.57	--	-0.21 --	-0.31 -.29	-0.56	-0.81	-0.23	-0.32		
Barium, dissolved	--	-0.28 -.26	-0.45 -.44	.79	1	-0.56	-0.52	-0.28 --	--	--	--	.38	.25	--	--	-0.72	-0.7	--	--			
Boron, total	-0.41	--	.55 .47	-0.76	-0.56	1	.98	--	.23 .27	--	--	-0.5	-0.44	--	.27 .26	.44 .43	.59	.78	.52	.5		
Boron, dissolved	-0.41	--	.54 .46	-0.77	-0.52	.98	1	--	-- .27	--	--	-0.51	-0.44	--	.27 .25	.48 .46	.53	.75	.49	.5		
Cadmium, total	-- .23	.24 --	-- .39	--	-0.28 --	--	--	1 .71	.6 .71	--	.33 .51	-- .30	-- .28	--	--	-- .28	.23 .28	--	--	-- -.25		
Cadmium, dissolved	-0.27 --	--	--	-0.24 --	--	.23 .27	-- .27	.6 .71	1 .71	-- -.26	-0.29 .26	-- --	-0.26 --	--	--	--	--	--	--	--		
Chromium, total	--	.32	--	--	--	--	--	-- -.26	1	.3	--	--	--	.46 .45	--	--	--	--	--	--		
Copper, total	.27 .26	.23 .21	.25 .29	--	--	--	--	.33 .51	-- .26	.3	1	.24 .22	.25 .23	--	.38 .39	--	.22 .24	--	--	-0.23 --		
Iron, total	.88	.31 .30	--	.53	--	-0.5	-0.51	-- .30	-0.29 --	--	.24 .22	1	.76	--	-- -.38	-- -.33	--	-0.49 -.49	-0.52	-0.63		
Manganese, total	.66	--	-0.26 --	.57	.38	-0.44	-0.44	-- .28	-0.26 --	--	.25 .23	.76	1	.23 .24	--	--	-0.49 -.49	-0.26	-0.34			

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Cadmium, dissolved	Chromium, total	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphorus, total	Phosphorus, dissolved	Strontium, total	Strontium, dissolved
Illinois River at Marseilles, Ill. (site 76)—Continued																				
Manganese, dissolved	--	-0.52 .50	-0.48 .45	--	0.25	--	--	--	--	--	--	--	0.23 .24	1	--	--	-0.26	--	0.28	0.35
Nickel, total	-0.23 --	-- .27	-0.21 --	--	0.27 .26	0.27 .25	--	--	0.46 .45	0.38 .39	--	--	--	1	0.6 .58	.28 .29	--	.23 .21	.25 .23	
Nickel, dissolved	-0.35 .31	-- .34	.27 .29	-0.31 --	--	.44 .43	.48 .46	--	--	--	-0.38 -.33	--	--	.6 .58	1	--	0.32 .36	.37 .39	.4 .39	
Phosphorus, total	--	.43 .42	.37 .39	-0.56	-0.72	.59	.53	0.23 .28	--	--	.22 .24	--	--	-0.26 .29	.28 .29	--	1 .7	--	--	
Phosphorus, dissolved	-.4	--	.37 .34	-0.81	-0.7	.78	.75	--	--	--	-0.49	-0.49	--	--	.32	.7	1	.4	.44	
Strontium, total	-.5	-.39 .38	--	-0.23	--	.52	.49	--	--	--	-0.52	-0.26	.28	.23 .21	.37 .36	--	.4	1	.98	
Strontium, dissolved	-.59	-.44 .43	--	-0.32	--	.5	.5	-- -.25	--	--	-0.23	-0.63	-0.34	.35 .25	.4 .39	--	.44	.98	1	
Discharge	.54	--	-.43 .36	.72	.47	-.69	-.65	--	-0.24 --	--	--	.63	.67	.31	--	-.37 -.35	-.35	-.68	-.42	-.43
Specific conductance	-.29	-.6	-.54 .60	--	.31	--	--	-- -.36	--	-.24	-.35	-.24	--	.56	--	--	-.31	--	.55	.57
pH	-.24	-.45	-- -.25	--	--	--	-- -.26	--	--	--	--	--	-.22	--	--	--	--	--	.29	.32
Temperature	--	.61 .60	.64 .62	--	--	--	--	--	--	--	--	--	-.73	--	--	--	--	--	-.29	-.32
Dissolved oxygen	-.32	-.65 .64	-.62 .64	--	.23	--	--	--	--	-.22	--	--	.64	--	--	-.28	--	.38	.4	
Hardness	--	-.64 .63	-.57 .65	.47	.65	-.37	-.32	-.29 -.24	--	-.25	--	--	.51	-.22	--	-.59	-.33	.39	.39	

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Cadmium, dissolved	Chromium, total	Copper, total	Iron, total	Manganese, total	Manganese, dissolved	Nickel, total	Nickel, dissolved	Phosphate, total	Phosphate, dissolved	Strontium, total	Strontium, dissolved
Illinois River at Marseilles, Ill. (site 76)—Continued																				
Alkalinity, dissolved	--	-0.74	--	-0.56	--	--	--	--	--	-0.65 .64	--	--	--	-0.66 .76	--	-0.5	--	0.53	0.58	
Calcium, total	--	-.63 -.62	-.62 -.69	0.51	0.66	-0.4	-0.35	-0.24 .22	--	--	--	--	0.23	0.52	--	--	-.59	-0.38	.36	.34
Calcium, dissolved	--	-.65 -.64	-.56 -.64	.46	.64	-.4	-.33	-.33	--	--	-.34 .33	--	--	.51	--	--	-.62	-.35	.37	.37
Magnesium, total	--	-.56 -.55	-.66 -.72	.6	.71	-.42	-.38	-.27 ..	-0.22 ..	--	--	--	.38	.47	--	--	-.57	-.44	.35	.3
Magnesium, dissolved	--	-.61 -.60	-.59 -.67	.49	.67	-.37	-.3	-.39 .33	-.22 ..	-0.23	-.32	--	--	.49	--	--	-.61	-.34	.41	.4
Sodium, total	-0.4	-.39	--	-.39	--	.47	.49	--	--	--	-0.36	--	.48	--	0.4 .37	.24	.48	.68	.69	
Sodium, dissolved	-.46	-.38 -.37	--	-.42	--	.47	.49	--	--	--	-.46	--	.47	--	.41 .38	.23	.5	.67	.7	
Potassium, total	-.23	.3	.31 .27	-.59	-.57	.55	.56	--	--	--	--	--	--	.38 .35	.23 ..	.65	.48	--	--	
Potassium, dissolved	-.43	--	.38 .31	-.74	-.57	.71	.73	--	--	--	-.44	-.33	--	.32 .29	.43 .39	.44	.64	.39	.42	
Chloride, dissolved	-.37	-.59 -.58	-.46 -.50	--	--	.23	.27	-- .25	--	--	--	-.36	--	.57 .56	--	.24	--	.24	.67	.69
Solids, residue on evaporation at 180°C	-.24	-.66 -.65	-.56 -.61	--	.49	--	--	-.42 -.45	--	-.25 -.24	-.32 -.31	-.26	--	.59	--	--	-.49	--	.46	.54
Solids, total suspended	.7	.35 .34	--	.44	.28	-.36	-.32	--	-.31 ..	--	--	.72	.66	--	--	--	-.41	-.35	-.41	
Solids, volatile	.55	.55 .54	.26 .36	--	--	--	--	--	--	--	--	.52	.42	-.24 -.23	--	--	--	-.28	-.32	
Carbon, total organic	.42	--	--	.24	--	--	--	--	--	--	--	.37	.29	--	--	--	--	--	--	

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Iron, total	Manganese, total	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Fox River at Algonquin, Ill. (site 89)													
Aluminum, total	1	0.63	0.56 .55	0.51	-0.21	0.35	0.33	0.89	0.79	0.64	0.22 .23	-0.33	-0.33
Arsenic, total	.63	1	.85 .84	.52 .53	-.29	.55 .56	.53 .54	.74 .73	.78	.71 .70	.34 .38	-.46 -.45	-.43 -.42
Arsenic, dissolved	.56 .55	.85 .84	1	.4 .38	-.21 -.24	.5 .54	.52 .55	.63 .61	.63	.62 .60	.33 .34	-.39 -.34	-.33 -.28
Barium, total	.51	.52 .53	.4 .38	1	.44	.47	.46	.47	.44	.52	.34 .36	--	--
Barium, dissolved	-.21	-.29	-.21 -.24	.44	1	--	--	-.38	-.45	-.21	--	.37	.43
Boron, total	.35	.55 .56	.5 .54	.47	--	1	.95	.39	.36	.42	.23 .25	--	--
Boron, dissolved	.33	.53 .54	.52 .55	.46	--	.95	1	.37	.31	.4	--	--	--
Iron, total	.89	.74 .73	.63 .61	.47	-.38	.39	.37	1	.89	.78	.33 .34	-.48	-.51
Manganese, total	.79	.78	.63 .62	.44	-.45	.36	.31	.89	1	.73	.26 .27	-.48	-.48
Phosphorus, total	.64	.71 .70	.62 .60	.52	-.21	.42	.4	.78	.73	1	.46 .47	-.47	-.47
Phosphorus, dissolved	.22 .23	.34 .38	.33 .33	.34 .36	--	.23 .25	--	.33 .34	.26 .27	.46 .47	1	--	--
Strontium, total	-.33	-.46 -.45	-.39 -.34	--	.37	--	--	-.48	-.48	-.47	--	1	.94
Strontium, dissolved	-.33	-.43 -.42	-.33 -.28	--	.43	--	--	-.51	-.48	-.47	--	.94	1

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Iron, total	Manganese, total	Phosphorus, total	Phosphorus, dissolved	Srtronium, total	Srtronium, dissolved
Fox River at Algonquin, Ill. (site 89)													
Discharge	--	-0.43 .44	-0.39 .41	-0.52	-0.21	-0.6	-0.63	-0.22	-0.26	-0.39	-0.21 .24	--	--
Specific conductance	-0.31	--	--	--	.29	.43	.41	-.46	-.44	--	--	0.75	0.76
pH	--	--	--	-.47	-.54	-.58	-.66	--	--	--	--	--	--
Temperature	.67	.75	.67 .64	.55	.3	--	.26	.69	.79	.66	--	-.49	-.42
Dissolved oxygen	-.56	-.74 .72	-.71 .66	-.51	-.31	-.32	-.39	-.66	-.61	-.68	--	.49	.46
Hardness	-.49	-.68	-.62 .61	--	.66	-.22	--	-.67	-.67	-.6	-.28	.59	.63
Alkalinity, dissolved	-.63	-.77 .79	-.62 .66	--	--	--	--	-.74	-.69	-.59	--	.63	--
Calcium, total	-.51	-.76	-.7 .69	-.23	.48	-.36	-.35	-.64	-.67	-.65	-.26 .27	.62	.56
Calcium, dissolved	-.6	-.8	-.7 .69	-.31	.57	-.39	-.33	-.75	-.77	-.73	-.36 .37	.61	.65
Magnesium, total	--	--	--	.45	.3	.53	.54	--	--	--	--	.33	.21
Magnesium, dissolved	--	--	--	.36	.5	.39	.45	--	--	--	--	.37	.37
Sodium, total	--	--	--	.31	.34	.59	.61	--	--	--	--	.49	.41
Sodium, dissolved	--	--	--	.25	.45	.49	.56	--	--	--	--	.49	.5
Potassium, total	--	.29 .32	-- .22	.35	--	.6	.58	.26	.21	.27	.3 .32	--	--
Potassium, dissolved	--	--	--	.21	.29	.43	.45	--	--	--	--	.31	.28

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum, total	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Iron, total	Manganese, total	Phosphorus, total	Phosphorus, dissolved	Strontrium, total	Strontrium, dissolved
Fox River at Algonquin, Ill. (site 89)													
Chloride, dissolved	--	--	--	0.25	0.59	0.32	0.38	-0.33	-0.33	--	--	0.59	0.56
Solids, residue on evaporation at 180°C	-0.47	-0.48 .47	-0.38 .37	--	.78	--	--	-0.63	-0.67	-0.39	-0.21 .1	.47	.47
Solids, total suspended	.64	.63 .61	.53 .51	.46 .45	.34	--	.31	.69 .68	.77	.54 .53	--	-.39 -.38	-.34
Solids, volatile	.64 .65	.74	.66 .65	.59	.48	.35	.4	.59	.71	.46 .47	--	--	--
Carbon, total organic	--	--	.28 .23	--	.47	--	--	--	--	--	--	--	--

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Iron, total	Manganese, total	Phosphorus, total	Phosphorus, dissolved	Srtrontium, total	Srtrontium, dissolved
Fox River at Dayton, Ill. (site 99)															
Aluminum, total	1	0.35 .36	0.51 .5	0.3 .33	0.39	--	--	--	--	0.89	0.82	0.48	--	-0.45	-0.44
Aluminum, dissolved	.35 .36	1	--	--	--	--	--	--	--	.35	--	--	--	--	--
Arsenic, total	.51 .50	--	1	.83 .80	.25	--	0.49 .47	0.44 .41	--	.5 .46	.72 .71	.66 .62	--	-0.33 -.34	-0.35
Arsenic, dissolved	.3 .33	--	.83 .80	1	--	--	.68 .54	.62 .49	--	-- .26	.56 .52	.6 .5	--	-- -.26	-- -.27
Barium, total	.39	--	.25	--	1	0.76	-.25 --	-.34	--	0.49 .26	.35	--	0.32 .33	--	--
Barium, dissolved	--	--	--	--	.76	1	--	-.27	--	--	--	--	.41 .40	.3	.34
Boron, total	--	--	.49 .47	.68 .54	-.25 --	--	1	.98	--	--	--	.5 .51	--	--	--
Boron, dissolved	--	--	.44 .41	.62 .49	-.34	-.27	.98	1	--	--	--	.48	--	--	--
Cadmium, total	--	--	--	--	.26	--	--	--	1	--	.36 .27	--	--	-- -.33	-- -.30
Iron, total	.89	.35	.5 .46	-- .26	.49	--	--	--	--	1	.81	.41	--	-0.46	-0.42
Manganese, total	.82	--	.72 .71	.56 .52	.35	--	--	--	--	.27	.81	1	.64	-.28 -.27	-.51 -.49
Phosphorus, total	.48	--	.66 .62	.6 .50	--	--	.5 .51	.48	--	.41	.64	1	--	--	--
Phosphorus, dissolved	--	--	--	--	.32 .33	.41 .40	--	--	--	--	-.28 -.27	--	1 .30	.33	--

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Iron, total	Manganese, total	Phosphorus, total	Phosphorus, dissolved	Srtronium, total	Srtronium, dissolved
Fox River at Dayton, Ill. (site 99)—Continued															
Strontium, total	-0.45	--	-0.33 -.34	-- -0.26	--	0.3	--	--	-- -0.33	-0.46	-0.51	--	0.33 .30	1	0.99
Strontium, dissolved	-.44	--	-.35	-- -.27	--	.34	--	--	-- -.30	-.42	-.49	--	--	.99	1
Discharge	.26	--	-.35 -.33	-.67 -.54	0.34	--	-0.85	-0.84	-- .28	.38	--	-0.25	--	--	--
Specific conductance	-.52	--	-.42 -.37	-.29	--	.35	--	--	-- -.31	-.49	-.6	--	.48 .47	.81	.81
pH	--	--	.29	.35 .33	-.41	-.43	.48	.52	--	--	--	-- -.57	--	--	
Temperature	.5	--	.78	.79 .75	--	--	.44	.38	--	.46	.78	.51 .50	-.43 -.41	-.51 -.52	-.49
Dissolved oxygen	-.49	--	-.29	--	-.5	--	.3	.32	--	-.56	-.44	--	-.26 -.28	.34	.32
Hardness	-.57	--	-.72 -.68	-.61 -.55	--	.52	-.37	-.36	--	-.47	-.72	-.54	.33 .32	.57	.58
Alkalinity, dissolved	-.55	--	--	--	--	.55	--	--	--	--	--	--	.8 .81	.65	.64
Calcium, total	-.34	--	-.72 -.66	-.7 -.60	.28	.54	-.59 -.60	-.56	--	--	-.55	-.51	.34	.39	.41
Calcium, dissolved	-.42	--	-.77 -.70	-.73 -.61	--	.49	-.57 -.58	-.54	--	-.32	-.66	-.64	.34 .33	.39	.44
Magnesium, total	-.43	-0.26 --	--	--	--	--	.47	.46	--	-.43	-.28	--	--	.49	.47
Magnesium, dissolved	-.53	-.32 -.31	--	--	--	--	.42	.41	-- -.27	-.49	-.4	--	--	.54	.54

Table 9. Summary of correlation coefficients observed among physical properties and elements in water in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum, total	Aluminum, dissolved	Arsenic, total	Arsenic, dissolved	Barium, total	Barium, dissolved	Boron, total	Boron, dissolved	Cadmium, total	Iron, total	Manganese, total	Phosphorus, total	Phosphorus, dissolved	Sodium, total	Sodium, dissolved
Fox River at Dayton, Ill. (site 99)—Continued															
Sodium, total	-0.28	--	--	0.34 .37	-0.32	--	0.71	0.71	-- -0.27	-0.36	--	0.38	--	0.53	0.46
Sodium, dissolved	-.26	--	--	.35	-.33	--	.72	.73	--	-.33	--	.39	--	.53	.49
Potassium, total	--	--	0.53 .55	.52 .50	--	--	.57 .58	.53	--	--	0.32	.58	--	--	--
Potassium, dissolved	--	--	.4 .42	.48 .41	--	--	.72	.71	--	--	--	.43	--	--	--
Chloride, dissolved	--	--	--	.28 .33	--	--	.57	.57	--	--	--	.49	0.25 .26	.44	.35
Solids, residue on evaporation at 180°C	-.37	--	--	--	--	0.38	--	--	--	-.32	-.37	--	.41 .43	.59	.55
Solids, total suspended	.52	0.39 .40	0.52 .54	.51 .52	--	--	.35 .33	.33	-.32 --	.43	.69	.55	-.39 .38	-.28 .27	-.28
Solids, volatile	.41	.38	.61 .60	.61 .53	--	--	.5 .49	.47 .46	--	.33 .34	.62	.54	-.42 .41	--	--
Carbon, total organic	.34	--	.72 .66	.7 .58	--	-.39	.69	.66	--	--	.65	.66	-.45	--	--

Table 10. Summary of selected trends in element concentrations in stream water in the upper Illinois River Basin, 1978–90

[This table includes only those sites with greater than 30 observations and 3 years of data, results with a confidence level greater than 90 percent, more than half of the number of observations above the detection limit, and little difference between results when 0 or the minimum reporting level was substituted for censored observations]

Element	Number of sites	
	Downward trend	Upward trend
Aluminum, total recoverable	2	1
Arsenic, total recoverable	1	0
Barium, total recoverable	17	1
Barium, dissolved	12	1
Boron, total recoverable	13	0
Boron, dissolved	4	0
Chromium, total recoverable	0	1
Copper, total recoverable	4	1
Iron, total recoverable	8	1
Iron, dissolved	1	0
Manganese, total recoverable	14	1
Manganese, dissolved	13	0
Nickel, total recoverable	2	2
Nickel, dissolved	3	0
Strontium, total recoverable	6	15
Strontium, dissolved	7	9

Table 11. Statistical summary of concentrations for selected elements in streambed sediments from the upper Illinois River Basin, 1978–87

[All concentrations are in micrograms per gram; <, less than]

Element	Period of record	Number of observations	Percentile ¹				
			10	25	50 (median)	75	90
Unsieved							
Arsenic	1978–82	54	2.7	3.6	5.5	7.2	9.1
Cadmium	1978–82	80	1.0	1.5	3.0	10.8	61.9
Chromium	1978–82	105	9.0	17.0	35.0	120	444
Copper	1978–82	89	11.0	24.0	49.0	130	460
Iron	1978–82	83	5,280	10,000	16,000	23,000	32,000
Lead	1978–82	105	20.0	48.5	130	262	908
Manganese	1978–82	56	290	352	474	573	692
Mercury	1978–82	100	.05	.10	.30	.50	2.18
Phosphorus	1978–82	103	334	552	949	1,410	2,570
Zinc	1978–82	91	50	100	230	510	1,770
Sieved (<63 micrometers)							
Arsenic	1982–87	77	4.1	5.2	6.0	8.40	13.0
Cadmium	1982–87	77	<.5	<.5	<.5	1.9	4.2
Chromium	1982–87	77	10.8	14.5	32.0	44.0	78.0
Copper	1982–87	77	13.0	17.4	35.0	68.0	122
Iron	1982–87	77	15,300	18,700	24,000	29,000	34,200
Lead	1982–87	77	14.0	20.4	49.0	96.0	240
Manganese	1982–87	77	418	480	620	865	1,020
Mercury	1982–87	77	.04	.06	.10	.30	.72
Phosphorus	1982–87	73	534	645	848	1,500	1,990
Zinc	1982–87	76	63.0	80.3	145	210	379

¹Percentage of observations with concentrations less than or equal to indicated value.

Table 12. Tukey studentized range test for ranked concentrations of sieved streambed samples, 1978–87

[<x> is the mean of ranks for the subbasin. "grp" indicates which means can be grouped together; means of concentrations, with the same letter(s) for each element in the subbasin, are not significantly different at the 95-percent confidence level]

Subbasin	Number of observations	Arsenic <x> grp	Cadmium <x> grp	Chromium <x> grp	Copper <x> grp	Iron <x> grp	Lead <x> grp	Mercury <x> grp	Manganese <x> grp	Phosphorus <x> grp	Zinc <x> grp
Tributaries to lower Fox River	10	26 a	24 a	16 a	14 a	15 a	10 a	15 a	39 abc	18 a	13 a
Tributaries to upper Fox River	9	41 a	25 a	14 a	16 a	27 ab	20 ab	22 ab	49 c	28 ac	16 a
Tributaries to Des Plaines River	10	36 a	28 ab	35 ab	28 ab	46 b	31 bc	27 ab	42 b	28 ac	27 ab
Kankakee River	4	46 a	26 ab	29 ab	23 ab	42 ab	33 ad	28 abc	58 c	20 ac	31 abc
Little Calumet River	6	27 a	35 ab	47 b	42 bc	41 ab	52 cd	43 bc	21 ab	26 ac	47 bc
Lower Du Page River	6	23 a	32 ab	33 ab	47 bc	18 ac	36 bcd	41 bc	24 abc	45 bc	41 bc
East and West Branches	10	36 a	50 b	47 b	52 bc	38 ab	43 cd	51 c	15 a	59 b	50 c
Du Page River	8	45 a	52 b	44 b	46 c	44 bc	46 cd	45 bc	33 abc	33 ac	47 bc
Des Plaines River	5	32 a	37 ab	57 b	53 c	50 bc	59 d	49 bc	34 abc	43 abc	56 c
Salt Creek and North Branch of Chicago River											

Table 13. Tukey studentized range test for ranked concentrations of unsieved streambed samples, 1978–87

[“n” is the number of observations in a subbasin, “<x>” is the mean of ranks for the subbasin, “grp” indicates which means can be grouped together; means of concentrations, with the same letter(s) for each element in the subbasin, are not significantly different at the 95-percent confidence level; No obs., no observations]

Subbasin	Arsenic n <x> grp	Cadmium n <x> grp	Chromium n <x> grp	Copper n <x> grp	Iron n <x> grp	Lead n <x> grp	Mercury n <x> grp	Manganese n <x> grp	Phosphorus n <x> grp	Zinc n <x> grp
Tributaries to Fox River	6 14 b	No obs.	8 13 a	7 13 a	7 31 ab	8 18 a	7 6 a	6 19 ab	8 10 a	7 9 a
Tributaries to Illinois River	No obs.	No obs.	7 19 ab	7 14 a	7 18 a	7 14 a	7 30 ab	No obs.	7 18 ab	7 13 ab
Upper Fox River	9 34 a	9 24 a	13 35 bc	13 26 ab	14 33 ab	13 35 ab	13 46 bc	12 33 bc	12 44 bc	13 29 ab
Lower Fox River	18 27 a	18 43 b	18 46 c	18 49 c	17 40 ab	18 45 b	18 48 bc	18 31 c	18 49 bc	18 40 bc
Calumet Sag Channel	No obs.	11 38 ab	10 70 d	10 60 cd	10 37 ab	11 74 cd	10 67 cd	No obs.	10 74 c	10 65 d
Little Calumet River	No obs.	10 28 ab	12 82 de	No obs.	No obs.	12 48 b	10 37 b	No obs.	12 63 c	No obs.
North Shore Channel	11 10 b	11 67 c	11 91 e	11 78 d	No obs.	11 90 d	10 87 d	11 7 a	11 48 bc	10 76 e
Skokie River	No obs.	14 20 a	19 35 bc	18 38 bc	19 48 b	19 56 bc	18 41 b	No obs.	19 58 c	19 48 cd

Table 14. Relation of trace element concentrations in streambed sediments from the upper Illinois River Basin to background concentrations in streambed sediment and average concentrations in soils
[Concentrations are in milligrams per kilogram except where indicated as percent (%)]

Element	Illinois streambed sediments ¹		Eastern United States soils ²		Upper Illinois River Basin percentiles for unsieved samples ³						
	98% Geometric mean confidence limits		98% Geometric mean confidence limits		10		25		50 (median)	75	90
Arsenic	4.4	11.6	4.8	31	2.7	3.6	5.5	7.2	9.1		
Cadmium	.1	1.3	--	--	1.0	1.5	3.0	10.8	61.9		
Copper	11.3	34	13	102	9.0	17.0	35.0	120	444		
Chromium	8.4	25	33	223	11.0	24.0	49.0	130	460		
Iron	13%	29%	1.4%	12%	.53%	1.00%	1.60%	2.30%	3.26%		
Lead	15	41	14	53	20.0	48.5	130	262	908		
Manganese	430	1,474	260	3,794	290	352	474	573	692		
Mercury	.04	.15	.081	.51	.05	.10	.30	.50	2.18		
Phosphorus	350	1,012	200	1,741	334	552	949	1,410	2,570		
Zinc	45	111	40	178	50	100	230	510	1,770		

¹From Kelly and Hite, 1984.

²From Shacklette and Boerngen, 1984

³Percentage of samples with concentrations less than or equal to indicated value.

Table 15. Correlation coefficients between log-transformed element concentrations in sieved streambed-sediment samples from the upper Illinois River Basin, 1978–87

	Copper	Zinc	Chromium	Mercury	Phosphorus	Lead	Cadmium	Iron	Manganese	Arsenic
Copper	1.0									
Zinc	.95	1.0								
Chromium	.91	.90	1.0							
Mercury	.89	.90	.82	1.0						
Phosphorus	.78	.71	.72	.77	1.0					
Lead	.74	.81	.73	.69	.50	1.0				
Cadmium	.59	.55	.68	.47	.42	.50	1.0			
Iron	.34	.39	.43	.40	.36	.34	.22	1.0		
Manganese	-.33	-.26	-.24	-.23	-.29	-.5	-.2	-.4	1.0	
Arsenic	.19	.21	.24	.29	.28	.23	.27	.30	.41	1.0

Table 16. Correlation coefficients between log-transformed element concentrations in unsieved streambed-sediment samples from the upper Illinois River Basin, 1978–87

	Zinc	Copper	Chromium	Cadmium	Mercury	Phosphorus	Lead	Manganese	Arsenic	Iron
Zinc	1.0									
Copper	.85	1.0								
Chromium	.85	.80	1.0							
Cadmium	.75	.69	.68	1.0						
Mercury	.78	.69	.77	.61	1.0					
Phosphorus	.68	.51	.58	.27	.51	1.0				
Lead	.61	.66	.31	.40	.26	.52	1.0			
Manganese	-.21	-.35	-.21	-.50	-.07	.37	-.31	1.0		
Arsenic	-.05	-.16	-.10	-.28	.10	.42	-.12	.62	1.0	
Iron	.31	.30	.22	.24	.16	.40	.40	.42	.43	1.0

Table 17. Factor analysis of log-transformed trace element data from streambed sediments of the upper Illinois River Basin, 1978–87
[Factor loadings are multiplied by 100]

Element	Factor loadings	
	Factor 1	Factor 2
Sieved		
Copper	97	-14
Zinc	97	-7
Chromium	95	-1
Mercury	91	-1
Phosphorus	77	-5
Lead	76	10
Cadmium	60	15
Iron	43	16
Manganese	-24	73
Arsenic	30	68
Percent variance explained	54	11
Unsieved		
Copper	89	25
Zinc	87	40
Chromium	86	35
Lead	84	30
Mercury	77	30
Phosphorus	34	94
Percent variance explained	62	28

Table 18. Summary of element concentrations in water, suspended sediment, streambed sediment, and biota in the upper Illinois River Basin, 1987–90
[Ranges for total recoverable data represent the total range in concentrations for 40 sites. Ranges for suspended-sediment data represent the total range in concentrations for 8 sites. Ranges in streambed-sediment data represent the total range in concentrations from main stems and tributaries at 372 sites. Data for biota in micrograms per gram dry weight. µg/g, micrograms per gram; <, less than; --, not analyzed for this element]

Element	Concentrations			
	Total recoverable in water (µg/L)	Suspended sediment (µg/g)	Streambed sediment (µg/g)	Biota (µg/g)
Aluminum	<50–49,000	800–99,000	15,000–83,000	3.0–2,100
Antimony	--	<.1–7.4	.3–81	--
Arsenic	<1–8	<.1–910	1.1–140	.2–6.7
Barium	<5–270	--	57–380	.1–590
Beryllium	<5–4.0	<.1–3	<1–7	--
Boron	<50–950	--	<4–14	2–340
Cadmium	<.1–62	<.1–46	<2–46	.3–9.5
Chromium	<5–420	<16–980	17–640	1–11
Cobalt	<5–110	<2–34	6–65	--
Copper	<5–650	.28–990	9–800	3.8–210
Iron	<50–27,000	600–85,000	15,000–130,000	110–2,500
Lead	<5–710	1.8–440	11–1,700	5.0–22
Manganese	<5–1,100	35–10,000	180–7,500	1.9–7,800
Mercury	<.05–1.7	--	<.02–6.2	.005–0.5
Molybdenum	--	.3–780	2–51	1–17
Nickel	<5–200	<4–300	9–130	2–36
Selenium	<.1–1	--	.1–9.5	.3–7.9
Silver	<3–10	<.1–19	<2–29	2–15
Strontium	73–1,800	--	29–1,100	.1–580
Vanadium	<5–33	<4–150	23–110	.3–5.6
Zinc	<50–1,100	9–2,100	24–3,200	34–1,300

Table 19. Element concentrations in streambed sediments from the upper Illinois River Basin as related to pollutional classification of Illinois stream sediments

[NAWQA, National Water-Quality Assessment Program; <, less than; >, greater than; mg/kg, milligrams per kilogram, --,]

Element	Concentration classification (mg/kg) ¹					Breaks in probability curves from NAWQA streambed-sediment data (mg/kg)
	Nonelevated	Slightly elevated	Elevated	Highly elevated	Extreme	
Arsenic	<8	>8	>11	>17	>28	10
Cadmium	<.5	>.5	>1	>2	>20	<2
Chromium	<16	>16	>23	>38	>60	90
Copper	<38	>38	>60	>100	>200	80
Lead	<28	>28	>38	>60	>100	40
Mercury	<.07	>.07	>.1	>.17	>.3	No observable break
Nickel	--	--	--	--	--	50
Zinc	<80	>80	>100	>170	>300	200

¹Illinois River streambed-sediment classification from Kelly and Hite (1984).

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987-90

[Correlations were done with the concentrations less than the minimum reporting level (MRL) set to zero. Correlations not shown if majority of concentrations for an element were below the MRL.
--, correlations with p>0.10]

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
All 8 sites combined																	
Aluminum	1	0.3	0.34	0.81	--	0.52	0.57	0.19	0.68	--	--	0.22	0.54	-0.19	--	0.98	0.15
Antimony	.3	1	.38	.3	0.77	.72	.63	.74	.35	0.7	0.15	.49	.74	.57	0.8	.35	.8
Arsenic	.34	.38	1	.27	.23	.29	.52	.14	.67	--	.45	.23	.33	--	.22	.41	.29
Beryllium	.81	.3	.27	1	.12	.48	.46	.16	.51	--	--	.17	.48	--	--	.82	.13
Cadmium	--	.77	.23	.12	1	.68	.52	.77	.2	.79	.15	.45	.69	.7	.84	.11	.82
Chromium	.52	.72	.29	.48	.68	1	.7	.75	.41	.65	--	.62	.95	.53	.66	.55	.73
Cobalt	.57	.63	.52	.46	.52	.7	1	.57	.71	.45	.53	.54	.78	.33	.55	.63	.62
Copper	.19	.74	.14	.16	.77	.75	.57	1	.29	.82	--	.69	.77	.64	.81	.21	.86
Iron	.68	.35	.67	.51	.2	.41	.71	.29	1	--	.39	.41	.48	--	.19	.7	.32
Lead	--	.7	--	--	.79	.65	.45	.82	--	1	.13	.53	.65	.76	.8	--	.81
Manganese	--	.15	.45	--	.15	--	.53	--	.39	.13	1	--	.13	.2	.22	--	.22
Molybdenum	.22	.49	.23	.17	.45	.62	.54	.69	.41	.53	--	1	.66	.36	.52	.23	.68
Nickel	.54	.74	.33	.48	.69	.95	.78	.77	.48	.65	.13	.66	1	.49	.66	.57	.76
Phosphorus	-.19	.57	--	--	.7	.53	.33	.64	--	.76	.2	.36	.49	1	.79	-.15	.72
Silver	--	.8	.22	--	.84	.66	.55	.81	.19	.8	.22	.52	.66	.79	1	--	.85
Vanadium	.98	.35	.41	.82	.11	.55	.63	.21	.7	--	--	.23	.57	-.15	--	1	.18
Zinc	.15	.8	.29	.13	.82	.73	.62	.86	.32	.81	.22	.68	.76	.72	.85	.18	1
Discharge	.18	.34	.27	.17	.44	.42	.24	.4	.3	.35	-.12	.19	.43	.11	.28	.19	.33
Calcium	-.89	-.32	-.43	-.7	--	-.5	-.62	-.2	-.72	--	-.12	-.28	-.54	.14	--	-.88	-.21
Sodium	-.25	.25	-.18	-.21	.23	.13	--	.4	-.2	.38	-.12	.47	.17	.23	.28	-.24	.34
Potassium	.87	.23	.13	.72	--	.57	.52	.3	.51	--	-.11	.41	.59	-.12	--	.84	.23
Suspended sediment concentration	.31	-.28	--	.2	-.33	-.17	-.22	-.28	.12	-.43	-.37	-.18	-.19	-.6	-.4	.26	-.36
Carbon, organic total	-.16	-.32	-.24	-.16	-.2	-.22	-.45	-.14	-.28	-.15	-.29	-.21	-.3	-.2	-.21	-.21	-.27
Percent of sample <.062 mm	.29	--	--	.25	--	.22	--	.11	--	--	-.12	--	.21	--	--	.27	--
Particle surface area	.78	.13	.48	.59	-.1	.26	.5	--	.72	-.26	.23	--	.31	-.33	-.11	.78	--
Kankakee River at Momence, Ill. (site 14)																	
Aluminum	1	--	--	.57	--	.69	.38	--	--	--	--	--	.74	--	-.34	.95	--
Antimony	--	1	.52	--	.5	.36	.46	--	.4	.41	--	--	.38	.35	.4	.34	.52
Arsenic	--	.52	1	-.38	.57	--	.68	--	.8	.33	.79	--	--	.78	.76	--	.54
Beryllium	.57	--	-.38	1	--	.51	--	--	--	--	-.52	--	.51	-.31	-.48	.57	--
Cadmium	--	.5	.57	--	1	--	.42	--	.39	.38	.52	--	--	.39	.46	--	.53

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Kankakee River at Momence, Ill. (site 14)—Continued																	
Chromium	0.69	0.36	--	0.51	--	1	0.31	--	--	--	0.33	0.77	--	-0.31	0.69	--	
Cobalt	.38	.46	0.68	--	0.42	.31	1	0.31	0.8	0.35	0.72	--	.66	0.74	.31	.47	
Copper	--	--	--	--	--	--	.31	1	.45	.59	--	.51	--	.31	--	--	
Iron	--	.4	.8	--	.39	--	.8	.45	1	.45	.75	--	.44	.89	.46	.32	
Lead	--	.41	.33	--	.38	--	.35	.59	.45	1	--	.38	.31	.34	--	.53	
Manganese	--	--	.79	-.52	.52	--	.72	--	.75	--	1	--	--	.86	.53	--	
Molybdenum	--	--	--	--	--	.33	--	.51	--	.38	--	1	.34	--	--	--	
Nickel	.74	.38	--	.51	--	.77	.66	--	.44	.31	--	.34	1	--	--	.74	
Phosphorus	--	.35	.78	-.31	.39	--	.74	.31	.89	.34	.86	--	--	1	.46	--	
Silver	-.34	.4	.76	-.48	.46	-.31	.31	--	.46	--	.53	--	--	.46	1	--	
Vanadium	.95	.34	--	.57	--	.69	.47	--	.32	--	--	--	.74	--	--	1	
Zinc	--	.52	.54	--	.53	--	.52	--	.51	.53	.47	--	.32	.49	.35	--	
Discharge	.75	.32	--	.58	--	.68	.55	.34	.33	.38	--	.38	.79	--	-.34	.77	
Calcium	-.92	--	--	-.57	--	-.71	-.47	--	-.33	--	--	--	-.81	--	--	-.89	
Sodium	-.49	--	--	-.53	--	-.31	-.3	.3	--	.3	--	.31	-.4	--	.32	-.55	
Potassium	.83	--	-.32	.55	-.42	.62	--	--	--	--	-.47	.38	.57	--	-.38	.73	
Suspended sediment concentration	.56	--	-.41	.52	-.41	.32	--	--	--	--	-.63	--	--	-.43	-.41	.45	
Carbon, organic total	--	--	-.54	--	-.56	--	-.53	--	-.51	-.46	-.64	--	--	-.48	-.37	--	
Percent of sample <.062 mm	--	--	-.44	.31	--	--	-.31	--	--	-.38	-.41	-.36	--	--	-.39	--	
Particle surface area	.79	--	--	.53	--	.55	.58	--	.42	--	--	--	.74	--	--	.83	
Iroquois River near Chebanse, Ill. (site 28)																	
Aluminum	1	.35	--	.69	--	.45	--	--	.83	--	-.36	--	.42	--	--	.88	--
Antimony	.35	1	.45	.29	--	.29	.29	--	.42	.37	--	--	.29	--	--	.39	
Arsenic	--	.45	1	--	--	--	.27	--	.32	.29	--	.35	--	.29	--	--	
Beryllium	.69	.29	--	1	--	.38	.29	.33	.74	--	--	--	.52	--	--	.83	
Cadmium	--	--	--	--	1	.31	.35	.34	--	.41	.39	--	.45	--	--	--	
Chromium	.45	.29	--	.38	.31	1	--	--	.5	--	--	--	.71	--	--	.48	
Cobalt	--	.29	.27	.29	.35	--	1	--	.28	--	.78	--	.35	.42	--	.3	
Copper	--	--	--	.33	.34	--	--	1	.36	.5	-.32	--	--	.28	--	--	
Iron	.83	.42	.32	.74	--	.5	.28	.36	1	--	--	--	.51	.36	--	.84	
Lead	--	.37	.29	--	.41	--	--	.5	--	1	--	.51	.32	.33	.28	--	

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Iroquois River near Chebanse, Ill. (site 28)—Continued																	
Manganese	-0.36	--	--	--	0.39	--	0.78	-0.32	--	--	1	--	--	0.39	--	--	--
Molybdenum	--	--	0.35	--	--	--	--	--	--	0.51	--	1	0.31	--	--	--	0.3
Nickel	.42	0.29	--	0.52	.45	0.71	.35	--	0.51	.32	--	.31	1	--	--	0.51	.29
Phosphorus	--	--	.29	--	--	--	.42	.28	.36	.33	.39	--	--	1	--	--	.4
Silver	--	--	--	--	--	--	--	--	--	.28	--	--	--	--	1	--	.36
Vanadium	.88	.39	--	.83	--	.48	.3	--	.84	--	--	--	.51	--	--	1	--
Zinc	--	--	.55	.27	--	--	.39	--	--	.55	--	.3	.29	.4	.36	--	1
Discharge	.38	--	--	--	--	--	-5	.44	.38	--	-.67	--	--	--	--	--	--
Calcium	-.65	--	--	-.37	.36	--	.38	--	-.49	--	.66	--	--	--	--	--	-.48
Sodium	-.61	--	--	-.34	--	--	--	--	-.65	--	.26	--	-.34	--	--	--	-.53
Potassium	.35	--	--	.56	--	--	.51	--	--	--	--	--	.45	--	--	.49	--
Suspended sediment concentration	.41	--	--	.28	--	--	-.42	--	--	--	-.7	--	--	--	--	.29	--
Carbon, organic total	.37	--	--	--	--	.32	--	--	--	--	-.5	--	--	--	--	.35	--
Percent of sample <.062 mm	--	--	--	--	.36	--	--	--	--	--	--	--	.4	--	--	--	--
Particle surface area	.64	--	.37	.52	--	.48	--	--	.52	--	-.48	--	.47	--	--	.65	--
Des Plaines River at Riverside, Ill. (site 40)																	
Aluminum	1	--	--	.52	--	--	.44	--	.88	--	--	--	--	--	.32	.94	--
Antimony	--	1	.36	--	--	--	--	--	--	--	--	--	--	--	--	--	.42
Arsenic	--	.36	1	.4	.34	--	.48	--	.34	--	--	.4	.45	--	--	.38	--
Beryllium	.52	--	.4	1	--	.36	.54	--	.63	--	--	--	--	--	.41	.59	--
Cadmium	--	--	.34	--	1	--	--	.38	--	--	--	--	--	--	--	--	.49
Chromium	--	--	--	.36	--	1	.46	--	--	.39	.37	--	.6	.48	.29	--	.34
Cobalt	.44	--	.48	.54	--	.46	1	-.3	.66	--	.7	--	.39	.52	.42	.56	.35
Copper	--	--	--	--	.38	--	-.3	1	--	--	-.55	--	--	-.42	--	--	.34
Iron	.88	--	.34	.63	--	--	.66	--	1	--	--	--	--	--	.45	.89	--
Lead	--	--	--	--	--	.39	--	--	--	1	--	--	--	--	--	--	.31
Manganese	--	--	--	--	--	.37	.7	-.55	--	--	1	--	--	.8	--	--	--
Molybdenum	--	--	.4	--	--	--	--	--	--	--	1	.43	--	--	--	--	--
Nickel	--	--	.45	--	--	.6	.39	--	--	--	--	.43	1	--	--	--	--
Phosphorus	--	--	--	--	--	.48	.52	-.42	--	--	.8	--	--	1	.4	--	.35
Silver	.32	--	--	.41	--	.29	.42	--	.45	--	--	--	--	.4	1	.42	.59

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Des Plaines River at Riverside, Ill. (site 40)—Continued																	
Vanadium	0.94	--	0.38	0.59	--	--	0.56	--	0.89	--	--	--	--	--	0.42	1	--
Zinc	--	0.42	--	--	0.49	0.34	.35	0.34	--	0.31	--	--	--	0.35	.59	--	1
Discharge	--	--	--	--	.31	-.3	--	.34	--	-.36	-0.47	--	--	-.7	--	--	--
Calcium	-.45	-.29	--	--	--	--	-.34	--	-.43	--	-.45	--	--	-.46	--	-.41	--
Sodium	-.41	-.36	--	--	--	--	--	--	-.31	--	--	0.47	--	-.28	--	-.33	--
Potassium	.81	--	--	.35	--	--	--	--	.61	--	--	--	--	--	--	.77	--
Suspended sediment concentration	--	--	--	--	--	--	-.5	.32	--	--	-.74	--	--	-.7	-.34	--	--
Carbon, organic total	--	--	--	--	--	--	--	--	-.35	--	--	--	--	--	-.52	--	--
Percent of sample <.062 mm	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Particle surface area	.42	--	--	.33	--	.36	.49	-.47	.46	--	.43	--	--	.55	--	.54	--
Chicago Sanitary and Ship Canal at Romeoville, Ill. (site 55)																	
Aluminum	1	-.37	--	.65	--	--	--	--	.86	--	--	-.7	-0.34	--	--	.92	--
Antimony	-.37	1	.31	-.4	.35	.3	--	.33	--	--	--	.28	.35	--	.35	-.38	--
Arsenic	--	.31	1	--	--	.31	.32	--	--	--	--	--	--	--	--	--	--
Beryllium	.65	-.4	--	1	--	--	--	--	.49	--	--	-.44	--	--	--	.64	--
Cadmium	--	.35	--	--	1	.72	--	.75	--	--	--	--	--	.44	.7	--	.82
Chromium	--	.3	.31	--	.72	1	.44	.64	--	--	--	--	.66	.7	.83	--	.63
Cobalt	--	--	.32	--	--	.44	1	--	.52	--	.91	--	.49	.48	--	.37	--
Copper	--	.33	--	--	.75	.64	--	1	--	--	-.3	--	--	.42	.74	-.35	.77
Iron	.86	--	--	.49	--	--	.52	--	1	--	.4	-.66	--	--	--	.77	--
Lead	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--
Manganese	--	--	--	--	--	--	.91	-.3	.4	--	1	--	.4	.41	--	.32	--
Molybdenum	-.7	.28	--	-.44	--	--	--	--	-.66	--	--	1	--	--	--	-.63	--
Nickel	-.34	.35	--	--	--	.66	.49	--	--	--	.4	--	1	.42	.46	--	--
Phosphorus	--	--	--	--	.44	.7	.48	.42	--	--	.41	--	.42	1	.55	--	.36
Silver	--	.35	--	--	.7	.83	--	.74	--	--	--	--	.46	.55	1	--	.62
Vanadium	.92	-.38	--	.64	--	--	.37	-.35	.77	--	.32	-.63	--	--	--	1	--
Zinc	--	--	--	--	.82	.63	--	.77	--	--	--	--	--	.36	.62	--	1
Discharge	--	--	.29	--	--	--	--	.29	--	--	-.35	--	--	--	--	--	.39
Calcium	-.69	--	--	-.37	-.33	--	-.49	--	-.77	--	-.42	.58	--	--	--	-.62	--
Sodium	-.83	--	--	-.49	-.39	--	-.32	--	-.86	--	--	.65	--	--	--	-.69	--

Table 20

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Chicago Sanitary and Ship Canal at Romeoville, Ill. (site 55)—Continued																	
Potassium	0.54	-0.5	--	0.29	--	-0.33	--	--	0.45	--	--	-0.32	-0.4	-0.42	--	0.46	--
Suspended sediment concentration	.3	--	0.42	--	0.3	--	-0.32	--	--	--	-0.36	--	-0.3	--	--	--	--
Carbon, organic total	--	--	--	--	--	--	-0.37	0.36	--	--	-0.4	--	-0.31	--	--	--	--
Percent of sample <.062 mm	.46	--	--	--	--	--	--	--	.46	--	--	--	--	--	.36	-0.32	
Particle surface area	.82	--	--	.46	--	--	.46	--	.81	0.41	.41	-.56	--	--	--	.75	--
Du Page River at Shorewood, Ill. (site 69)																	
Aluminum	1	--	.57	.68	--	.61	.5	.38	.91	--	--	--	.58	-.57	--	.96	--
Antimony	--	1	.64	.29	.36	.41	.44	.34	.43	--	--	--	.58	-.29	0.39	.39	--
Arsenic	.57	.64	1	.56	--	.56	.56	.41	.67	--	--	--	.61	-.45	.33	.73	--
Beryllium	.68	.29	.56	1	--	.46	.34	.39	.74	--	--	--	.44	-.49	--	.73	--
Cadmium	--	.36	--	--	1	--	--	.5	--	--	--	--	.37	--	.61	--	.47
Chromium	.61	.41	.56	.46	--	1	.73	.58	.71	.36	--	--	.73	--	.29	.65	--
Cobalt	.5	.44	.56	.34	--	.73	1	.58	.65	.41	.55	--	.73	--	.55	.55	.43
Copper	.38	.34	.41	.39	.5	.58	.58	1	.55	.63	--	--	.69	--	.61	.41	.57
Iron	.91	.43	.67	.74	--	.71	.65	.55	1	--	--	--	.71	-.46	.3	.94	--
Lead	--	--	--	--	--	.36	.41	.63	--	1	--	--	.46	.31	.44	--	.46
Manganese	--	--	--	--	--	--	.55	--	--	--	1	--	--	.58	.42	--	.5
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--
Nickel	.58	.58	.61	.44	.37	.73	.73	.69	.71	.46	--	--	1	--	.5	.63	.47
Phosphorus	-.57	-.29	-.45	-.49	--	--	--	--	-.46	.31	.58	--	--	1	.29	-.57	.54
Silver	--	.39	.33	--	.61	.29	.55	.61	.3	.44	.42	--	.5	.29	1	--	.64
Vanadium	.96	.39	.73	.73	--	.65	.55	.41	.94	--	--	--	.63	-.57	--	1	--
Zinc	--	--	--	--	.47	--	.43	.57	--	.46	.5	--	.47	.54	.64	--	1
Discharge	.4	.3	.53	.39	--	--	--	--	.38	--	-.27	--	--	-.6	--	.44	--
Calcium	-.84	--	-.53	-.55	--	-.61	-.49	-.34	-.74	--	--	--	-.45	.46	--	-.79	--
Sodium	-.6	--	--	-.33	--	-.31	-.29	--	-.44	--	--	.48	--	.37	--	-.53	--
Potassium	.86	.29	.47	.64	--	.63	.54	.41	.85	--	--	.3	.65	-.43	--	.87	--
Suspended sediment concentration	.59	.38	.49	.33	.34	.52	--	--	.47	--	--	--	.43	-.54	--	.57	--
Carbon, organic total	.45	--	--	.3	--	--	--	--	.33	--	--	--	--	-.42	--	.38	--
Percent of sample: <.062 mm	.41	--	--	--	--	.32	--	--	.37	.38	--	--	.46	--	--	.39	--
Particle surface area	.81	--	.55	.54	--	.47	.42	--	.68	--	--	--	.43	-.63	--	.8	--

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Illinois River at Marseilles, Ill. (site 76)																	
Aluminum	1	-0.64	0.4	0.56	-0.29	-0.51	--	-0.66	0.87	-0.63	--	-0.5	-0.58	-0.67	-0.46	0.97	-0.65
Antimony	-.64	1	-.31	--	.66	.59	0.34	.5	-.62	.66	--	.36	.7	.51	.53	-.61	.59
Arsenic	.4	-.31	1	.3	-.33	-.3	--	-.61	.57	-.43	0.31	-.32	-.33	--	-.29	.43	--
Beryllium	.56	--	.3	1	--	--	--	-.48	.58	-.29	--	-.35	--	--	--	.55	-.37
Cadmium	-.29	.66	-.33	--	1	.51	--	.35	-.47	.37	--	--	.5	.4	.63	--	.47
Chromium	-.51	.59	-.3	--	.51	1	.48	.64	-.5	.68	--	.29	.72	.72	.74	-.44	.42
Cobalt	--	.34	--	--	--	.48	1	--	--	.44	.72	--	.64	.59	.46	--	.32
Copper	-.66	.5	-.61	-.48	.35	.64	--	1	-.57	.56	--	.62	.67	.52	.51	-.61	.64
Iron	.87	-.62	.57	.58	-.47	-.5	--	-.57	1	-.55	--	-.35	-.5	-.46	-.43	.88	-.5
Lead	-.63	.66	-.43	-.29	.37	.68	.44	.56	-.55	1	--	.37	.65	.69	.72	-.57	.49
Manganese	--	--	.31	--	--	--	.72	--	--	--	1	--	.28	.27	--	--	--
Molybdenum	-.5	.36	-.32	-.35	--	.29	--	.62	-.35	.37	--	1	.4	.3	.28	-.46	.54
Nickel	-.58	.7	-.33	--	.5	.72	.64	.67	-.5	.65	.28	.4	1	.65	.6	-.45	.63
Phosphorus	-.67	.51	--	--	.4	.72	.59	.52	-.46	.69	.27	.3	.65	1	.8	-.59	.55
Silver	-.46	.53	-.29	--	.63	.74	.46	.51	-.43	.72	--	.28	.6	.8	1	-.43	.53
Vanadium	.97	-.61	.43	.55	--	-.44	--	-.61	.88	-.57	--	-.46	-.45	-.59	-.43	1	-.6
Zinc	-.65	.59	--	-.37	.47	.42	.32	.64	-.5	.49	--	.54	.63	.55	.53	-.6	1
Discharge	.49	-.52	.36	--	--	-.51	-.61	-.34	.46	-.62	-.37	--	-.64	-.52	-.4	.46	-.35
Calcium	-.75	.57	-.33	-.33	.34	.36	--	.54	-.58	.54	--	.54	.41	.62	.53	-.76	.54
Sodium	-.82	.53	-.45	-.55	--	.36	--	.71	-.72	.52	--	.7	.46	.45	.31	-.8	.52
Potassium	.69	-.52	--	.37	--	--	--	--	.61	--	--	--	--	--	--	.74	-.35
Suspended sediment concentration	.47	-.37	.29	--	--	-.36	-.53	-.32	.41	-.47	-.38	--	-.46	-.46	-.34	.49	-.38
Carbon, organic total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent of sample <.062 mm	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Particle surface area	.79	-.46	.42	.56	--	-.33	--	-.58	.71	-.41	--	-.48	-.27	-.47	-.29	.82	-.46
Fox River at Algonquin, Ill. (site 89)																	
Aluminum	1	--	--	--	--	.46	.65	.42	.55	.34	.38	--	.67	--	.39	.83	--
Antimony	--	1	.31	--	.59	--	--	--	.39	.43	--	--	--	--	.46	--	.42
Arsenic	--	.31	1	--	.33	.44	--	--	.48	--	.46	--	--	.51	.36	.43	.44
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	.59	.33	--	1	--	--	--	--	--	--	--	--	--	.58	--	--

Table 20

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987-90—Continued

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Fox River at Algonquin, Ill. (site 89)—Continued																	
Chromium	0.46	--	0.44	--	--	1	0.42	--	0.36	--	0.45	--	0.53	0.44	0.31	0.55	--
Cobalt	.65	--	--	--	--	.42	1	0.62	.71	0.46	.36	0.58	.72	--	--	.51	0.33
Copper	.42	--	--	--	--	--	.62	1	.46	.58	--	.54	.53	-.3	--	--	--
Iron	.55	0.39	.48	--	--	.36	.71	.46	1	.5	.38	.46	.56	--	--	.6	.47
Lead	.34	.43	--	--	--	--	.46	.58	.5	1	--	.31	--	--	--	--	.53
Manganese	.38	--	.46	--	--	.45	.36	--	.38	--	1	--	--	.44	--	.52	--
Molybdenum	--	--	--	--	--	--	.58	.54	.46	.31	--	1	.41	-.37	--	--	.42
Nickel	.67	--	--	--	--	.53	.72	.53	.56	--	--	.41	1	--	.42	.6	--
Phosphorus	--	--	.51	--	--	.44	--	-.3	--	--	.44	-.37	--	1	--	--	--
Silver	.39	.46	.36	--	0.58	.31	--	--	--	--	--	--	.42	--	1	--	--
Vanadium	.83	--	.43	--	--	.55	.51	--	.6	--	.52	--	.6	--	--	1	--
Zinc	--	.42	.44	--	--	--	.33	--	.47	.53	--	.42	--	--	--	--	1
Discharge	--	--	--	--	--	--	--	.42	--	.4	--	--	--	-.3	--	--	--
Calcium	--	-.35	-.51	--	--	-.38	--	--	--	--	--	--	-.31	-.54	-.32	--	-.34
Sodium	--	.39	--	--	--	--	--	.5	--	.41	-.42	.63	--	-.48	--	--	--
Potassium	.67	--	--	--	--	.31	.56	.58	.41	.48	--	.39	.6	--	--	.48	.43
Suspended sediment concentration	--	--	--	--	--	--	--	--	--	--	-.44	--	--	-.57	-.42	--	--
Carbon, organic, total	--	-.45	-.5	--	-.4	--	--	--	-.4	--	-.4	--	--	-.56	-.42	--	-.59
Percent of sample <.062 mm	--	-.41	--	--	-.45	--	--	--	-.36	--	--	--	--	--	--	--	--
Particle surface area	.4	--	--	--	--	.36	--	--	--	--	.44	--	.44	--	.38	.47	--
Fox River at Dayton, Ill. (site 99)																	
Aluminum	1	.49	.67	--	--	.47	.75	.34	.96	.47	--	--	.64	--	.48	.91	.37
Antimony	.49	1	.44	--	.65	.3	.35	.54	.52	.62	--	--	.35	--	.64	.38	.47
Arsenic	.67	.44	1	--	--	.43	.33	--	.65	--	.3	--	.39	--	.34	.58	--
Beryllium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	--	.65	--	--	1	.29	--	.58	.37	.54	.29	--	--	--	.74	--	.66
Chromium	.47	.3	.43	--	.29	1	.56	.45	.51	--	.34	--	.84	--	.45	.6	--
Cobalt	.75	.35	.33	--	--	.56	1	.51	.75	.47	--	--	.75	-.44	.55	.87	.4
Copper	.34	.54	--	--	.58	.45	.51	1	.37	.53	--	--	.43	--	.53	.43	.42
Iron	.96	.52	.65	--	.37	.51	.75	.37	1	.54	.37	--	.64	--	.66	.87	.42
Lead	.47	.62	--	--	.54	--	.47	.53	.54	1	--	--	.4	--	.61	.39	.63

Table 20. Summary of correlation coefficients for physical properties and elements in suspended sediment at eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987–90—Continued

Physical property or element	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Fox River at Dayton, Ill. (site 99)—Continued																	
Manganese	--	--	0.3	--	0.29	0.34	--	--	0.37	--	1	--	--	0.43	0.49	--	--
Molybdenum	--	--	--	--	--	--	--	--	--	--	1	0.51	--	--	--	--	--
Nickel	0.64	0.35	.39	--	--	.84	0.75	0.43	.64	0.4	--	.51	1	-.33	.48	0.73	--
Phosphorus	--	--	--	--	--	--	-.44	--	--	--	.43	--	-.33	1	--	-.31	--
Silver	.48	.64	.34	--	.74	.45	.55	.53	.66	.61	.49	--	.48	--	1	.45	0.54
Vanadium	.91	.38	.58	--	--	.6	.87	.43	.87	.39	--	--	.73	-.31	.45	1	.3
Zinc	.37	.47	--	--	.66	--	.4	.42	.42	.63	--	--	--	--	.54	.3	1
Discharge	.45	.41	--	--	.4	.48	.64	.47	.6	.57	--	--	.56	-.49	.73	.5	--
Calcium	-.84	-.56	-.47	--	-.36	-.49	-.76	-.59	-.84	-.51	--	--	-.6	.32	-.5	-.85	-.46
Sodium	--	.36	--	--	--	--	--	--	--	.53	--	.33	--	--	--	--	.35
Potassium	.74	.34	.33	--	--	.41	.83	.48	.73	.55	--	--	.6	-.46	.43	.83	.47
Suspended sediment concentration	--	--	--	--	--	--	.37	--	--	--	--	--	.32	-.56	--	.32	--
Carbon, organic total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Percent of sample <.062 mm	--	--	--	--	-.43	--	--	--	--	-.46	--	--	--	--	--	--	--
Particle surface area	.74	.43	.57	--	.48	.56	.62	.35	.8	.36	.42	--	.57	--	.68	.7	--

Table 21. Correlation coefficients for selected elements in streambed sediments at high-order streams in the upper Illinois River Basin, 1987

Element	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Vanadium	Zinc
Aluminum	1.00																				
Antimony	--	1.00																			
Arsenic	-.25	.14	1.00																		
Barium	.36	.33	--	1.00																	
Beryllium	.76	.39	--	.37	1.00																
Boron	.15	.20	--	--	.30	1.00															
Cadmium	--	.67	--	.37	.22	.15	1.00														
Chromium	.47	.73	--	.39	.65	.29	.69	1.00													
Cobalt	.68	.25	--	.33	.68	.16	--	.46	1.00												
Copper	.19	.77	--	.30	.45	.41	.75	.86	--	1.00											
Iron	.51	.35	.41	.32	.58	--	--	.36	.74	.20	1.00										
Lead	--	.77	--	.27	.36	.36	.77	.79	.24	.90	--	1.00									
Manganese	-.23	-.28	.15	--	-.30	-.23	-.38	-.49	--	-.53	--	-.46	1.00								
Mercury	.17	.66	--	.26	.41	.37	.65	.75	.27	.85	.15	.82	-.45	1.00							
Molybdenum	.24	.48	.26	.21	.48	.28	.25	.48	.39	.47	.52	.36	-.35	.48	1.00						
Nickel	.51	.70	--	.40	.69	.28	.69	.91	.58	.78	.44	.71	-.43	.71	.53	1.00					
Selenium	--	.51	--	.33	.27	.29	.53	.50	--	.56	.22	.64	-.23	.48	.32	.46	1.00				
Silver	--	.72	--	.29	.38	.21	.84	.77	.21	.80	.19	.72	-.46	.70	.41	.75	.47	1.00			
Strontrium	-.49	--	-.22	-.20	-.30	.24	.21	--	-.51	--	-.45	--	--	--	--	-.19	.14	--	1.00		
Vanadium	.95	.18	--	.39	.79	.21	--	.48	.74	.20	.61	--	-.17	.18	.33	.56	--	.14	-.47	1.00	
Zinc	.20	.79	--	.31	.44	.35	.71	.85	.32	.92	.34	.90	-.44	.82	.49	.76	.60	.76	--	.23	1.00
Calcium	-.73	--	--	-.25	-.53	--	.29	-.16	-.60	--	-.61	.24	--	--	-.24	-.21	--	--	.57	-.74	--
Carbon, inorganic	-.64	--	.21	-.25	-.44	--	.30	--	-.52	--	-.63	.27	--	--	-.26	-.17	--	--	.54	-.66	--
Carbon, organic	-.23	.38	.28	.15	--	.20	.53	.27	--	.41	--	.48	--	.34	.26	.26	.67	.45	.33	-.19	.46
Carbon, total	-.58	.36	--	--	-.23	--	.59	.19	-.38	.43	-.28	.54	--	.41	--	.14	.47	.45	.51	-.55	.41
Phosphorus	--	.64	--	.29	.30	.46	.69	.68	.22	.77	.30	.72	-.25	.68	.41	.65	.58	.67	.18	--	.80
Potassium	.88	.20	.19	.27	.70	.16	--	.53	.68	.27	.40	.17	-.26	.27	.25	.55	--	.21	-.51	.87	.27
Sodium	--	-.48	--	--	-.30	-.14	-.58	-.47	--	-.51	--	-.57	.19	-.48	-.15	-.55	-.46	-.52	--	--	-.44

Table 22. Correlation coefficients for selected elements in biota from the upper Illinois River Basin, 1989 and 1990

[Correlations not shown if majority of concentrations for an element were below the minimum reporting level (MRL). Correlations were done twice, first with concentrations less than the MRL set to the MRL, and second with those values set to zero. If two coefficients are shown, the first represents the correlation where the below MRL values were set to the MRL, and the coefficient in parentheses represents the correlation where the below MRL values were set to zero. --, correlations with $p > 0.10$]

Element	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Vanadium	Zinc
Common Carp, 1989–90																			
Aluminum	1.00																		
Arsenic	--	1.00																	
Barium	--	--	1.00																
Beryllium	--	--	--	1.00															
Boron	--	--	--	--	1.00														
Cadmium	--	--	--	--	--	1.00													
Chromium	--	--	--	--	--	--	1.00												
Copper	--	--	--	--	--	.5 (.40)	--	1.00											
Iron	--	--	--	--	--	--	--	--	1.00										
Lead	--	--	--	--	--	--	--	--	--	1.00									
Manganese	--	.29 (.34)	--	--	--	--	--	.47	--	--	1.00								
Mercury	--	--	--	--	--	--	--	.56	.38	--	--	1.00							
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--	1.00						
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00					
Selenium	--	--	--	--	--	.76 (.69)	--	.50	--	--	--	--	--	--	--	--	1.00		
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00			
Strontium	.44 (.45)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-.47 (-.51)	--	1.00	
Vanadium	--	.32 (.38)	--	--	--	--	--	.37	--	--	.46 (.45)	.34 (.37)	--	--	--	--	--	1.00	
Zinc	--	--	--	--	--	.31 (.29)	--	.54	.42	--	--	.53	--	--	--	--	.36 (.37)	1.00	
White Sucker, 1990																			
Aluminum	1.00																		
Arsenic	--	1.00																	
Barium	--	--	1.00																
Beryllium	--	--	--	1.00															
Boron	--	--	--	--	1.00														

Table 22. Correlation coefficients for selected elements in biota from the upper Illinois River Basin, 1989 and 1990—Continued

Element	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Vanadium	Zinc
White Sucker, 1990—Continued																			
Cadmium	--	--	--	--	--	1.00													
Chromium	--	--	--	--	--	--	1.00												
Copper	--	--	--	--	--	--	--	1.00											
Iron	--	--	--	--	--	--	--	--	1.00										
Lead	--	--	--	--	--	--	--	--	--	1.00									
Manganese	--	--	--	--	--	--	--	--	--	--	1.00								
Mercury	--	--	--	--	--	--	--	.83	--	--	--	1.00							
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--	1.00						
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00					
Selenium	--	--	--	--	--	--	--	.66	.70	--	--	--	--	--	--	1.00			
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00		
Strontium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00		
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	
Zinc	--	--	--	--	--	--	--	.99	--	--	--	.88	--	--	.58	--	--	--	1.00
Crayfish, 1990																			
Aluminum	1.00																		
Arsenic	--	1.00																	
Barium	--	.51	1.00																
Beryllium	--	--	--	1.00															
Boron	--	--	--	--	1.00														
Cadmium	--	--	--	--	--	1.00													
Chromium	.63	--	--	--	--	--	1.00												
Copper	--	-.67	--	--	--	--	--	1.00											
Iron	.88	--	--	--	--	--	.76	--	1.00										
Lead	--	--	--	--	--	--	--	--	--	1.00									
Manganese	-.74	--	--	--	--	--	--	--	-.57	--	1.00								
Mercury	--	--	--	--	--	--	-.63	--	--	--	--	1.00							
Molybdenum	--	--	--	--	--	--	--	--	--	--	--	--	1.00						
Nickel	--	--	--	--	--	--	.55	--	--	--	--	-.64	--	1.00					
Selenium	--	--	.65	--	-.64 (-.69)	--	(.52)	--	--	--	.55	--	(-.58)	--	--	1.00			
Silver	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00			
Strontium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00		
Vanadium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.00	
Zinc	--	--	--	--	--	--	--	.62	--	--	--	--	--	--	.53	--	--	--	1.00

Table 22. Correlation coefficients for selected elements in biota from the upper Illinois River Basin, 1989 and 1990

[Correlations not shown if majority of concentrations for an element were below the minimum reporting level (MRL). Correlations were done twice, first with concentrations less than the MRL set to the MRL, and second with those values set to zero. If two coefficients are shown, the first represents the correlation where the below MRL values were set to the MRL, and the coefficient in parentheses represents the correlation where the below MRL values were set to zero. --, correlations with p > 0.10]

Element	Aluminum	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Vanadium	Zinc

Table 23. Correlation coefficients observed in physical properties and elements in water and suspended sediment from the eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987–90

[Correlations were done with the concentrations less than the minimum reporting level (MRL) set to zero. Correlations not shown if majority of concentrations for an element were below the MRL.

--, correlations with $p > 0.10$]

Physical property or element in water	Element in suspended sediment																
	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium	Zinc
Aluminum, total	0.55	--	0.11	0.44	-0.11	0.17	--	--	0.23	-0.23	-0.39	--	0.13	-0.37	-0.16	0.53	-0.12
Aluminum, dissolved	.18	-0.12	--	.14	--	--	--	--	--	--	--	--	--	--	--	.18	--
Antimony, dissolved	--	.58	--	--	.63	.62	0.39	0.60	--	.67	--	0.36	.60	.48	.56	--	.64
Arsenic, total	--	--	.14	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic, dissolved	-.15	.13	-.17	-.13	.20	.16	--	.15	-.26	.23	--	--	.12	.37	.24	-.15	.21
Barium, total	--	-.65	-.16	--	-.61	-.58	-.56	-.62	-.21	-.66	-.34	-.54	-.62	-.63	-.65	--	-.66
Barium, dissolved	-.30	-.70	-.29	-.31	-.60	-.71	-.51	-.68	-.33	-.59	--	-.61	-.74	-.47	-.61	-.33	-.65
Beryllium, total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Boron, total	--	.47	-.24	.10	.39	.43	.29	.49	-.12	.46	--	.43	.40	.59	.56	--	.48
Boron, dissolved	--	.45	-.24	--	.38	.40	.27	.47	-.16	.45	--	.41	.37	.60	.54	--	.46
Cadmium, total	.14	.58	.14	.21	.60	.58	.24	.59	--	.52	-.23	.44	.56	.40	.55	.15	.52
Cadmium, dissolved	--	.25	.11	--	.21	.23	--	.27	--	.18	-.11	.21	.23	.12	.19	--	.19
Chromium, total	.25	.15	.17	.27	.19	.32	.20	.18	.13	--	--	.12	.27	.13	.14	.25	.16
Chromium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt, total	.20	--	--	.15	-.13	--	--	--	.11	-.14	-.20	--	--	-.16	-.13	.18	-.11
Cobalt, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper, total	.25	.30	.11	.28	.21	.31	--	.33	--	.20	-.35	.23	.29	--	.21	.24	.21
Copper, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Iron, total	.48	--	.31	.35	-.12	--	--	--	.40	-.25	-.28	--	--	-.45	-.18	.46	-.13
Iron, dissolved	.16	.10	.11	.15	--	.15	--	.12	--	--	-.21	.11	.17	--	--	.18	--
Lead, total	.20	.42	.14	.18	.38	.39	--	.41	--	.35	-.32	.30	.36	.19	.37	.19	.34
Lead, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese, total	.15	-.23	.36	.12	-.19	-.11	--	-.18	.27	-.32	--	--	-.13	-.37	-.25	.16	-.18
Manganese, dissolved	.26	.44	.55	.21	.34	.44	.58	.44	.55	.32	.35	.65	.46	.25	.44	.30	.51
Mercury, total	--	--	--	--	--	--	-.16	--	--	--	-.19	--	--	--	--	--	--
Mercury, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Molybdenum, dissolved	--	.33	--	--	.26	.22	.28	.26	--	.21	.24	.39	.26	.30	.37	--	.30
Nickel, total	.30	.47	.22	.30	.42	.58	.39	.46	.22	.39	--	.36	.57	.34	.41	.30	.42
Nickel, dissolved	.12	.47	--	.10	.46	.57	.40	.50	.13	.46	--	.34	.56	.43	.45	.13	.47

Table 23

Table 23. Correlation coefficients observed in physical properties and elements in water and suspended sediment from the eight National Water-Quality Assessment fixed sites in the upper Illinois River Basin, 1987–90—Continued

Major and Trace Elements in Water, Sediment, and Biota, 1978–90	Element in suspended sediment																
	Physical property or element in water	Aluminum	Antimony	Arsenic	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Molybdenum	Nickel	Phosphorus	Silver	Vanadium
Phosphorus, total	0.15	0.55	-0.18	0.17	0.41	0.50	0.19	0.58	--	0.51	-0.27	0.50	0.45	0.56	0.61	0.14	0.52
Phosphorus, dissolved	.30	.61	-0.14	.26	.43	.56	.37	.59	--	.52	-0.12	.55	.55	.52	.62	.29	.56
Selenium, total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium, dissolved	.39	--	.11	.35	-0.15	.10	--	-0.14	0.24	-0.19	-0.15	--	--	-0.27	-0.20	.39	-0.17
Silver, total	--	--	--	.11	--	--	.11	--	--	--	--	--	--	--	--	--	--
Silver, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Strontium, total	-.31	-0.15	-0.52	-0.20	-0.13	-0.26	-0.28	-0.13	-0.54	.10	--	-0.24	-0.28	.28	--	-.32	--
Strontium, dissolved	-.34	-0.15	-0.50	-0.25	-0.14	-0.27	-0.28	-0.14	-0.54	--	--	-0.23	-0.30	.28	--	-.36	--
Vanadium, total	.32	--	--	.29	--	.14	--	--	.10	-0.13	-0.27	--	--	-0.21	-.11	.32	--
Vanadium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc, total	.11	.21	--	--	.12	.18	--	.19	--	.13	-0.14	.21	.18	.11	.17	--	.16
Zinc, dissolved	--	--	--	--	--	--	--	--	--	--	--	.11	--	--	--	--	.10
Discharge	.19	.36	.30	.17	.44	.41	.24	.40	.31	.35	-0.14	.19	.42	--	.27	.19	.33
Specific conductance	--	.20	-0.24	--	.15	.11	.12	.25	-0.12	.30	.11	.18	--	0.43	.38	--	.28
pH	-.45	-.57	-0.45	-.35	-.44	-.65	-.57	-.49	-.47	-.42	--	-.57	-.64	-.27	-.48	-.47	-.54
Temperature	-.11	--	-0.14	-0.14	--	--	-0.16	--	-0.22	-0.12	--	--	--	--	--	-0.12	--
Dissolved oxygen	-.17	-.34	-0.22	-0.11	-0.31	-.46	-.23	-.34	-.17	-.27	--	-.37	-.43	-.20	-.32	-0.19	-.39
Hardness	-.10	-.33	-0.17	-0.14	-0.35	-.40	-.11	-.29	--	-.28	.26	-.18	-.38	-0.14	-.20	-0.13	-.26
Alkalinity, total	-.53	--	-0.50	-0.52	--	-.76	-.59	--	--	--	--	--	-.69	--	--	-.50	--
Calcium, total	.14	-0.18	--	--	-0.28	-.22	.12	-.14	.26	-.27	.31	--	-.19	-.23	-.15	.12	-.15
Calcium, dissolved	.14	-0.11	--	--	-0.20	-.16	.19	--	.28	-.20	.37	--	-0.12	-0.14	--	.12	--
Magnesium, total	-.40	-.53	-0.50	-0.33	-0.46	-.61	-.53	-.47	-.53	-.34	--	-.48	-.64	--	-.33	-.43	-.45
Magnesium, dissolved	-.42	-.51	-0.48	-0.36	-0.42	-.59	-.48	-.45	-.51	-.30	--	-.46	-.61	--	-.29	-.45	-.41
Sodium, total	--	.43	-0.27	--	.38	.33	.19	.48	-.18	.51	--	.38	.30	.65	.61	--	.48
Sodium, dissolved	--	.43	-0.28	--	.37	.32	.18	.47	-.21	.50	--	.36	.29	.66	.60	--	.47
Potassium, total	.11	.49	-0.20	.14	.36	.40	.22	.49	--	.44	-0.12	.44	.37	.53	.54	.12	.45
Potassium, dissolved	--	.47	-0.25	--	.38	.36	.22	.48	-.14	.49	--	.42	.34	.61	.56	--	.47
Chloride, dissolved	--	.34	-0.31	--	.30	.24	.11	.38	-.24	.44	--	.27	.21	.60	.53	--	.39
Solids, residue on evaporation at 180°C	--	.16	-0.20	--	--	--	.14	.21	--	.22	.17	.15	--	.37	.34	--	.25
Solids, total suspended	.23	-.30	--	.13	-.23	--	.13	-.23	--	-.25	--	-.24	--	-.15	-.22	.20	-.24
Solids, volatile	--	-.27	-0.13	--	-.17	--	-.26	-.18	-.19	-.16	-.11	-.31	-.17	--	-.16	--	-.21
Carbon, total organic	--	-.24	-0.20	-0.12	--	-.18	-.36	-.16	-.36	--	-.21	-.26	-.24	.12	--	-.22	-.14

Table 24. Correlation coefficients for median measurements of physical properties and concentrations of elements in water and streambed sediment in the upper Illinois River Basin

[Correlations were done with the concentrations less than the minimum reporting level (MRL) set to zero. Correlations not shown if majority of concentrations for an element were below the MRL].
--, correlations with $p > 0.10$

Physical property or element in water	Element in streambed sediment																				
	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Selenium	Strontium	Vanadium	Zinc
Aluminum, total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	-0.34	--	--	
Aluminum, dissolved	--	--	--	--	0.32	--	-0.36	--	--	--	--	--	--	--	0.31	--	--	--	--	--	
Arsenic, total	--	0.55	--	--	--	--	.51	0.43	--	0.63	--	0.66	--	0.56	--	--	0.53	0.67	.40	--	0.55
Arsenic, dissolved	--	--	--	--	--	--	.65	--	--	.70	--	.81	--	.78	--	--	.71	--	.74	--	--
Barium, total	-0.44	-0.45	-0.40	--	-0.33	--	-0.41	-0.56	--	-0.53	--	-0.41	--	-0.39	--	-0.34	--	-0.32	--	--	-0.49
Barium, dissolved	-.51	-.51	-.41	--	-.43	--	-.42	-.62	--	-.58	-0.33	-.45	--	-.41	--	-.41	-.34	-.36	--	-0.36	-.55
Boron, total	--	.33	--	--	.62	0.68	--	.43	0.52	.54	.46	--	--	.39	.77	.51	.61	--	--	.36	.48
Boron, dissolved	--	.34	--	--	.62	.67	--	.43	.50	.56	.45	--	--	.39	.77	.49	.61	--	--	.36	.49
Chromium, total	.51	.61	--	0.33	.66	--	.41	.73	.35	.66	.37	.48	-0.35	.43	.51	.47	.53	.32	--	.45	.69
Copper, total	--	--	--	--	.58	.66	--	.31	.58	.37	.43	--	--	.35	.78	.43	.42	--	--	.36	.36
Iron, total	--	--	--	--	--	--	-.35	--	--	.32	--	--	--	.33	--	--	--	-0.37	--	--	--
Iron, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	-.33	--	--	--	--	--	--	--
Manganese, total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese, dissolved	.47	--	.35	--	.51	--	--	.34	.44	--	.52	--	--	--	.52	.31	--	-.44	.47	.47	.34
Nickel, total	.37	.63	--	.43	.66	.33	.46	.74	.44	.75	.41	.55	--	.52	.59	.52	.76	.49	--	.35	.74
Nickel, dissolved	.33	.49	--	.36	.50	--	.49	.59	.48	.58	.34	.43	--	--	.44	.48	.60	.36	--	--	.55
Phosphorus, total	--	--	--	--	.48	.74	--	.38	.47	.50	.42	--	--	.48	.73	.48	.67	--	--	--	.40
Phosphorus, dissolved	.35	--	.33	--	.57	.70	--	.42	.55	.49	.49	--	--	.45	.75	.53	.61	--	--	.43	.43
Strontium, total	-0.40	--	--	-.48	--	.36	--	--	--	-.37	--	--	--	--	--	--	--	-.31	.60	-.41	--
Strontium, dissolved	-.37	--	--	-.48	--	.36	--	--	--	-.35	--	--	--	--	--	--	--	.58	-.39	--	--
Hardness	--	-.43	--	--	--	--	-.55	-.49	--	-.46	--	-.59	--	-.39	--	-.39	--	-.47	--	--	-.46
Carbon, total organic	--	--	-.70	--	--	--	--	--	--	--	-.51	--	--	--	--	--	--	--	--	--	--

Table 24

Table 25. Correlation coefficients for 90th-percentile measurements of physical properties and element concentrations in water and streambed sediment in the upper Illinois River Basin

[Correlations were done with the concentrations less than the minimum reporting level (MRL) set to zero. Correlations not shown if majority of concentrations for an element

Physical property or element in water	Element in streambed sediment																			
	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Selenium	Strontium	Vanadium	Zinc
Aluminum, total	0.43	--	--	--	0.48	--	--	0.47	--	0.47	-0.35	--	--	0.39	--	--	--	-0.44	0.51	--
Aluminum, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic, total	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium, total	-0.38	-0.49	-0.48	--	--	--	-0.53	--	-0.54	--	-0.41	--	-0.40	--	--	--	-0.36	--	--	-0.50
Barium, dissolved	-0.48	-0.54	-0.48	--	-0.43	--	-0.60	-0.35	-0.57	-0.35	-0.41	--	-0.39	--	-0.36	-0.33	-0.31	.33	-0.36	-0.55
Boron, total	.35	--	--	--	.64	0.66	.38	.52	.46	.46	--	--	--	.75	.44	.52	--	--	.39	.40
Boron, dissolved	.37	--	--	--	.65	.65	.37	.55	.43	.47	--	--	--	.75	.44	.50	--	--	.42	.39
Chromium, total	.42	--	--	0.33	.58	--	.32	.42	--	.43	--	--	--	.42	--	--	--	--	.45	.39
Chromium, dissolved	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper, total	.54	--	--	.35	.64	.56	.44	.62	.51	.42	--	--	.47	.66	.45	.43	--	--	.55	.50
Copper, dissolved	--	--	--	--	.50	.44	--	.46	--	.34	--	--	.35	.65	--	--	--	--	--	.31
Iron, total	.41	--	--	--	.54	--	--	.47	--	.51	--	--	--	.45	--	--	--	-0.43	.51	--
Iron, dissolved	.61	--	.31	--	.43	--	--	.41	--	.47	--	--	--	.38	.34	--	--	-0.51	.66	--
Lead, total	.49	.53	--	--	.67	.44	.63	.35	.71	.37	.53	-0.41	.56	.65	.50	.53	--	--	.51	.72
Manganese, total	--	--	--	--	--	--	-0.37	--	-0.41	--	-0.39	--	-0.48	--	-0.32	-0.49	--	-0.50	--	-0.32
Manganese, dissolved	.45	--	--	--	.45	--	--	.37	--	.39	--	--	--	.47	--	--	--	-0.49	.45	--
Nickel, total	.63	.43	.43	.50	.87	.40	.63	.73	.56	.68	.34	--	.41	.73	.60	.52	.35	--	.66	.63
Nickel, dissolved	.56	.53	--	.45	.77	.39	.74	.60	.70	.48	.52	--	.50	.67	.63	.59	.41	--	.57	.73
Phosphorus, total	--	--	--	--	.50	.69	.39	.47	.50	.44	--	--	.47	.71	.49	.64	--	--	.33	.39
Phosphorus, dissolved	--	--	--	--	.52	.66	.38	.50	.46	.45	--	--	.42	.71	.49	.60	--	--	.35	.37
Strontium, total	-0.50	--	-0.33	-0.47	-0.42	--	-0.32	-0.38	--	-0.47	--	--	--	--	--	--	--	.69	-0.51	--
Strontium, dissolved	-0.50	--	-0.33	-0.48	-0.42	--	-0.33	-0.37	--	-0.47	--	--	--	--	--	--	.69	-0.51	--	--
Vanadium, total	--	--	--	--	--	--	--	--	--	--	-0.37	--	--	--	--	--	--	--	--	--
Zinc, total	--	.40	--	.46	.39	.42	.51	.34	.56	--	.41	--	.48	.52	.40	--	--	--	.46	.69
Discharge	--	--	--	--	--	--	--	--	--	--	--	--	--	-0.38	--	--	--	--	--	--

Table 25. Correlation coefficients for 90th-percentile measurements of physical properties and element concentrations in water and streambed sediment in the

Physical property or element in water	Element in streambed sediment																			
	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Selenium	Strontrium	Vanadium	Zinc
Specific conductance	--	--	--	--	.49	.70	.39	.42	.50	--	--	--	.52	.66	.45	.40	--	--	.35	.48
pH	-0.37	--	-0.45	--	-.34	--	-.40	-.33	-.39	-0.33	--	--	--	-.42	--	--	-0.32	--	-.31	-.32
Temperature	--	--	-.38	--	-.45	--	--	-.42	--	-.45	--	--	--	-.60	--	--	--	--	-.36	--
Dissolved oxygen	-.36	-0.49	-.51	--	-.38	--	-.50	--	-.41	-.39	--	--	--	--	--	--	-0.38	0.39	--	-.40
Hardness	--	-.41	--	--	--	.35	-.34	--	--	--	-0.46	--	--	--	--	--	-.50	--	--	--
Calcium, total	--	--	--	--	--	--	--	--	-.31	--	-.50	--	-.36	--	--	--	-.32	-.39	--	--
Calcium, dissolved	--	--	--	--	--	--	--	--	-.34	.31	-.51	--	-.38	--	--	--	-.36	-.40	--	--
Magnesium, total	-.44	-.48	-.45	-0.33	-.32	--	-.43	-.35	--	-.41	--	--	--	--	--	--	-.33	.42	-.39	-.32
Magnesium, dissolved	-.44	-.49	-.48	-0.33	-.33	--	-.45	-.35	--	-.41	--	--	--	--	--	--	-.36	.44	-.39	-.32
Sodium, total	.36	--	--	--	.57	.72	.45	.50	.56	.36	.33	--	.56	.68	.52	.47	--	--	.39	.55
Sodium, dissolved	.34	--	--	--	.59	.75	.45	.46	.57	.36	.33	--	.57	.75	.48	.53	--	--	.39	.54
Potassium, total	--	--	--	--	.51	.72	.33	.47	.47	.37	--	--	.39	.69	.41	.52	--	--	--	.40
Potassium, dissolved	--	--	--	--	.50	.75	.36	.46	.50	.37	--	--	.44	.70	.44	.56	--	--	--	.42
Chlorine, dissolved	.36	--	--	--	.56	.67	.48	.45	.60	--	.36	--	.58	.68	.49	.45	--	--	.36	.56
Solids, total suspended	--	--	--	--	.34	.35	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Solids, volatile	-.40	--	-.49	--	--	.36	-.36	--	--	-.33	--	--	--	--	--	--	-.32	.47	-.32	--

Table 26. Correlation coefficients for concurrent measurements of physical properties and elements in water and streambed sediment in the upper Illinois River Basin
 [Correlations were done with the concentrations less than the minimum reporting level (MRL) set to zero. Correlations not shown if majority of concentrations for an element were below the MRL.
 --, correlations with p>0.10]

Physical property or element in water	Element in streambed sediment																			
	Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Phosphorus	Selenium	Sodium	Strontium	Vanadium
Aluminum, total	--	--	--	--	--	-0.35	--	--	--	--	--	--	--	--	--	--	--	-0.48	--	--
Arsenic, total	0.48	0.71	--	--	0.71	--	0.75	--	0.76	0.59	0.68	--	0.51	0.67	0.63	0.56	0.54	--	0.52	0.80
Barium, total	-0.48	-0.57	-0.41	--	-0.47	--	-0.67	-0.31	-0.69	-0.33	-0.54	--	-0.51	-0.41	-0.42	-0.40	-0.45	--	-0.36	-0.66
Barium, dissolved	-0.53	-0.58	-0.39	--	-0.48	--	-0.69	--	-0.66	-0.35	-0.51	0.39	-0.48	-0.36	-0.40	-0.37	-0.43	--	-0.41	-0.67
Boron, total	.35	--	--	--	.58	.60	.40	.59	.45	.44	--	--	.35	.71	.49	.48	--	--	.42	.40
Boron, dissolved	.34	--	--	--	.56	.60	.39	.58	.45	.42	--	--	.36	.69	.47	.49	--	--	.40	.40
Iron, total	--	--	--	--	--	-0.43	--	--	--	--	--	--	-0.33	--	--	--	--	-0.53	--	--
Manganese, total	--	--	--	--	--	-0.46	--	--	--	--	--	--	--	--	--	--	--	-0.49	--	--
Manganese, dissolved	.36	--	.34	--	.45	--	--	.34	--	.38	--	--	--	.38	--	--	--	-0.34	.37	--
Phosphorus, total	.42	.37	.32	0.42	.71	.59	.59	.51	.61	.49	.34	--	.47	.75	.51	.67	.32	--	.46	.61
Phosphorus, dissolved	.40	.33	.38	.43	.67	.54	.56	.62	.57	.52	--	--	.47	.76	.58	.67	--	--	.46	.55
Strontium, total	-0.38	--	--	--	--	.43	--	--	--	-0.32	--	--	--	--	--	--	--	.68	-0.38	--
Strontium, dissolved	-0.36	--	--	--	--	.45	--	--	--	-0.31	--	--	--	--	--	--	--	.67	-0.37	--
Discharge	-0.33	--	--	--	--	--	--	-0.36	--	--	.39	--	--	-0.43	--	--	--	-0.41	--	--
Specific conductance	--	--	--	--	--	.65	--	--	--	--	--	--	--	.49	--	.43	--	.36	--	--
pH	-0.42	--	--	--	--	-0.49	--	--	--	-0.36	--	--	--	-0.34	--	--	--	--	-0.39	--
Temperature	--	--	--	--	--	-0.49	--	--	--	-0.34	--	--	-0.46	--	--	--	--	-0.49	--	--
Dissolved oxygen	-0.54	--	-0.39	--	-0.44	--	-0.34	-0.31	--	-0.44	--	--	-0.32	--	--	--	--	.47	-0.54	--
Hardness	-0.46	--	--	--	--	-0.49	--	--	--	-0.37	.33	--	--	-0.34	--	--	--	.34	-0.40	-0.43
Calcium, total	--	--	--	--	--	--	-0.45	--	-0.32	--	-0.44	.45	-0.33	--	--	--	--	--	--	-0.43
Calcium, dissolved	--	--	--	--	--	--	-0.43	--	--	--	-0.41	.46	-0.32	--	--	--	--	--	--	-0.38
Magnesium, total	-0.68	-0.42	--	--	-0.57	--	-0.61	-0.33	-0.38	-0.44	-0.38	--	--	-0.44	--	--	.57	-0.62	-0.55	
Magnesium, dissolved	-0.66	-0.41	--	--	-0.52	--	-0.58	--	-0.35	-0.41	-0.35	--	--	-0.40	--	--	.56	-0.60	-0.51	
Sodium, total	--	--	--	--	.40	.68	.33	.49	.47	.37	--	--	.44	.68	.46	.59	--	--	.38	
Sodium, dissolved	--	--	--	--	.40	.68	.34	.49	.47	.37	--	--	.43	.68	.47	.59	--	--	.38	
Potassium, total	.35	--	--	--	.56	.59	.37	.59	.43	.44	--	--	.34	.67	.47	.48	--	--	.43	.37
Potassium, dissolved	.32	--	--	--	.54	.58	.35	.57	.44	.42	--	--	.34	.66	.44	.48	--	--	.39	.37
Chlorine, dissolved	--	--	.39	--	.35	.59	--	.48	--	.45	--	--	.61	--	.50	--	--	--	--	
Solids, total suspended	--	--	--	--	--	--	--	-0.35	--	--	--	--	--	--	--	--	--	--	--	
Solids, volatile	-0.39	--	-0.44	-0.60	--	--	-0.33	-0.44	--	-0.57	--	--	--	-0.33	-0.36	--	-0.38	--	-0.41	--