OCCURRENCE OF HERBICIDES, NITRITE PLUS NITRATE, AND SELECTED TRACE ELEMENTS IN GROUND WATER FROM NORTHWESTERN AND NORTHEASTERN MISSOURI, JULY 1991 AND 1992

By DONALD H. WILKISON *and* RANDALL D. MALEY

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Multiply	By	To obtain
foot	0.3048	meter
inch	25.4	millimeter
mile	1.609	kilometer

To convert degrees Celsius (°C) to degrees Fahrenheit (°F) use the following:

$$°F = 9/5\ °C + 32.$$

Sea Level: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)--a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

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By Donald H. Wilkison[1] *and* Randall D. Maley[2]

Abstract

In July 1991, the U. S. Geological Survey and the Missouri Department of Health collected water samples from 130 rural domestic wells in Caldwell, Clinton, Daviess, Gentry, and Nodaway Counties in northwestern Missouri. Triazine or Cl (chlorinated)-acetamide herbicide concentrations exceeded 0.05 microgram per liter in 32 percent of all samples analyzed with enzyme-linked immunosorbent assays. Samples from 79 wells were analyzed using gas chromatograph/mass spectrometry methods. One or more of the herbicides alachlor, atrazine, cyanazine, metolachlor, metribuzin, and trifluralin were detected at concentrations greater than or equal to 0.05 microgram per liter in water from 19 of the 79 wells. Atrazine was detected in samples from 16 of the wells in concentrations that ranged from 0.05 to 9.6 micrograms per liter. Atrazine concentrations exceeded 3 micrograms per liter in only one sample.

Nitrite plus nitrate as nitrogen concentrations in water samples from 129 wells sampled in northwestern Missouri during 1991 ranged from less than 0.05 to 63 milligrams per liter. Nitrite plus nitrate concentrations were greater than or equal to 10 milligrams per liter in water samples from 31 wells. Mean well depth for wells with nitrite plus nitrate concentrations less than 0.05 milligram per liter was 72.7 feet and mean well diameter was 20.2 inches. Wells with nitrite plus nitrate concentrations greater than 0.05 milligram per liter had a mean well depth of 44.2 feet and a mean well diameter of 32.6 inches.

Arsenic was detected in two samples and the concentrations in all samples ranged from less than 5 to 9 micrograms per liter. Total recoverable iron concentrations ranged from less than 50 to 6,600 micrograms per liter and were greater than 500 micrograms per liter in 23 wells. Manganese concentrations in water samples ranged from less than 20 to 2,600 micrograms per liter and were greater than 50 micrograms per liter in 38 samples.

In July 1992, water samples were collected from 147 wells in Audrain, Clark, Lewis, Monroe, Scotland, and Shelby Counties in northeastern Missouri and analyzed for herbicides. Alachlor, atrazine, cyanazine, metribuzin, and metolachlor were detected at concentrations greater than 0.10 microgram per liter in water samples from 19 of the 147 wells. Atrazine was detected in water from 18 of the 19 wells with detectable herbicide concentrations. Atrazine concentrations exceeded 3.0 micrograms per liter in two of the samples.

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Depth of wells in northeastern Missouri with detectable concentrations of herbicides in water samples ranged from 12 to 220 feet and averaged 58.9 feet. Depth of wells with no detectable concentrations of herbicides ranged from 15 to 740 feet and averaged 211 feet. The diameter of wells with detectable concentrations of herbicides in the water samples ranged from 1.5 to 144 inches and averaged 32.2 inches. The diameter of wells with no detectable herbicide concentrations in the water samples ranged from 1.5 to 72 inches and averaged 14.7 inches. Although 21 percent of the 147 wells sampled in July 1992 were completed in rocks of Pennsylvanian age of the Cherokee Group, these wells accounted for 60 percent of the wells with detectable concentrations of herbicides in the water samples. The rest of the wells sampled were screened in glacial till, alluvium of the Des Moines or Mississippi Rivers, or rocks of Mississippian or Ordovician age.

Water samples from 144 wells in northeastern Missouri were analyzed for nitrite plus nitrate during 1992. Nitrite plus nitrate concentrations ranged from less than 0.05 to 60 milligrams per liter. Nitrite plus nitrate concentrations were greater than or equal to 10 milligrams per liter in water samples from 28 wells. Wells with nitrite plus nitrate concentrations less than 0.05 milligram per liter in water samples had a mean depth of 237 feet and a mean diameter of 7.8 inches. Wells with nitrite plus nitrate concentrations greater than 0.05 milligram per liter had a mean well depth of 152 feet and a mean diameter of 25.7 inches.

Concentrations of total recoverable iron in water samples ranged from less than 50 to 22,100 micrograms per liter and were greater than 500 micrograms per liter in 51 wells. Manganese concentrations in water samples ranged from less than 20 to 3,020 micrograms per liter and exceeded 50 micrograms per liter in 43 samples.

INTRODUCTION

Northwestern and northeastern Missouri contain extensive quantities of land used for agricultural crop and livestock production. The principal agricultural crops are corn, soybeans, hay, wheat, and sorghum; the principal livestock products are beef, dairy, and pork. Corn and soybeans account for the largest part of the crop land in both regions. The percentage of crop land in corn and soybeans during 1990 ranged from 95 percent in Nodaway County to 63 percent in Audrain County (figs. 1 and 2; Missouri Department of Agriculture, 1991).

Ninety percent of land in corn and soybean production in Missouri had herbicides applied in 1989. Atrazine was the most commonly applied broadleaf herbicide; alachlor was the most commonly applied grass herbicide. Atrazine, alachlor, butylate, metolachlor, and cyanazine were the herbicides used on most corn crops. Trifluralin, alachlor, imaziquin, pendimethalin, and metolachlor were the herbicides used on most soybean crops (Smith and Fairchild, 1990). Nitrogen fertilizers were most commonly applied as ammonium nitrate, anhydrous ammonia, nitrogen solutions, and urea.

Because ground water is the primary drinking water source for many rural residents in the area, the U.S. Geological Survey (USGS), in cooperation with the Missouri Department of Health (DOH), sampled wells in northwestern and northeastern Missouri to determine concentration of herbicides, nitrate plus nitrite, and selected trace elements in ground water.

Herbicides in ground water may originate from a point source, such as mixing or spilling herbicides near a well, or from a nonpoint source, such as the application of herbicides to a field and subsequent infiltration to the ground water. Nitrate may be present in ground water because of field application of fertilizers, wastes leaching from confined feedlot wastes, or household septic systems.

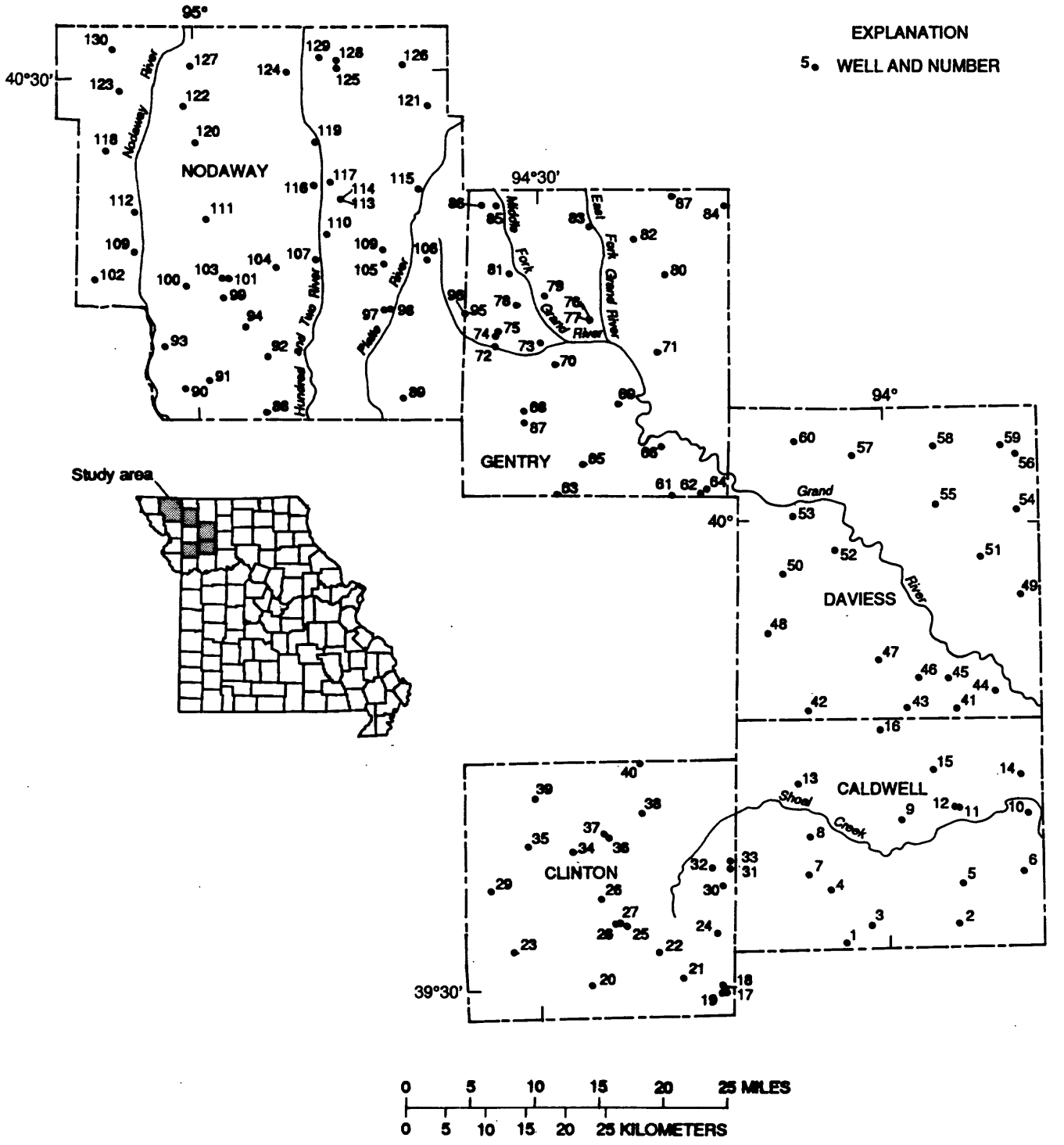

Figure 1. Location of wells sampled in northwestern Missouri during 1991.

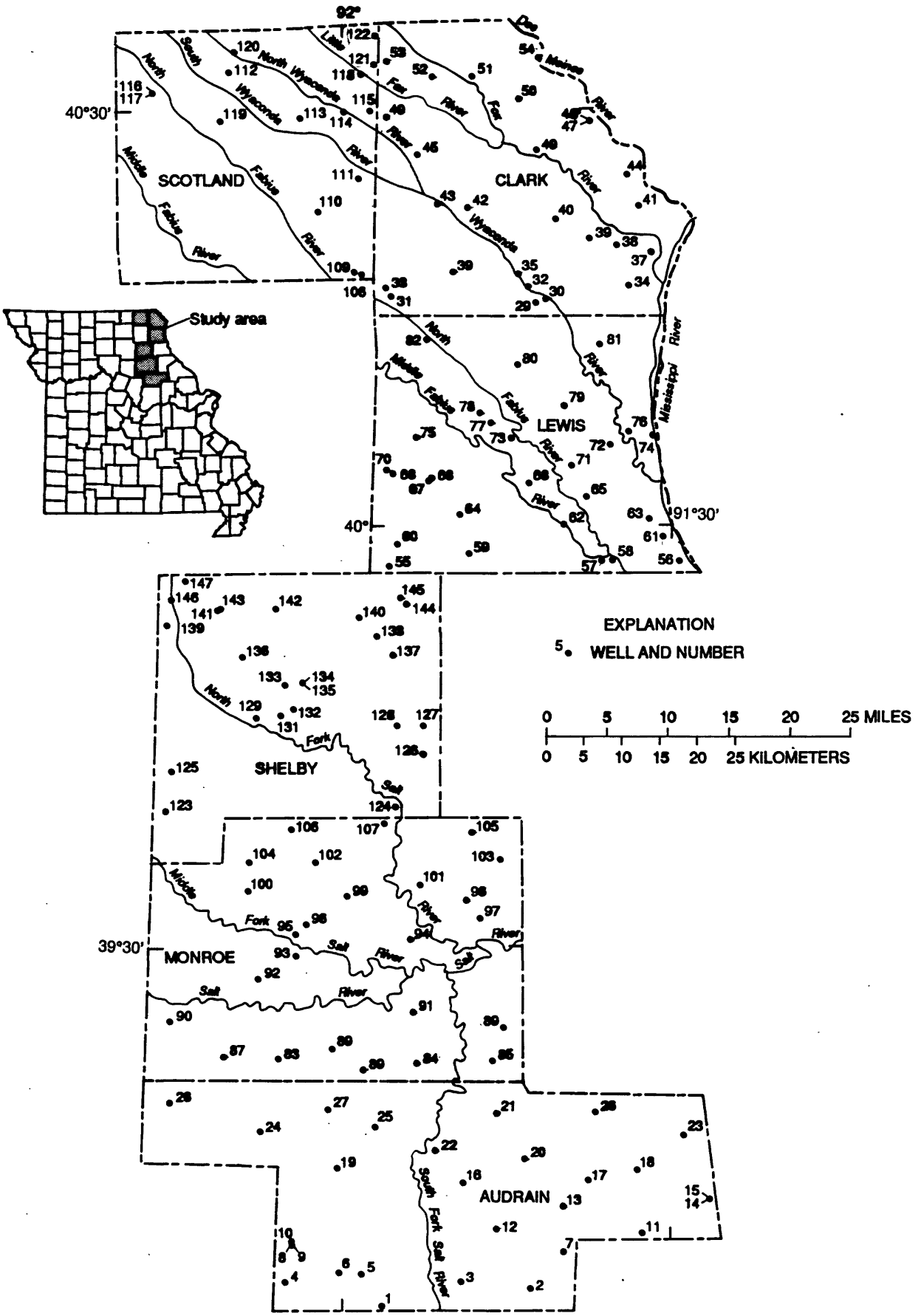

Figure 2. Location of wells sampled in northeastern Missouri during 1992.

The purpose of this report is to present water-quality and land-use data for domestic wells sampled during 1991 and 1992 in northwestern and northeastern Missouri. Wells were sampled in Caldwell, Clinton, Daviess, Gentry, and Nodaway Counties in northwestern Missouri and in Audrain, Clark, Lewis, Monroe, Scotland, and Shelby Counties in northeastern Missouri.

Hydrogeology

In northern Missouri, loess, glacial drift, and Pennsylvanian sediments dominate the near-surface geology (figs. 3 and 4). At the end of glaciation, retreating ice sheets began to scour the previously dissected Pennsylvanian rocks. The resultant topography shows the combined effects of pre-glacial and post-glacial erosional processes (McQueen and Greene, 1938). In areas where the glacial till occupied previously cut valleys, the deposits can thicken to several hundred feet. These buried glacial drift valleys have been shown to provide an abundant source of ground water for local residents (Fuller and others, 1956; Fuller and others, 1957; Heim and others, 1959). The thickness of the glacial drift thins southward and is 50 ft (feet) or less in southern Caldwell and Clinton Counties in northwestern Missouri and in most of Audrain and Monroe Counties in northeastern Missouri. Most of the wells sampled in northwestern Missouri and four wells in northeastern Missouri were screened in glacial drift aquifers.

Extensive alluvial deposits of Holocene age are associated with major streams in the study area: the Grand, Nodaway, and Platte Rivers in northwestern Missouri; and the Fox, Mississippi, Salt, and Wyaconda Rivers in northeastern Missouri. These alluvial deposits can be a local source of rural domestic drinking water. Alluvium associated with the Grand and Mississippi Rivers can produce yields adequate for some municipal or irrigation supplies. Twenty-two alluvial wells were sampled in northwestern Missouri and 15 were sampled in northeastern Missouri.

Cyclic Pennsylvanian sediments of limestone, shale, sandstone, coal, and underclays thicken to the north and west coincident with the regional dip (McQueen and Greene, 1938). Wells completed in Pennsylvanian rocks are usually shallow, hand-dug wells lined with rocks or bricks. The small yields of these wells limit their use to domestic supply. Twenty-one of the wells sampled in northwestern Missouri were completed in Pennsylvanian rocks, and 25 of the wells sampled in northeastern Missouri were completed in Pennsylvanian rocks.

Mississippian rocks do not crop out in northwestern Missouri, but crop out extensively in northeastern Missouri. These rocks are cherty limestone, dolostone, and shale. Well-developed solution channels are common in the Burlington and Keokuk Limestones and provide a source of domestic water in northeastern Missouri (Imes, 1985). Wells completed in Mississippian formations were not sampled in northwestern Missouri, but were sampled in northeastern Missouri.

Rocks of Ordovician or Cambrian age do not crop out in northwestern or northeastern Missouri, but wells completed in these formations provide an important source of water for many residents in northeastern Missouri. A sequence of Lower Mississippian, Devonian, Silurian, and Upper Ordovician shale and limestone formations serves to separate the Ordovician and Cambrian formations from the overlying sediments. The Ordovician and Cambrian formations are composed of a series of permeable and semi-permeable sandstones and dolostones, some of which may yield water too highly mineralized to be suitable for drinking water (Imes, 1985). Twenty-four wells completed in the Ordovician and Cambrian formations were sampled in northeastern Missouri.

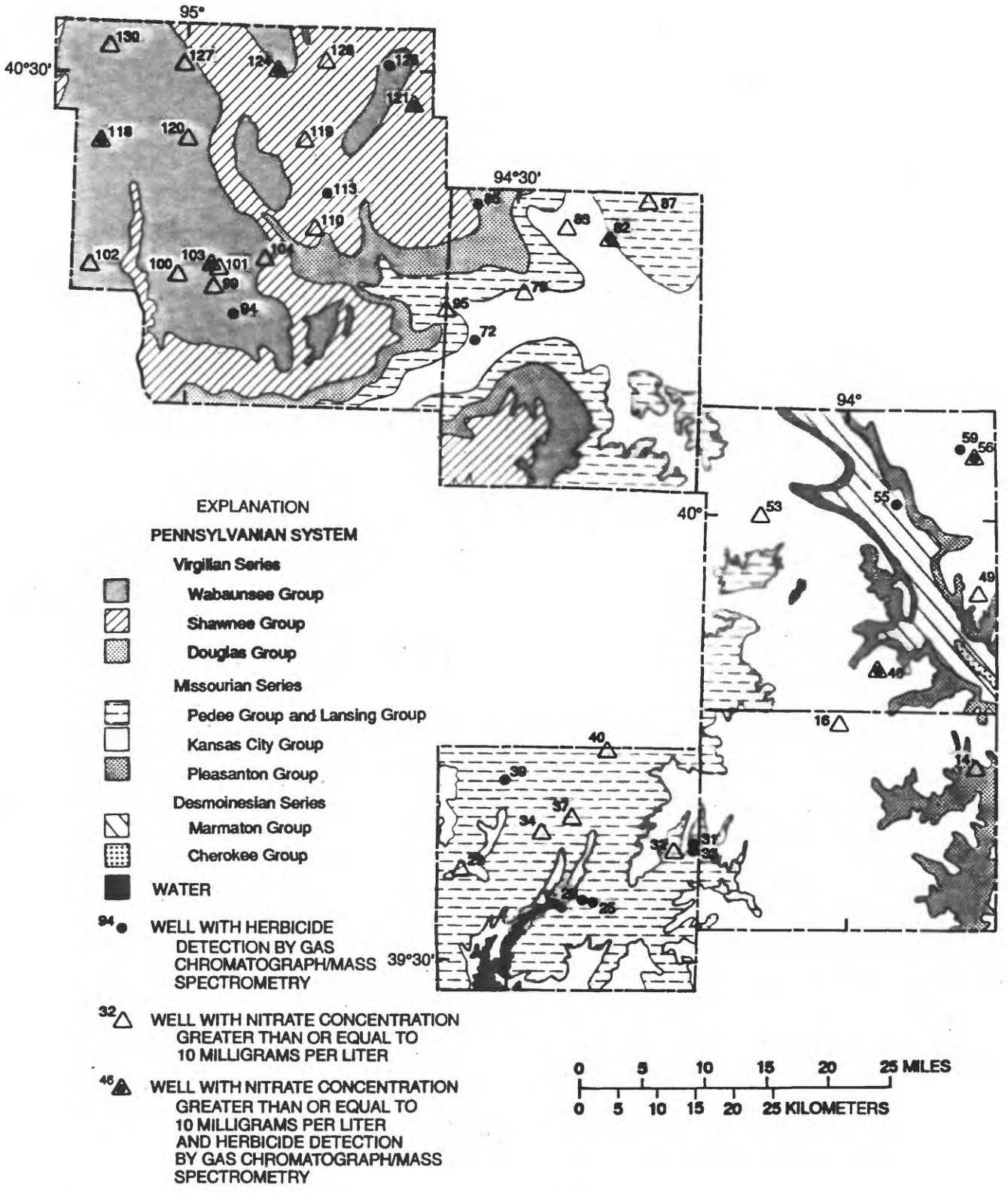

Figure 3. Geologic map of northwestern Missouri and location of wells with water samples that had detectable concentrations of herbicides or nitrite plus nitrate concentrations greater than or equal to 10 milligrams per liter (geology from Missouri Department of Natural Resources, 1979).

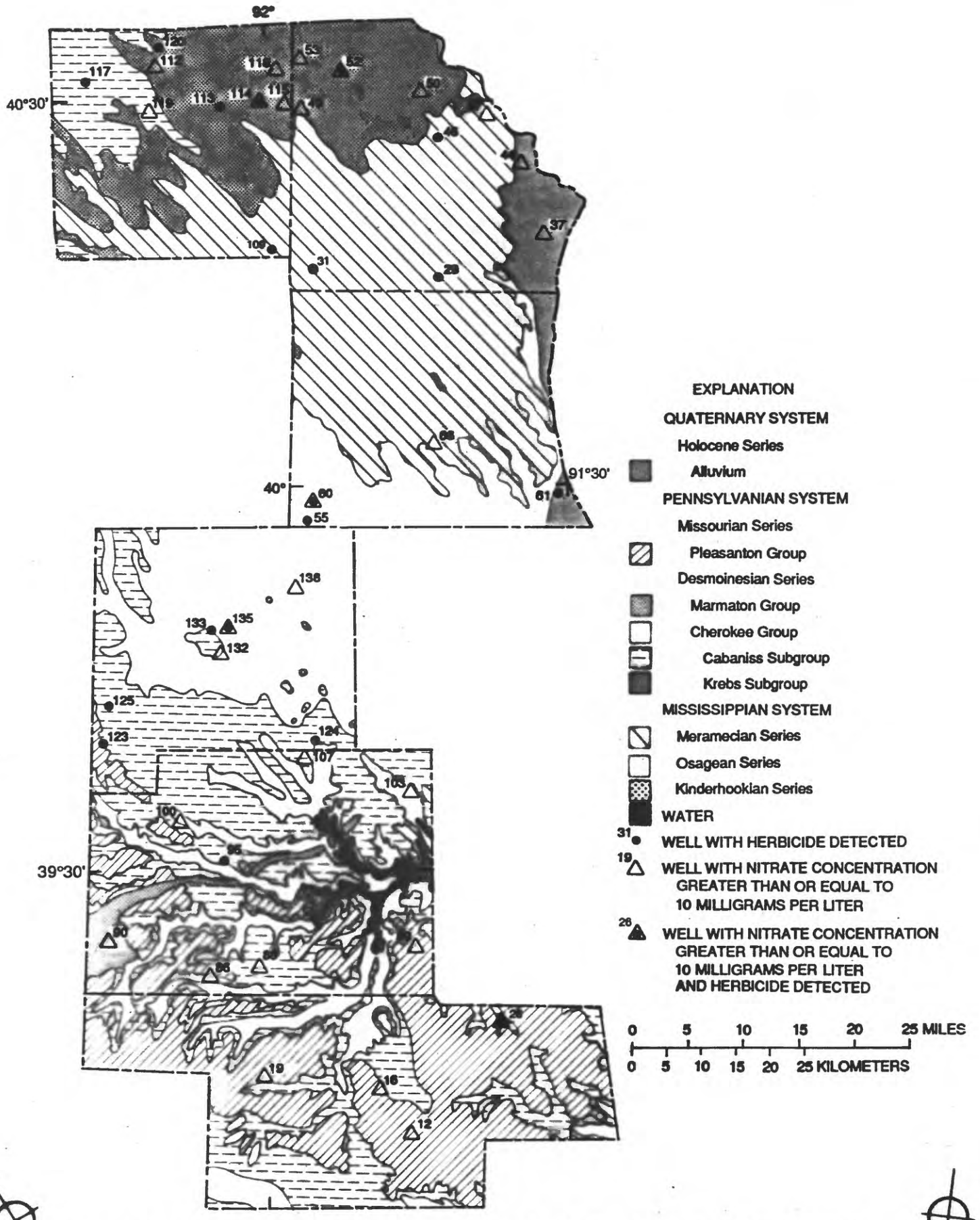

Figure 4. Geologic map of northeastern Missouri and location of wells with water samples that had detectable concentrations of herbicides or nitrite plus nitrate concentrations greater than or equal to 10 milligrams per liter (geology from Missouri Department of Natural Resources, 1979).

Previous Investigations

The geology of northern Missouri has been described by several authors. McQueen and Greene (1938) described the geology of northwestern Missouri. More general descriptions of northern Missouri geology with emphasis on Pennsylvanian stratigraphy are given by Hinds (1911) and Hinds and Greene (1915). A reconnaissance of the geology of Clark and Lewis Counties in northeastern Missouri is given by Noble (1956).

Gann and others (1971, 1973) described the water resources of northwestern and northeastern Missouri. Ground-water resource possibilities from the glacial drift for Daviess, Gentry, and Nodaway Counties in northwestern Missouri were listed in Fuller and others (1956), Fuller and others (1957), and Heim and others (1959). Emmett and Imes (1984) described the ground-water resources in Audrain County in northeastern Missouri. Imes (1985) described the ground-water flow in northern Missouri.

Although the occurrence of herbicides in the study area is unknown, several reports describe the occurrence of pesticides and nitrate in other parts of the State. Atrazine, atrazine degradation products (deisopropylatrazine and desethylatrazine), alachlor, and metolachlor have been the most frequently detected herbicides (Mesko and Carlson, 1988; Sievers and Fulhage, 1990; Ziegler and others, 1993; Ziegler and others, 1994). Nitrate concentrations have exceeded 10 mg/L (milligrams per liter), as nitrogen, in approximately 20 percent of the wells sampled in Missouri. Well distance from livestock feeding areas has been shown to be a significant factor in the occurrence of ground water with nitrate concentrations exceeding 10 mg/L in east-central Missouri (Sievers and Fulhage, 1990) and in west-central Missouri (Ziegler and others, 1994). Additionally, samples collected from wells in west-central Missouri indicate that most of the ground water shows enrichment of 15-N (nitrogen), which is consistent with animal-waste sources of nitrate (Wilkison, 1993).

SELECTION AND DESCRIPTION OF SAMPLING SITES

During 1991, wells were sampled in Caldwell, Clinton, Daviess, Gentry, and Nodaway Counties because the land use was considered representative of northwestern Missouri. The University of Missouri Extension office in each county provided a list of well owners in the county. Land-use questionnaires were mailed to these owners. Wells were selected for wide areal distribution by dividing each county into four sections of about equal area based on those well owners who responded to the questionnaire. Within each section, six wells were selected for sampling. Because a random sampling of domestic-drinking water was desired, wells were not excluded from sampling if chemicals were mixed near the well. In some areas, public-drinking water was available and no domestic wells were sampled. The sampled wells withdraw water from the alluvium, glacial drift, and Pennsylvanian rocks.

Data on selected well and land-use characteristics were collected for the wells sampled in northwestern Missouri (fig. 1 and table 1, at the back of this report). Where well depths could not be measured, information provided by the owners was used. Well depths were available for 106 of the 130 wells sampled in northwestern Missouri. Well depths ranged from 8.4 to 310 ft below land surface, with a mean depth of 47.7 ft. Water levels in the wells ranged from 1.7 to 68.2 ft below land surface with a mean of 15.2 ft for the 36 wells where levels were measured. Well diameter ranged from 1.5 to 96 in. (inches) with a mean of 31 in. Most of the sampled wells in northwestern Missouri were augered and cased with concrete tiles. Land-use data were provided by the well owners and checked onsite by personnel sampling the well.

During 1992, wells were sampled in Audrain, Clark, Lewis, Monroe, Scotland, and Shelby Counties because the land use was considered representative of northeastern Missouri. Wells were selected for sampling from a list of wells provided by the DOH. Sites were selected for sampling by dividing each county into four sections of about equal area. Within each section, six wells were selected for sampling. Only domestic wells were sampled. Because a random sampling was desired, wells were not excluded if chemicals were mixed near the well. In some areas, where public-drinking water was readily available, no wells were sampled. The sampled wells in northeastern Missouri withdraw water from alluvium, glacial drift, Pennsylvanian, Mississippian, and Ordovician rocks.

Data on selected well and land-use characteristics were collected for the wells sampled in northeastern Missouri (fig. 2 and table 2, at the back of this report). Well depths were provided by the owners. Well depths were available for 128 of the 147 wells sampled in northeastern Missouri. Well depths ranged from 12 to 740 ft below land surface, with a mean depth of 191 ft. Well diameter ranged from 1.5 to 144 in. with a mean of 17.1 in. Twenty-seven wells in the Pennsylvanian rocks were sampled in northeastern Missouri. In general, those wells in the Pennsylvanian rocks that had a diameter greater than 24 in. were hand dug and rock- or brick-lined. Land-use data were provided by the well owners and checked onsite by personnel sampling the well.

Methods

Ground-water samples were collected after purging the well for at least 10 minutes or until the water reached a constant temperature. The sample was collected directly from a spigot nearest the well without passing through any hoses, water treatment, or softening systems.

All samples were unfiltered. Water samples were collected in 1-liter glass bottles, chilled, and maintained at 4 °C (degrees Celsius) and analyzed for herbicides at the University of Iowa Hygienic Laboratory, Ames, Iowa. Samples were collected in 125-mL (milliliter) amber glass bottles, chilled, and maintained at 4 °C for duplicate herbicide analyses at a USGS laboratory. Subsamples from the 125-mL glass amber bottles were used for screening by enzyme-linked immunosorbent assay (ELISA) for the presence of triazine and Cl (chlorinated)-acetamide herbicides. Samples analyzed by the DOH for nitrite plus nitrate were collected in 125-mL glass amber bottles, preserved with sulfuric acid to inhibit bacterial growth, and chilled at 4 °C until analysis. Samples analyzed by the USGS for nitrite plus nitrate were collected in 250-mL brown polyethylene bottles, 1 mL of mercuric chloride was added to inhibit bacterial growth, and the samples were chilled at 4 °C until analysis. Samples for trace-element (arsenic, iron, and manganese) analyses were collected in 125-mL glass bottles and preserved with nitric acid.

In northwestern Missouri, all samples collected were screened for concentrations of triazine herbicides using ELISA. Thirty-nine samples were screened for concentrations of Cl-acetamide herbicides using ELISA. Results of the ELISA samples were quantified by comparison to standards using a differential photometer with a detection limit of 0.2 µg/L (microgram per liter; Goolsby and others, 1990). Thirty-nine triazine samples and 36 Cl-acetamide ELISA samples were quantified by comparison to standards using a magnetic-particle-based method with a detection limit of 0.05 µg/L (Rubio and others, 1991).

Water samples with detectable concentrations of herbicides by ELISA screenings in northwestern Missouri were shipped to the laboratory for additional analyses. Water samples were analyzed for herbicide concentrations at the University of Iowa Hygienic Laboratory. Duplicate herbicide analyses were performed at the USGS Research Laboratory in Lawrence, Kansas.

In northeastern Missouri, water samples were analyzed for concentrations of herbicides at the University of Iowa Hygienic Laboratory. Samples were not previously screened by ELISA methods. The detection and quantification limits for herbicide samples analyzed by the University of Iowa Hygienic Laboratory were reported to be 0.1 µg/L, although some samples had quantification levels of 0.2 µg/L. These variations were due to matrix effects of interfering compounds. Thirteen sample replicates were analyzed by the USGS National Water-Quality Laboratory in Arvada, Colorado. The detection and quantification limits for samples analyzed by the USGS laboratory was 0.05 µg/L for all herbicides, except cyanazine, which had a detection and quantification limit of 0.2 µg/L.

Unfiltered nitrite plus nitrate concentrations were analyzed by the USGS and DOH laboratories. Total recoverable arsenic, iron, and manganese concentrations in water samples were analyzed by the DOH laboratory.

Values of specific conductance, pH, and water temperature were determined in northwestern Missouri at the time of sampling. Specific conductance was measured using a portable conductivity meter with temperature compensation designed to express readings in microsiemens per centimeter at 25 °C. The potentiometric method was used to determine the pH value. The pH values were measured using a portable pH meter calibrated with standard buffers bracketing the sample pH value. Water temperature was measured using a mercury thermometer to the nearest 0.5 °C.

Quality Assurance/Quality Control Procedures

During 1991, 15 replicate samples (11.5 percent), 2 blind duplicate samples (1.5 percent), and 2 matrix spikes were analyzed for herbicides by gas chromatograph and mass spectrometer (GC/MS) methods (table 3, at the back of this report). Concentrations of herbicides were less than the detection limit in all but three replicate samples. The concentrations of herbicides in the replicate samples that had detectable herbicides were within 30 percent of each other, with the exception of well 113. Water in well 113 had an atrazine concentration of 0.12 µg/L as determined by the USGS laboratory but was less than the detection limit of 0.10 µg/L as determined by the University of Iowa Hygienic Laboratory. No herbicides were detected in either blind duplicate sample. Two samples were spiked in the field with 0.25 µg/L alachlor. Recovery of analytes from these matrix spikes were 40 and 52 percent. Thirty-nine (30 percent) sample splits were analyzed for herbicides using ELISA methods (table 4, at the back of this report).

During 1992, 13 replicate samples (9 percent), 13 blind duplicate samples (9 percent), and 2 matrix spikes (1.5 percent) were analyzed for herbicides (table 5, at the back of this report). The concentrations of herbicides in all replicate samples and all but one duplicate sample were within 20 percent of each other. Water in well 133 had alachlor concentrations of 0.28 and 0.32 µg/L and atrazine concentrations of 0.17 and 0.61 µg/L as determined by the University of Iowa Hygienic Laboratory. Two samples were spiked in the field with 2.5 µg/L atrazine. Recovery of the analyte from these matrix spikes was 88 and 96 percent.

HERBICIDES

During 1991, water samples from 130 wells in northwestern Missouri were analyzed for triazine and Cl-acetamide herbicide concentrations by ELISA (table 6, at the back of this report). Triazine herbicide concentrations were larger than the analytical detection limit in water samples from 27 wells (21 percent). Triazine concentrations ranged from less than 0.05 to 9.6 µg/L in the samples. The Cl-acetamide herbicide concentrations were larger than the analytical detection limit in 31 wells (24 percent) and concentrations ranged from less than 0.05 to 9.5 µg/L.

Water samples from 42 wells with detectable concentrations of triazine or Cl-acetamide herbicides and 37 wells with no detectable concentrations of triazine or Cl-acetamide herbicides, as determined by ELISA, were sent to laboratories for quantitative analysis of herbicides. One or more of the herbicides, alachlor, atrazine, cyanazine, metolachlor, metribuzin, and trifluralin, were detected at concentrations greater than or equal to 0.05 µg/L from the 79 water samples (table 6). Atrazine was the most frequently detected herbicide and was detected in samples from 16 wells (12.3 percent). Concentrations of atrazine in water samples ranged from 0.05 to 9.6 µg/L. Atrazine concentrations exceeded 3.0 µg/L in one sample. Four of 15 samples analyzed for atrazine degradation products had concentrations ranging from 0.05 to 0.12 µg/L. Alachlor was detected in water samples from six wells (4.6 percent) and concentrations ranged from 0.05 to 47 µg/L.

Wells sampled in northwestern Missouri that had detectable herbicide concentrations in samples had a mean well depth of 51.4 ft and a mean well diameter of 31.3 in. (table 7). Wells with no detectable concentrations in water samples had a mean well depth of 36.8 ft and a mean well diameter of 33.8 in. The percentage of row crops within a 0.25 mi (mile) radius of wells was 46.8 percent for both wells with detectable herbicide concentrations in water samples and for wells with no detectable concentration.

In July 1992, water samples from 147 wells in northeastern Missouri were sent to the University of Iowa Hygienic Laboratory for herbicide analysis (table 8, at the back of this report). Alachlor, atrazine, cyanazine, and metribuzin were detected at concentrations greater than 0.05 µg/L in water samples from 19 of the wells (13 percent). Atrazine was detected in water samples from 18 of the 19 wells with detectable herbicide concentrations. Atrazine concentrations exceeded 3.0 µg/L in well 55 in Lewis County and well 125 in Shelby County.

Wells sampled in northeastern Missouri that had detectable herbicide concentrations in water samples had a mean well depth of 58.9 ft and a mean well diameter of 32.2 in. (table 7). Wells that did not have detectable concentrations in the water had a mean well depth of 211 ft and a mean well diameter of 14.7 in. The percentage of row crops within a 0.25 mi radius of the well was 49.4 percent for those wells that had detectable herbicide concentrations in water samples and 51.2 percent for those wells that had no detectable concentrations.

NITRITE PLUS NITRATE

Nitrite plus nitrate, as nitrogen, concentrations in water samples from wells ranged from less than 0.05 to 63 mg/L (table 9, at the back of this report) in samples from 129 wells in northwestern Missouri in July 1991. The mean nitrite plus nitrate concentration in water samples from wells was 8.9 mg/L. Water samples from 31 wells (24 percent) had nitrite plus nitrate concentrations that were greater than or equal to the Missouri drinking-water supply criteria of 10 mg/L (Missouri Department of Natural Resources, 1992).

Water samples in northwestern Missouri that had nitrite plus nitrate concentrations greater than or equal to 10 mg/L had a mean well depth of 38.0 ft and a mean well diameter of 30.7 in. (table 10). Wells that had nitrite plus nitrate concentrations less than the detection limit of 0.05 mg/L had a mean depth of 72.7 ft and a mean diameter of 20.2 in.

In July 1992, nitrite plus nitrate concentrations in water samples from 144 wells in northeastern Missouri ranged from less than 0.05 to 60 mg/L (table 11, at the back of this report) with a mean concentration of 5.8 mg/L. The nitrite plus nitrate concentrations were greater than or equal to 10 mg/L in water samples from 28 wells (19 percent). Wells in northeastern Missouri that had nitrite plus nitrate concentrations greater than or equal to 10 mg/L had a mean well depth of 78.5 ft as compared to 237 ft for those wells that had nitrite plus nitrate concentrations less than the detection limit of 0.05 mg/L (table 10). The mean well diameter for wells with nitrite plus nitrate concentrations greater than or equal to 10 mg/L was 24.1 in. as compared to 7.8 in. for those wells that had nitrite plus nitrate concentrations less than 0.05 mg/L.

TRACE ELEMENTS AND PHYSICAL PROPERTIES

Samples of water from 130 wells in northwestern Missouri were analyzed for total recoverable arsenic, iron, and manganese concentrations during 1991 (table 9). Arsenic concentrations detected in water samples from all wells ranged from less than 5 to 9 µg/L. Total recoverable iron concentrations from samples collected ranged from less than 50 to 6,600 µg/L. Concentrations of iron in water samples from 23 wells were greater than 500 µg/L. Manganese concentrations in water samples exceeded 50 µg/L in 38 samples and ranged from less than 20 to 2,600 µg/L.

Table 7. Summary of herbicide detections and well and land-use data for wells sampled in northwestern and northeastern Missouri during 1991 and 1992

[GC/MS, gas chromatograph/mass spectrometry; ELISA, enzyme-linked immunosorbent assay; <, less than; >, greater than]

	Northwestern Missouri during 1991 (130 wells sampled)				Northeastern Missouri during 1992 (147 wells sampled)	
	Herbicides detected in water samples by GC/MS	Herbicides not detected in water samples by GC/MS	Herbicides detected in water samples by ELISA	Herbicides not detected in water samples by ELISA	Herbicides detected in water samples	Herbicides not detected in water samples
Number of wells	19	60	42	88	19	128
Range of well depths, in feet	13.9 - 200	8.4 - 80	12 - 200	8.4 - 310	12 - 220	15 - 740
Mean well depth, in feet (number of wells)[1]	51.4 (14)	36.8 (47)	41.3 (31)	50.7 (75)	58.9 (17)	211 (110)
Mean well diameter, in inches (number of wells)[2]	31.3 (17)	33.8 (46)	31.0 (34)	31.1 (76)	32.2 (15)	14.7 (92)
	Distance of well from chemical mixing area[3]					
Number of wells--<100 feet	3	9	10	5	2	4
Number of wells--100 feet-0.25 mile	7	16	11	23	2	19
Number of wells-->0.25 mile	5	20	11	39	11	82
Total	15	45	32	67	15	105
Percentage of land area in row crops within 0.25 mile	46.8	46.8	48.6	38.8	49.4	51.2

[1]Depth was not available for all wells.
[2]Diameter was not available for all wells.
[3]Distance from chemical mixing area was not available for all wells.

Water samples were analyzed for total recoverable iron and manganese concentrations from 144 wells in northeastern Missouri during 1992 (table 11). Concentrations of iron in water samples from wells were greater than 500 µg/L in samples from 51 wells and ranged from less than 50 to 22,100 µg/L. Manganese concentrations in water samples exceeded 50 µg/L in 43 samples and ranged from less than 20 to 3,020 µg/L.

In northwestern Missouri during 1991, specific conductance, pH, and water temperature were determined at time of sample collection (table 9). The specific conductance of water samples from 130 wells ranged from 173 to 2,590 µS/cm (microsiemens per centimeter at 25 °C) with a mean of a 737 µS/cm. The pH values of water samples from 26 wells ranged from 6.0 to 7.4. The water temperature of wells ranged from 12.5 to 24.5 °C for 103 samples and a mean temperature of 17.9 °C.

Table 10. Summary of nitrate concentrations and well and land-use data for wells sampled in northwestern and northeastern Missouri during 1991 and 1992

[N, nitrogen; <, less than; mg/L, milligrams per liter; ≥, greater than or equal to; >, greater than]

	Nitrate concentrations, as N					
	Northwestern Missouri during 1991 (129 wells sampled)			Northeastern Missouri during 1992 (144 wells sampled)		
	<0.05 mg/L	≥ 0.05 mg/L	≥10 mg/L	<0.05 mg/L	≥ 0.05 mg/L	≥10 mg/L
Number of wells	14	115	31	67	77	28
Range of well depths, in feet	19.6 - 300	8.4 - 310	9.4 - 85	12 - 740	14 - 690	14 - 600
Mean well depth, in feet (number of wells)[1]	72.7 (13)	44.2 (92)	38.0 (25)	237 (60)	152 (63)	78.5 (24)
Mean well diameter (number of wells)[2]	20.2 (12)	32.6 (97)	30.7 (27)	7.8 (49)	25.7 (55)	24.1 (20)
Distance of well from chemical mixing area[3]						
Number of wells--<100 feet	1	14	7	3	3	1
Number of wells--100 feet-0.25 mile	5	29	7	10	11	4
Number of wells-->0.25 mile	4	45	10	45	45	17
Total	10	91	24	58	59	22
Percentage of land area in row crops within 0.25 mile	35	43.2	44.0	46.7	55.1	53.7
Distance of well from feedlot[4]						
Number of wells--<100 feet	2	25	9	8	11	6
Number of wells--100 feet-0.25 mile	5	50	16	17	11	3
Number of wells-->0.25 mile	7	38	6	34	40	13
Total	14	113	31	59	62	22
Distance of well from septic system[5]						
Number of wells--<100 feet	3	11	3	1	9	6
Number of wells--100 feet-0.25 mile	9	77	22	42	32	11
Number of wells-->0.25 mile	0	9	2	3	0	0
Total	12	99	27	46	41	17

[1]Depth was not available for all wells.
[2]Diameter was not available for all wells.
[3]Distance from chemical mixing area was not available for all wells.
[4]Distance from feedlot was not available for all wells.
[5]Distance from septic system was not available for all wells.

SUMMARY

In July 1991 and 1992, water samples from wells in five counties (Caldwell, Clinton, Daviess, Gentry, and Nodaway) in northwestern Missouri and six counties (Audrain, Clark, Lewis, Monroe, Scotland, and Shelby) in northeastern Missouri were analyzed for concentrations of herbicides, nutrients, arsenic, iron, and manganese. Wells were sampled in northwestern Missouri during 1991 and in northeastern Missouri during 1992.

Concentrations of triazine herbicides were detected in 21 percent of the 130 wells sampled in northwestern Missouri during 1991 by ELISA methods. The concentrations of triazines ranged from less than 0.05 to 9.6 µg/L in water samples. Thirty-one percent of the water samples from the sampled wells had concentrations of Cl-acetamide herbicides larger than the detection limit using ELISA methods and concentrations ranged from less than 0.05 to 9.5 µg/L.

Of the 130 sampled wells, 42 wells with positive ELISA detections and 37 wells with no ELISA detections were analyzed for the presence of herbicides by GC/MS methods. One or more of the herbicides alachlor, atrazine, cyanazine, metolachlor, metribuzin, and trifluralin were detected in these samples at concentrations greater than or equal to 0.05 µg/L. Atrazine was the most frequently detected herbicide and the concentration of atrazine exceeded 3.0 µg/L in one sample. Alachlor was detected in water samples from six wells with concentrations that ranged from 0.05 to 47 µg/L. Wells that had herbicides detected in water samples had an average of 46.8 percent of land within a 0.25 mi radius of the well in row crops and wells that had no herbicides detected in water samples also had an average of 46.8 percent of land in row crops.

One or more of the herbicides alachlor, atrazine, cyanazine, and metribuzin were detected at concentrations greater than 0.05 µg/L in water samples from 19 of 147 wells sampled in northeastern Missouri during 1992. Atrazine was the most frequently detected herbicide and atrazine concentrations exceeded 3.0 µg/L in two samples. Shallower, larger diameter wells had more frequent detections of herbicides. The mean depth of wells with herbicides detected in the water was 58.9 ft compared to a mean depth of 211 ft for those wells which did not have herbicides detected in the water. The mean diameter for wells with herbicide detections was 32.2 in. and 14.7 in. for wells without herbicide detections. The percentage of row crops within a 0.25 mi radius was 49.4 percent for wells with herbicides detected and 51.2 percent for wells which did not have herbicides detected.

During 1991, nitrite plus nitrate concentrations exceeded 10 mg/L in water samples from 28 of 130 wells sampled in northwestern Missouri. The nitrite plus nitrate concentrations ranged from less than 0.05 to 63 mg/L with a mean concentration of 8.9 mg/L.

During 1992, nitrite plus nitrate concentrations exceeded 10 mg/L in water samples from 28 of 145 wells sampled. The nitrite plus nitrate concentrations ranged from less than 0.05 to 60 mg/L with a mean concentration of 5.8 mg/L.

Water samples from 130 wells in northwestern Missouri were analyzed for concentrations of arsenic, iron, and manganese during 1991. Arsenic was detected in water samples from two wells. Concentrations of iron exceeded 500 µg/L in water samples from 23 wells. Manganese concentrations in excess of 50 µg/L were detected in 38 samples.

During 1992, water from 144 wells in northeastern Missouri were sampled for iron and manganese. Iron concentrations exceeded 500 µg/L in 51 wells. Manganese concentrations exceeded 50 µg/L in 43 samples.

REFERENCES CITED

Emmett, L.F., and Imes, J.L., 1984, Ground-water resources of Audrain County: U.S. Geological Survey Open-File Report 84-245, 55 p.

Fuller, D.L., McMillen, J.R., Pick, H., and Russell, W.B., 1957, Water possibilities from the glacial drift of Daviess County: Rolla, Missouri Division of Geology and Land Survey Water Resources Report 9, 13 p.

Fuller, D.L., McMillen, J.R., Pick, H., Russell, W.B., and Wells, J.S., 1956, Water possibilities from the glacial drift of Gentry County: Rolla, Missouri Division of Geology and Land Survey Water Resources Report 7, 10 p.

Gann, E.E., Harvey, E.J., Barks, J.H., and Fuller, D.L., 1973, Water resources of northwestern Missouri: U.S. Geological Survey Hydrologic Investigations Atlas HA-444, 4 sheets.

Gann, E.E., Harvey, E.J., Jeffery, H.G., and Fuller, D.L., 1971, Water resources of northeastern Missouri: U.S. Geological Survey Hydrologic Investigations Atlas HA-372, 4 sheets.

Goolsby, D.A., Thurman, E.M., Clark, M.L., and Pomes, M.L., 1990, Immunoassay as a screening tool for triazine herbicides in streams, in Vanderlaan, M., and others, eds., Immunoassays for Trace Chemical Analysis: Monitoring Toxic Chemicals in Humans, Food, and the Environment, ACS Symposium Series 451, American Chemical Society, Washington, D.C., p. 86-99.

Heim, G.E., Martin, J.A., and Howe, W.B., 1959, Groundwater resources of Nodaway County, Missouri: Rolla, Missouri Division of Geology and Land Survey Water Resources Report 16, 26 p.

Hinds, H., 1911, The coal deposits of Missouri: Rolla, Missouri Division of Geology and Land Survey, 2nd ser., v. 11, 503 p.

Hinds, H., and Greene, F.C., 1915, The stratigraphy of the Pennsylvanian series in Missouri: Rolla, Missouri Division of Geology and Land Survey, 2nd ser., v. 13, 407 p.

Imes, J.L., 1985, The ground-water flow system in northern Missouri with emphasis on the Cambrian-Ordovician aquifer: U.S. Geological Survey Professional Paper 1305, 61 p.

Mesko, T.O., and Carlson, G.M., 1988, Occurrence of pesticides, nitrate, volatile organic compounds, and trace elements in ground water and streams, southeastern Missouri, 1986-87: U.S. Geological Survey Open-File Report 88-495, 73 p.

Missouri Department of Agriculture, 1991, Missouri farm facts: Jefferson City, 67 p.

Missouri Department of Natural Resources, 1979, Geologic map of Missouri: Rolla, Missouri Division of Geology and Land Survey, 1 sheet, scale 1:500,000.

_____ 1992, Missouri water quality standards--Chapter 7, Water quality: Jefferson City, Clean Water Commission, 100 p.

McQueen, H.S., and Greene, F.C., 1938, The geology of northwestern Missouri: Rolla, Missouri Division of Geology and Land Survey, 2nd ser., v. 25, 217 p.

Noble, J.E., 1956, A limited geologic reconnaissance of Clark and Lewis Counties, Missouri: University of Missouri-Rolla, unpublished M.S. thesis, 80 p.

Rubio, F.M., Itak, J.A., Scutellaro, A.M., Selisker, M.Y., and Herzog, D.P., 1991, Performance characteristics of a novel magnetic particle based ELISA for the quantitative analysis of atrazine and related triazines in water samples: Food and Agricultural Immunology, v. 3, p. 113-125.

Sievers, D.M., and Fulhage, C.D., 1990, Survey of rural wells in Missouri--Region I sampling, in Proceedings of Agricultural Impacts on Ground Water Quality: Kansas City, Mo., National Water Well Association Cluster of Conferences, 15 p.

Smith, G.S., and Fairchild, M., 1990, Pesticide use survey in Missouri field crops--1989: University of Missouri-Columbia, M-141, 40 p.

Wilkison, D.H., 1993, Source and extent of nitrate, atrazine, and related triazine herbicides in shallow wells west-central Missouri: University of Missouri-Kansas City, unpublished M.S. thesis, 93 p.

Ziegler, A.C., Wallace, W.C., Blevins, D.W., and Maley, R.D., 1993, Occurrence of pesticides, nitrite plus nitrate, arsenic, and iron in two reaches of the Missouri River alluvium, northwestern Missouri--July 1988 and June-July 1989: U.S. Geological Survey Open-File Report 93-101, 30 p.

Ziegler, A.C., Wilkison, D.H., and Maley, R.D., 1994, Occurrence of pesticides, nutrients and nitrogen isotopes, radionuclides, selected trace elements, and physical properties in west-central Missouri--July 1990-March 1991: U.S. Geological Survey Open-File Report 93-362, 71 p.

-PAGE 18 FOLLOWS-

SUPPLEMENTAL DATA

Table 1. Location, description, and selected land-use data for wells sampled in northwestern Missouri during 1991

[Geologic unit indicates formation(s) in which well is completed; --, indicates value not determined]

Well number (fig. 1)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Water level depth below land surface (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Caldwell County						
1	393200 0940312	07-15-91	Glacial drift	54.0	--	48	C	25	C	B
2	393315 0935322	07-15-91	Missourian	25.0	--	30	--	0	B	A
3	393317 0940101	07-15-91	Glacial drift	9.0	--	72	--	40	B	B
4	393540 0940431	07-15-91	Glacial drift	68.0	--	36	A	50	A	B
5	393554 0935301	07-15-91	Glacial drift	15.0	--	--	--	80	C	B
6	393644 0934741	07-15-91	Glacial drift	50.0	--	30	C	--	A	B
7	393644 0940628	07-15-91	Glacial drift	29.0	--	36	B	75	C	B
8	393916 0940620	07-15-91	Glacial drift	12.5	4.0	30	--	0	C	C
9	394016 0935822	07-16-91	Glacial drift	--	--	--	--	50	C	--
10	394038 0934714	07-15-91	Glacial drift	29.8	6.6	36	B	50	B	B
11	394104 0935319	07-15-91	Glacial drift	--	--	--	--	60	C	--
12	394104 0935336	07-15-91	Glacial drift	25.0	--	6	--	40	C	B
13	394248 0940725	07-16-91	Glacial drift	55.0	--	36	B	10	C	B
14	394312 0934751	07-15-91	Glacial drift	17.0	--	48	--	25	B	B
15	394332 0935536	07-16-91	Glacial drift	43.8	20.9	48	B	75	C	--
16	394617 0940013	07-16-91	Missourian	15.0	--	48	C	75	B	--
				Clinton County						
17	392852 0941344	07-16-91	Missourian	35.0	--	30	C	0	C	B
18	392852 0941409	07-16-91	Missourian	--	--	--	B	25	B	B
19	392922 0941407	07-16-91	Missourian	110	--	8	--	10	A	B
20	392931 0942543	07-16-91	Glacial drift	27.0	--	48	C	10	B	B
21	392955 0941739	07-16-91	Missourian	15.0	--	48	C	0	B	B
22	393141 0941946	07-16-91	Glacial drift	65.0	--	30	C	20	B	B
23	393148 0943233	07-16-91	Glacial drift	90.0	--	6	B	10	C	B
24	393254 0941440	07-16-91	Glacial drift	72.0	--	36	A	25	C	B
25	393330 0942233	07-16-91	Glacial drift	85.0	--	8	A	80	C	B
26	393341 0942332	07-16-91	Glacial drift	14.0	--	72	A	90	B	B
27	393345 0942309	07-16-91	Glacial drift	90.0	--	8	C	90	B	A
28	393522 0942452	07-16-91	Glacial drift	55.0	--	30	C	0	C	A
29	393556 0943437	07-15-91	Glacial drift	20.0	--	36	--	75	C	B
30	393608 0941404	07-16-91	Glacial drift	--	--	36	--	0	B	--
31	393715 0941225	07-16-91	Glacial drift	--	--	18	--	0	C	B

Table 1. Location, description, and selected land-use data for wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Water level depth below land surface (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Clinton County--Continued						
32	393718 0941503	07-16-91	Glacial drift	68.0	--	--	A	40	A	--
33	393746 0941225	07-16-91	Glacial drift	--	--	12	--	60	C	C
34	393833 0942717	07-15-91	Glacial drift	40.0	--	24	--	25	B	B
35	393850 0943121	07-15-91	Alluvium	25.0	--	18	B	50	B	C
36	393926 0942410	07-15-91	Glacial drift	70.0	--	36	C	10	B	B
37	393937 0942430	07-15-91	Glacial drift	--	--	24	--	25	B	B
38	394102 0942113	07-15-91	Glacial drift	40.0	--	30	B	75	A	B
39	394205 0943043	07-15-91	Glacial drift	--	--	--	--	80	B	A
40	394422 0942123	07-15-91	Glacial drift	85.0	--	12	C	0	B	A
				Daviess County						
41	394744 0935325	07-16-91	Missourian	20.0	13.7	48	B	0	C	B
42	394745 0940628	07-15-91	Alluvium	22.5	1.7	72	B	50	B	B
43	394750 0935748	07-16-91	Glacial drift	31.3	4.8	18	C	50	B	B
44	394855 0935007	07-15-91	Missourian	8.4	2.2	96	C	25	C	B
45	394948 0935412	07-16-91	Missourian	95.0	--	5	A	50	A	A
46	394953 0935648	07-16-91	Missourian	25.1	6.6	48	B	95	C	B
47	395112 0940016	07-16-91	Missourian	19.6	9.0	--	B	50	C	A
48	395310 0940958	07-15-91	Alluvium	13.0	5.1	72	B	50	B	B
49	395524 0934747	07-15-91	Glacial drift	9.4	2.5	36	C	75	A	B
50	395704 0940840	07-15-91	Missourian	19.8	5.3	60	C	75	C	B
51	395759 0935120	07-16-91	Missourian	13.9	8.7	48	C	50	B	B
52	395834 0940405	07-16-91	Missourian	14.0	2.2	72	B	75	A	A
53	400057 0940743	07-16-91	Missourian	34.2	31.6	72	A	0	B	B
54	400108 0934805	07-15-91	Glacial drift	--	--	--	--	50	B	B
55	400134 0935513	07-16-91	Glacial drift	200	68.2	12	B	75	B	--
56	400445 0934812	07-16-91	Glacial drift	32.4	17.5	36	C	60	B	B
57	400452 0940233	07-16-91	Glacial drift	135	--	6	B	0	A	B
58	400524 0935529	07-16-91	Glacial drift	--	--	--	--	90	A	--
59	400525 0934930	07-16-91	Glacial drift	18.7	9.2	48	A	0	A	B
60	400556 0940740	07-16-91	Missourian	21.0	--	2	C	90	C	B
				Gentry County						
61	400218 0941831	07-10-91	Missourian	75.0	--	32	C	75	C	B
62	400238 0941555	07-10-91	Missourian	25.0	--	18	C	25	B	B
63	400238 0942843	07-09-91	Glacial drift	--	--	12	C	0	A	B
64	400256 0941521	07-10-91	Missourian	35.0	--	36	C	50	C	A

Table 1. Location, description, and selected land-use data for wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Water level depth below land surface (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Gentry County--Continued						
65	400436 0942622	07-10-91	Glacial drift	60.0	--	--	B	25	B	B
66	400546 0941922	07-10-91	Missourian	60.0	--	36	C	50	C	--
67	400736 0943131	07-09-91	Missourian	--	--	--	--	80	B	B
68	400821 0943133	07-09-91	Glacial drift	35.0	--	12	--	25	A	B
69	400842 0942312	07-10-91	Glacial drift	53.0	--	12	C	25	A	B
70	401124 0942848	07-09-91	Glacial drift	44.0	--	30	B	20	B	B
71	401213 0941942	07-09-91	Glacial drift	90.0	35.0	6	C	0	A	B
72	401249 0943407	07-10-91	Glacial drift	61.3	10.2	36	C	75	C	B
73	401302 0943005	07-09-91	Glacial drift	310	--	6	C	0	C	--
74	401331 0943406	07-10-91	Glacial drift	15.7	9.6	96	C	0	B	B
75	401346 0943353	07-10-91	Glacial drift	57.7	52.7	36	C	25	A	A
76	401428 0942542	07-10-91	Glacial drift	300	--	4	--	25	B	B
77	401430 0942541	07-10-91	Glacial drift	60.0	--	36	C	10	C	--
78	401539 0943215	07-10-91	Glacial drift	38.3	2.0	24	--	0	B	B
79	401616 0942942	07-10-91	Alluvium	35.0	--	4	A	50	B	B
80	401738 0941901	07-15-91	Glacial drift	125	--	2	C	10	C	--
81	401754 0943253	07-10-91	Glacial drift	--	--	--	--	75	C	B
82	402002 0942148	07-10-91	Alluvium	--	--	--	--	80	A	--
83	402054 0942544	07-10-91	Alluvium	32.0	--	12	--	30	C	B
84	402210 0941343	07-15-91	Glacial drift	70.0	--	9	C	10	C	--
85	402226 0943401	07-15-91	Glacial drift	30.0	--	24	B	40	C	--
86	402226 0943521	07-15-91	Alluvium	--	--	--	--	75	B	--
87	402248 0941820	07-15-91	Glacial drift	20.0	--	15	C	0	B	B
				Nodaway County						
88	400831 0945427	07-09-91	Glacial drift	20.0	--	96	C	75	C	B
89	400922 0944220	07-09-91	Glacial drift	20.0	--	18	--	40	B	--
90	401012 0950136	07-09-91	Alluvium	--	--	--	C	75	C	C
91	401046 0945932	07-09-91	Alluvium	50.0	--	24	C	75	C	B
92	401222 0945427	07-09-91	Glacial drift	35.0	--	36	B	75	C	B
93	401308 0950325	07-08-91	Glacial drift	41.8	10.6	18	C	50	B	B
94	401426 0945620	07-09-91	Glacial drift	35.0	--	20	C	50	C	B
95	401505 0943648	07-08-91	Glacial drift	30.0	--	12	B	80	A	C
96	401505 0943648	07-08-91	Glacial drift	50	--	48	B	80	A	C
97	401530 0944401	07-09-91	Glacial drift	--	--	30	--	40	B	B

Table 1. Location, description, and selected land-use data for wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Water level depth below land surface (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Nodaway County--Continued						
98	401532 0944325	07-09-91	Alluvium	--	--	--	--	40	B	B
99	401632 0945817	07-09-91	Glacial drift	51.6	16.9	12	A	75	C	B
100	401722 0950134	07-08-91	Glacial drift	55.0	--	36	C	50	B	B
101	401749 0945751	07-09-91	Glacial drift	--	--	--	--	25	B	--
102	401756 0950934	07-18-91	Glacial drift	30.0	--	24	C	50	C	B
103	401805 0945111	07-09-91	Glacial drift	--	--	72	B	0	B	B
104	401831 0945338	07-08-91	Glacial drift	27.4	3.3	48	B	50	A	B
105	401838 0944404	07-08-91	Glacial drift	40.0	--	42	C	30	A	B
106	401854 0944013	07-08-91	Glacial drift	30.0	--	36	C	50	A	C
107	401900 0945008	07-09-91	Alluvium	12.0	--	8	C	60	C	A
108	401934 0944412	07-08-91	Glacial drift	35.0	--	24	B	20	B	C
109	401940 0950608	07-08-91	Alluvium	60.0	--	15	A	30	A	B
110	402044 0944908	07-09-91	Alluvium	45.2	16.1	42	A	40	A	B
111	402148 0945952	07-08-91	Glacial drift	30.0	--	60	C	10	B	B
112	402222 0950609	07-08-91	Alluvium	--	--	18	C	80	C	B
113	402304 0944759	07-08-91	Glacial drift	31.7	5.4	24	B	25	B	B
114	402306 0944759	07-08-91	Glacial drift	44.3	6.8	30	B	25	B	B
115	402340 0944100	07-09-91	Alluvium	19.4	6.3	24	B	75	B	C
116	402402 0944220	07-09-91	Glacial drift	26.0	--	1.5	C	75	C	B
117	402410 0944851	07-08-91	Alluvium	20.9	7.1	30	--	40	B	--
118	402632 0950841	07-08-91	Glacial drift	80	--	18	B	20	B	A
119	402654 0945010	07-09-91	Alluvium	30	--	24	A	75	A	B
120	402657 0950049	07-08-91	Glacial drift	32	--	36	C	20	B	B
121	402916 0944005	07-09-91	Alluvium	17.7	3.8	24	B	30	B	B
122	402927 0950152	07-09-91	Alluvium	28.0	--	--	A	90	B	B
123	403031 0950733	07-09-91	Alluvium	--	--	--	C	20	B	B
124	403136 0945244	07-09-91	Glacial drift	39.3	11.3	24	C	0	A	B
125	403152 0944818	07-09-91	Glacial drift	42.3	--	36	B	33	B	B
126	403203 0944222	07-09-91	Glacial drift	50.0	10.0	36	C	30	B	B
127	403210 0950120	07-09-91	Alluvium	--	--	24	A	60	B	A
128	403222 0944818	07-09-91	Glacial drift	--	--	--	B	95	B	C
129	403238 0944952	07-09-91	Alluvium	26.3	8.6	6	B	80	B	A
130	403321 0950809	07-09-91	Alluvium	80.0	--	18	C	40	A	B

[1]A, distance less than 100 feet; B, distance 100 feet-0.25 mile; C, distance greater than 0.25 mile.

Table 2. Location, description, and selected land-use data for wells sampled in northeastern Missouri during 1992

[Geologic unit indicates formation(s) in which well is completed; --, indicates value not determined]

Well number (fig. 2)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Audrain County					
1	390411 0915633	07-14-92	Ordovician	740	8	--	90	--	--
2	390524 0914238	07-13-92	Ordovician	650	6	C	15	C	B
3	390555 0914905	07-13-92	--	165	6	--	60	--	B
4	390603 0920530	07-14-92	Glacial drift	20	48	C	90	B	A
5	390637 0915827	07-14-92	Ordovician	325	6	C	60	C	--
6	390644 0920027	07-14-92	Ordovician	320	6	B	75	C	B
7	390805 0913933	07-13-92	Ordovician	590	--	C	90	--	--
8	390845 0920455	07-14-92	--	50	16	C	15	B	A
9	390851 0920457	07-14-92	--	175	6	C	15	A	B
10	390858 0920456	07-14-92	--	--	6	C	15	C	B
11	390922 0913218	07-13-92	Ordovician	500	6	C	80	A	B
12	390946 0914550	07-13-92	Glacial drift	20	36	C	90	C	A
13	391126 0913936	07-13-92	--	270	--	C	60	C	B
14	391154 0912605	07-13-92	Ordovician	640	6	C	80	B	B
15	391244 0912605	07-13-92	Ordovician	600	6	C	90	A	B
16	391316 0914857	07-13-92	Glacial drift	25	24	C	90	C	A
17	391322 0913715	07-13-92	--	--	6	C	80	C	--
18	391401 0913249	07-13-92	Ordovician	460	6	C	50	A	--
19	391422 0920042	07-14-92	Glacial drift	28	--	--	80	A	B
20	391455 0914309	07-13-92	Ordovician	690	9	C	80	B	B
21	391456 0914309	07-13-92	Ordovician	650	6	--	50	C	B
22	391537 0915133	07-13-92	Ordovician	590	6	C	60	C	--
23	391631 0912828	07-13-92	Ordovician	500	6	C	80	B	B
24	391708 0920758	07-14-92	Ordovician	630	6	C	60	--	--
25	391721 0915707	07-14-92	Ordovician	600	8	B	60	C	--
26	391815 0913635	07-13-92	--	27	--	B	80	B	--
27	391840 0920132	07-14-92	St. Peter	475	6	C	80	C	B
28	391915 0921623	07-14-92	--	200	6	C	50	B	--
				Clark County					
29	401623 0914158	07-07-92	Cherokee	35	24	C	50	C	--
30	401637 0914101	07-07-92	Cherokee	25	72	B	--	C	A
31	401657 0915528	07-07-92	Mississippian	167	6	C	80	C	--
32	401728 0914245	07-07-92	Ordovician	345	6	C	40	C	B
33	401735 0915600	07-07-92	Mississippian	137	6	C	25	B	--

Table 2. Location, description, and selected land-use data for wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Clark County--Continued					
34	401737 0913645	07-06-92	Alluvium	15	2	C	100	C	B
35	401826 0914339	07-07-92	Alluvium	65	--	C	0	C	--
36	401837 0914339	07-07-92	--	--	--	--	--	--	--
37	401953 0913111	07-06-92	Alluvium	18	2	B	60	C	--
38	402030 0913420	07-06-92	Alluvium	--	--	C	90	C	--
39	402102 0913654	07-06-92	Ordovician	319	6	C	100	B	B
40	402228 0914002	07-06-92	Cherokee	30	36	C	80	C	--
41	402318 0913219	07-07-92	Alluvium	30	1.5	--	90	C	--
42	402325 0914820	07-06-92	Ordovician	480	8	B	25	C	B
43	402344 0915110	07-07-92	Mississippian	200	6	C	35	B	B
44	402527 0913325	07-07-92	Alluvium	50	2	C	100	C	B
45	402708 0915308	07-06-92	Cherokee	20	36	C	0	B	--
46	402720 0914148	07-07-92	--	--	--	--	--	--	--
47	402921 0913650	07-07-92	Glacial drift	180	72	C	10	C	B
48	402921 0913650	07-07-92	Alluvium	25	6	C	10	C	A
49	402952 0915600	07-06-92	Cherokee	45	24	C	10	A	B
50	403104 0914333	07-06-92	Cherokee	35	36	C	60	B	B
51	403241 0914752	07-06-92	Cherokee	28	24	--	10	B	--
52	403241 0915140	07-06-92	Cherokee	65	36	C	20	C	--
53	403349 0915600	07-06-92	Cherokee	50	--	C	70	C	--
54	403355 0914137	07-06-92	Alluvium	--	--	C	20	C	--
				Lewis County					
55	395735 0915543	07-06-92	Alluvium	12	1.5	A	95	C	B
56	395738 0912835	07-06-92	Alluvium	35	2	C	80	C	C
57	395748 0913546	07-06-92	Meramecian	115	6	B	60	--	C
58	395750 0913445	07-06-92	Meramecian	100	6	A	80	C	B
59	395824 0914815	07-06-92	Meramecian	140	6	C	40	C	--
60	395905 0915500	07-06-92	--	--	--	--	80	--	--
61	395925 0913005	07-06-92	Alluvium	14	2	A	60	C	B
62	400029 0913921	07-06-92	Alluvium	60	--	C	80	B	B
63	400045 0913120	07-06-92	Alluvium	--	--	--	40	C	B
64	400119 0914906	07-06-92	Mississippian	135	5	--	60	--	B
65	400230 0913713	07-06-92	Meramecian	160	6	C	20	C	B
66	400333 0914237	07-06-92	Mississippian	65	--	C	100	C	B
67	400402 0915534	07-07-92	Meramecian	145	--	C	20	B	B

Table 2. Location, description, and selected land-use data for wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Lewis County--Continued					
68	400403 0915548	07-07-92	Meramecian	268	--	B	70	C	B
69	400422 0915522	07-06-92	Mississippian	150	6	C	95	B	B
70	400439 0915600	07-06-92	Mississippian	150	6	B	80	C	B
71	400446 0913836	07-06-92	Mississippian	250	6	C	50	C	--
72	400611 0913457	07-07-92	--	--	6	C	50	C	B
73	400646 0914418	07-07-92	Mississippian	150	--	B	--	C	--
74	400648 0913101	07-07-92	Alluvium	118	6.25	B	40	C	B
75	400655 0915315	07-07-92	Ordovician	400	6	C	25	C	B
76	400721 0915522	07-07-92	Mississippian	242	--	C	--	C	--
77	400752 0914608	07-07-92	Mississippian	188	--	C	50	C	--
78	400836 0914715	07-07-92	Mississippian	200	6	--	40	--	--
79	400855 0913914	07-07-92	Mississippian	140	--	B	40	C	B
80	401153 0914341	07-07-92	Mississippian	187	6	C	50	C	B
81	401312 0913558	07-07-92	Mississippian	195	6	C	60	C	--
82	401345 0915209	07-07-92	Mississippian	--	--	C	0	C	--
				Monroe County					
83	392124 0915813	07-13-92	Mississippian	150	--	C	30	A	B
84	392151 0915317	07-13-92	Mississippian	350	8	C	40	B	--
85	392157 0914609	07-13-92	Ordovician	690	6	C	80	C	B
86	392218 0920610	07-13-92	--	40	48	--	40	--	--
87	392228 0921121	07-13-92	Mississippian	199	6	C	50	C	--
88	392258 0920110	07-23-92	Mississippian	110	6	C	70	A	B
89	392422 0914512	07-13-92	Ordovician	600	6	C	50	A	B
90	392506 0921619	07-13-92	--	--	--	B	40	B	A
91	392530 0915335	07-13-92	--	--	--	--	80	C	--
92	392804 0920801	07-14-92	Mississippian	212	--	C	80	C	B
93	392940 0920430	07-14-92	--	--	--	A	60	B	B
94	393046 0915348	07-14-92	Mississippian	200	--	C	40	C	B
95	393116 0920430	07-13-92	Cherokee	25	36	--	20	--	--
96	393157 0920330	07-14-92	Mississippian	150	--	C	20	B	--
97	393213 0914717	07-14-92	Mississippian	340	--	C	40	C	B
98	393333 0914829	07-14-92	Mississippian	192	--	--	70	C	B
99	393358 0915944	07-13-92	Mississippian	151	--	B	80	--	--
100	393425 0920859	07-13-92	--	--	--	A	80	A	B
101	393444 0915250	07-14-92	Mississippian	120	--	C	0	C	--

Table 2. Location, description, and selected land-use data for wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Monroe County--Continued					
102	393628 0920242	07-13-92	Mississippian	160	6	B	20	B	B
103	393630 0914524	07-14-92	--	--	6	--	30	--	--
104	393634 0920854	07-13-92	Mississippian	186	--	C	90	C	B
105	393833 0914802	07-14-92	Mississippian	--	--	B	70	A	--
106	393858 0920457	07-13-92	--	--	--	--	--	--	--
107	393918 0915614	07-14-92	Ordovician	400	--	B	10	--	--
				Scotland County					
108	401836 0915817	07-07-92	Meramecian	28	42	--	20	--	--
109	401846 0915901	07-07-92	Meramecian	24	30	B	25	B	B
110	402315 0920226	07-07-92	Mississippian	200	12	C	--	--	B
111	402530 0915842	07-07-92	Cherokee	--	36	--	--	C	B
112	402942 0921141	07-08-92	Cherokee	30	36	C	50	C	A
113	402953 0920415	07-06-92	Cherokee	20	96	C	20	B	B
114	403018 0920011	07-06-92	Cherokee	50	12	C	60	A	B
115	403020 0915734	07-06-92	Cherokee	40	18	C	10	C	B
116	403151 0921806	07-06-92	Cherokee	24	36	C	20	A	A
117	403151 0921806	07-06-92	Cherokee	30	144	C	20	A	B
118	403255 0915830	07-06-92	Cherokee	30	36	--	--	--	--
119	403310 0921057	07-06-92	Cherokee	20	36	C	40	C	A
120	403315 0921050	07-06-92	Cherokee	28	30	C	60	C	B
121	403337 0915712	07-06-92	Cherokee	28	48	C	15	B	B
122	403537 0915711	07-06-92	Cherokee	24	36	--	--	--	--
				Shelby County					
123	394022 0921645	07-14-92	Mississippian	180	6	C	60	--	--
124	394027 0915508	07-15-92	Cherokee	60	18	C	50	C	--
125	394312 0921611	07-14-92	Mississippian	220	6	C	60	C	--
126	394407 0915233	07-14-92	Cherokee	38	36	C	30	C	--
127	394611 0915233	07-15-92	Cherokee	50	12	C	30	A	--
128	394612 0915503	07-15-92	Mississippian	180	6	A	30	C	C
129	394650 0920815	07-14-92	--	75	6	--	60	C	--
130	394651 0920815	07-14-92	Ordovician	550	6	--	60	C	--
131	394658 0920557	07-14-92	Mississippian	130	6	B	70	B	B
132	394725 0920445	07-14-92	--	32	36	C	30	C	--
133	394911 0920535	07-14-92	Cherokee	30	36	C	60	C	B
134	394919 0920356	07-14-92	Mississippian	120	--	--	70	--	--

Table 2. Location, description, and selected land-use data for wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Latitude-longitude	Date sampled	Geologic unit	Depth of well (feet)	Well diameter (inches)	Distance from chemical mixing area[1]	Percentage row crop within 0.25 mile	Distance from feedlot[1]	Distance from septic system[1]
				Shelby County--Continued					
135	394919 0920356	07-14-92	Cherokee	14	36	--	--	--	--
136	395112 0920933	07-14-92	Mississippian	100	6	C	30	B	B
137	395113 0915526	07-13-92	Mississippian	132	6	C	25	A	B
138	395234 0915659	07-13-92	Mississippian	110	6	C	25	C	--
139	395332 0921638	07-13-92	Mississippian	240	6	B	30	C	B
140	395353 0915837	07-13-92	Mississippian	87	--	C	60	C	B
141	395435 0921150	07-13-92	--	120	6	C	40	B	B
142	395437 0920625	07-13-92	Mississippian	155	6	C	30	B	B
143	395437 0921142	07-13-92	Mississippian	350	6	C	40	A	C
144	395450 0915408	07-13-92	--	--	--	C	10	B	--
145	395517 0915442	07-13-92	Mississippian	159	6	C	10	C	B
146	395519 0921613	07-13-92	Mississippian	318	--	C	30	C	B
147	395642 0921455	07-14-92	--	--	6	B	60	A	B

[1]A, distance less than 100 feet; B, distance 100 feet to 0.25 mile; C, distance greater than 0.25 mile.

Table 3. Herbicide concentrations in spike, duplicate, and replicate water samples collected from wells sampled in northwestern Missouri during 1991

[SPIKE, sample spiked with 0.25 microgram per liter alachlor; IOWA, University of Iowa Hygienic Laboratory, Ames, Iowa; <, less than; --, value not determined; USGS, U.S. Geological Survey Research Laboratory, Lawrence, Kansas; herbicide concentrations are total recoverable in micrograms per liter]

Well number (fig. 1)	Agency analyzing sample	Alachlor	Atrazine	Desethyl-atrazine	Deiso-propyl-atrazine	Butylate	Cyanazine	Metolachlor	Metribuzin	Trifluralin
SPIKE	IOWA	0.10	<0.10	--	--	<0.10	<0.10	<0.10	<0.10	<0.10
SPIKE	IOWA	.13	<.10	--	--	<.10	<.10	<.10	<.10	<.10
6	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
55	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	.05	0.05	<0.05	--	<.20	<.05	<.05	--
65	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--
66	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--
92	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
97	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
107	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--
108	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--
109	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--
110	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--
113	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	.12	<.05	<.05	--	<.20	<.05	<.05	--
115	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--
117	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	<.05
121	IOWA	.21	.17	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	.29	.22	<.05	.08	--	<.20	<.05	<.05	--
124	IOWA	<.10	.14	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	.15	.12	.09	--	<.20	<.05	<.05	--
130	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	USGS	<.05	<.05	<.05	<.05	--	<.20	<.05	<.05	--

Table 4. Herbicide concentrations by enzyme-linked immunosorbent assay in water samples collected from wells sampled in northwestern Missouri during 1991

[ELISA, enzyme-linked immunosorbent assay; Cl, chlorinated; USGS1, indicates sample analyzed by U.S. Geological Survey, Independence, Missouri, utilizing a differential photometer; <, less than; USGS2, indicates sample analyzed by U.S. Geological Survey, Independence, Missouri, utilizing a magnetic-particle-based method; --, value not determined; herbicide concentrations are in micrograms per liter on unfiltered samples]

Well number (fig. 1)	Agency analyzing sample	Triazines by ELISA	Cl-acetamides by ELISA
53	USGS1	<0.20	0.12
	USGS2	.13	<.05
55	USGS1	<.20	<.20
	USGS2	.10	<.05
56	USGS1	.39	<.20
	USGS2	.34	<.05
59	USGS1	4.6	3.5
	USGS2	9.6	3.6
65	USGS1	<.20	<.20
	USGS2	<.05	<.05
82	USGS1	.32	.72
	USGS2	.31	.29
85	USGS1	<.20	<.20
	USGS2	<.05	<.05
87	USGS1	<.20	<.20
	USGS2	<.05	<.05
91	USGS1	.39	<.20
	USGS2	.34	.24
94	USGS1	4.3	.28
	USGS2	2.2	.09
95	USGS1	<.20	.26
	USGS2	<.05	.09
96	USGS1	<.20	.32
	USGS2	<.05	.23
97	USGS1	<.20	<.20
	USGS2	<.05	<.05
98	USGS1	.21	<.20
	USGS2	.05	.13
99	USGS1	.30	.90
	USGS2	.33	.61
100	USGS1	<.20	<.20
	USGS2	<.05	.14
101	USGS1	<.20	<.20
	USGS2	<.05	.09
102	USGS1	.37	<.20
	USGS2	.09	<.05
103	USGS1	2.9	1.7
	USGS2	3.6	1.4
104	USGS1	<.20	.25
	USGS2	.30	.20

Table 4. Herbicide concentrations by enzyme-linked immunosorbent assay in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Agency analyzing sample	Triazines by ELISA	Cl-acetamides by ELISA
105	USGS1	<0.20	<0.20
	USGS2	<.05	.08
107	USGS1	.30	<.20
	USGS2	<.05	.06
108	USGS1	.48	<.20
	USGS2	.06	--
109	USGS1	.27	<.20
	USGS2	<.05	.08
110	USGS1	.33	<.20
	USGS2	<.05	.09
113	USGS1	.20	<.20
	USGS2	.47	<.05
115	USGS1	<.20	<.20
	USGS2	<.05	<.05
117	USGS1	.40	<.20
	USGS2	<.05	<.05
118	USGS1	<.20	1.8
	USGS2	.30	.89
119	USGS1	<.20	.72
	USGS2	.08	.26
121	USGS1	1.3	1.9
	USGS2	.17	1.4
122	USGS1	<.20	.53
	USGS2	<.05	.26
123	USGS1	<.20	<.20
	USGS2	<.05	.26
124	USGS1	<.20	.22
	USGS2	.07	.10
126	USGS1	.84	<.20
	USGS2	.37	<.05
127	USGS1	.68	<.20
	USGS2	.33	.12
128	USGS1	<.20	<.20
	USGS2	<.05	.49
129	USGS1	<.20	<.20
	USGS2	<.05	--
130	USGS1	<.20	<.20
	USGS2	<.05	--

Table 5. Herbicide concentrations in spike, duplicate, and replicate water samples collected from wells sampled in northeastern Missouri during 1992

[SPIKE, sample spiked with 0.25 microgram per liter alachlor; IOWA, University of Iowa Hygienic Laboratory, Ames, Iowa; <, less than; --, indicates value not determined; USGS, U.S. Geological Survey National Water-Quality Laboratory, Arvada, Colorado; herbicide concentrations are total recoverable in micrograms per liter]

Well number (fig. 2)	Agency analyzing sample	Alachlor	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Cyanazine	Butylate	Metolachlor	Metribuzin	Trifluralin
SPIKE	IOWA	<0.10	2.2	--	--	<0.10	<0.10	<0.10	<0.10	<0.10
SPIKE	IOWA	<.10	2.4	--	--	<.10	<.10	<.10	<.10	<.10
3	USGS	<.05	<.05	<0.05	<0.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
8	USGS	<.05	<.05	<.05	<.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
12	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
19	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
26	USGS	.07	.11	<.05	.07	<.20	--	<.05	<.05	--
	IOWA	<.10	.10	--	--	<.10	<.10	<.10	<.10	<.10
34	USGS	<.05	<.05	<.05	--	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
38	USGS	<.05	<.05	<.05	<.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
54	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
56	USGS	<.05	<.05	<.05	<.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
61	USGS	.05	.83	<.05	.12	<.20	--	.88	<.05	--
	IOWA	<.20	.89	--	--	<.10	<.10	1.00	<.10	<.10
63	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
74	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
83	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
86	USGS	<.05	<.05	<.05	<.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
93	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
96	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
108	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
112	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10

Table 5. Herbicide concentrations in spike, duplicate, and replicate water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Agency analyzing sample	Alachlor	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Cyanazine	Butylate	Metolachlor	Metribuzin	Trifluralin
118	USGS	<0.05	<0.05	<0.05	<0.05	<0.20	--	<0.05	<0.05	--
	IOWA	<.10	<.10	--	--	<.10	<0.10	<.20	<.10	<0.10
120	USGS	<.05	.18	.09	<.05	<.20	--	.06	<.05	--
	IOWA	<.10	.17	--	--	<.10	<.10	<.10	<.10	<.10
129	USGS	<.05	<.05	<.05	<.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
132	USGS	<.05	<.05	<.05	<.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
133	IOWA	.28	.61	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	.32	.17	--	--	<.10	<.10	<.10	<.10	<.10
135	IOWA	<.10	.21	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	.22	--	--	<.10	<.10	<.10	<.10	<.10
136	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10
141	USGS	<.05	<.05	<.05	<.05	<.20	--	<.05	<.05	--
	IOWA	<.10	<.10	--	--	<.10	<.10	<.10	<.10	<.10

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991

[ELISA, enzyme-linked immunosorbent assay; Cl, chlorinated; USGS, U.S. Geological Survey Research Laboratory, Lawrence, Kansas; <, less than; --, value not determined; IOWA, University of Iowa Hygienic Laboratory, Ames, Iowa; herbicide concentrations are total recoverable in micrograms per liter]

Well number (fig. 1)	Date	Time	Agency analyzing sample	Triazine herbicides						
				Total triazines by ELISA	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Caldwell County						
1	07-15-91	1745	USGS	<0.20	--	--	--	--	--	--
2	07-15-91	1615	USGS	<.20	--	--	--	--	--	--
3	07-15-91	1715	USGS	<.20	--	--	--	--	--	--
4	07-15-91	1845	USGS	<.20	--	--	--	--	--	--
	07-15-91	1845	IOWA	--	<0.10	--	--	--	<0.10	<0.10
5	07-15-91	1530	USGS	<.20	--	--	--	--	--	--
	07-15-91	1530	IOWA	--	<.10	--	--	--	<.10	<.10
6	07-15-91	1320	USGS	<.20	--	--	--	--	--	--
	07-15-91	1320	IOWA	--	<.10	--	--	--	<.10	<.10
	07-15-91	1320	IOWA	--	<.10	--	--	--	<.10	<.10
7	07-15-91	0720	USGS	<.20	--	--	--	--	--	--
8	07-15-91	1930	USGS	<.20	--	--	--	--	--	--
	07-15-91	1930	IOWA	--	<.10	--	--	--	<.10	<.10
9	07-16-91	1300	USGS	<.20	--	--	--	--	--	--
	07-16-91	1300	IOWA	--	<.10	--	--	--	<.10	<.10
10	07-15-91	1245	USGS	<.20	--	--	--	--	--	--
11	07-15-91	1430	USGS	<.20	--	--	--	--	--	--
12	07-15-91	0000	USGS	<.20	--	--	--	--	--	--
13	07-16-91	1400	USGS	<.20	--	--	--	--	--	--
14	07-15-91	1400	USGS	<.20	--	--	--	--	--	--
	07-15-91	1400	IOWA	--	<.10	--	--	--	<.10	<.10
15	07-16-91	1230	USGS	<.20	--	--	--	--	--	--
	07-16-91	1230	IOWA	--	<.10	--	--	--	<.10	<.10
16	07-16-91	1130	USGS	<.20	--	--	--	--	--	--
	07-16-91	1130	IOWA	--	<.10	--	--	--	<.10	<.10
				Clinton County						
17	07-16-91	1200	USGS	<0.20	--	--	--	--	--	--
18	07-16-91	1000	USGS	<.20	--	--	--	--	--	--
	07-16-91	1000	IOWA	--	<0.10	--	--	--	<0.10	<0.10
19	07-16-91	1115	USGS	<.20	--	--	--	--	--	--
20	07-16-91	1130	USGS	<.20	--	--	--	--	--	--
21	07-16-91	0930	USGS	<.20	--	--	--	--	--	--
22	07-16-91	1000	USGS	<.20	--	--	--	--	--	--
23	07-16-91	1100	USGS	<.20	--	--	--	--	--	--
24	07-16-91	0930	USGS	<.20	--	--	--	--	--	--
25	07-16-91	1215	USGS	<.20	--	--	--	--	--	--
	07-16-91	1215	IOWA	--	.10	--	--	--	<.10	<.10
26	07-16-91	1250	USGS	.32	--	--	--	--	--	--
	07-16-91	1250	IOWA	--	.18	--	--	--	<.10	<.10

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Triazine herbicides--Continued					Cl-acetamide herbicides				
	Prometon	Prometryn	Propazine	Simazine	Terbutryn	Total Cl-acetamides by ELISA	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Caldwell County--Continued					
1	--	--	--	--	--	<0.20	--	--	--	--
2	--	--	--	--	--	<.20	--	--	--	--
3	--	--	--	--	--	<.20	--	--	--	--
4	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
5	--	--	--	--	--	.29	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
6	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
7	--	--	--	--	--	<.20	--	--	--	--
8	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
9	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
10	--	--	--	--	--	<.20	--	--	--	--
11	--	--	--	--	--	<.20	--	--	--	--
12	--	--	--	--	--	<.20	--	--	--	--
13	--	--	--	--	--	<.20	--	--	--	--
14	--	--	--	--	--	.32	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
15	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
16	--	--	--	--	--	.22	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
					Clinton County--Continued					
17	--	--	--	--	--	<0.20	--	--	--	--
18	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
19	--	--	--	--	--	<.20	--	--	--	--
20	--	--	--	--	--	<.20	--	--	--	--
21	--	--	--	--	--	<.20	--	--	--	--
22	--	--	--	--	--	<.20	--	--	--	--
23	--	--	--	--	--	<.20	--	--	--	--
24	--	--	--	--	--	<.20	--	--	--	--
25	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
26	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Agency analyzing sample	Triazine herbicides						
				Total triazines by ELISA	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Clinton County--Continued						
27	07-16-91	1230	USGS	<0.20	--	--	--	--	--	--
28	07-16-91	1320	USGS	<.20	--	--	--	--	--	--
	07-16-91	1320	IOWA	--	<0.10	--	--	--	<0.10	<0.10
29	07-15-91	1845	USGS	<.20	--	--	--	--	--	--
	07-15-91	1845	IOWA	--	<.10	--	--	--	<.10	<.10
30	07-16-91	1030	USGS	<.20	--	--	--	--	--	--
	07-16-91	1030	IOWA	--	<.10	--	--	--	<.10	<.10
31	07-16-91	0945	USGS	<.20	--	--	--	--	--	--
	07-16-91	0945	USGS	--	.07	<0.05	<0.05	<0.05	--	<.02
32	07-16-91	1130	USGS	<.20	--	--	--	--	--	--
	07-16-91	1130	IOWA	--	<.10	--	--	--	<.10	<.10
33	07-16-91	0820	USGS	<.20	--	--	--	--	--	--
	07-16-91	0820	USGS	--	.05	<.05	<.05	<.05	--	<.02
34	07-15-91	1630	USGS	<.20	--	--	--	--	--	--
35	07-15-91	1700	USGS	<.20	--	--	--	--	--	--
36	07-15-91	1510	USGS	<.20	--	--	--	--	--	--
	07-15-91	1510	IOWA	--	<.10	--	--	--	<.10	<.10
37	07-15-91	1530	USGS	.25	--	--	--	--	--	--
	07-15-91	1530	IOWA	--	<.10	--	--	--	<.10	<.10
38	07-15-91	1430	USGS	<.20	--	--	--	--	--	--
	07-15-91	1430	IOWA	--	<.10	--	--	--	<.10	<.10
39	07-15-91	1800	USGS	1.80	--	--	--	--	--	--
	07-15-91	1800	IOWA	--	.65	--	--	--	<.10	.23
40	07-15-91	1345	USGS	<.20	--	--	--	--	--	--
				Daviess County						
41	07-16-91	0820	USGS	<0.20	--	--	--	--	--	--
	07-16-91	0820	IOWA	--	<0.10	--	--	--	<0.10	<0.10
42	07-15-91	1430	USGS	<.20	--	--	--	--	--	--
43	07-16-91	1030	USGS	<.20	--	--	--	--	--	--
	07-16-91	1030	IOWA	--	<.10	--	--	--	<.10	<.10
44	07-15-91	1600	USGS	<.20	--	--	--	--	--	--
	07-15-91	1600	IOWA	--	<.10	--	--	--	<.10	<.10
45	07-16-91	1000	USGS	<.20	--	--	--	--	--	--
46	07-16-91	0930	USGS	<.20	--	--	--	--	--	--
	07-16-91	0930	IOWA	--	<.10	--	--	--	<.10	<.10
47	07-16-91	0830	USGS	<.20	--	--	--	--	--	--
	07-16-91	0830	IOWA	--	<.10	--	--	--	<.10	<.10
48	07-15-91	1645	USGS	<.20	--	--	--	--	--	--
49	07-15-91	1730	USGS	<.20	--	--	--	--	--	--
50	07-15-91	1640	USGS	<.20	--	--	--	--	--	--
	07-15-91	1640	IOWA	--	<.10	--	--	--	<.10	<.10

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Triazine herbicides--Continued					Cl-acetamide herbicides				
	Prometon	Prometryn	Propazine	Simazine	Terbutryn	Total Cl-acetamides by ELISA	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Clinton County--Continued					
27	--	--	--	--	--	<0.20	--	--	--	--
28	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
29	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
30	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
31	--	--	--	--	--	9.5	--	--	--	--
	<0.05	<0.05	<0.05	<0.05	<0.05	--	47	<.05	<.05	--
32	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
33	--	--	--	--	--	--	--	--	--	--
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
34	--	--	--	--	--	<.20	--	--	--	--
35	--	--	--	--	--	<.20	--	--	--	--
36	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
37	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
38	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
39	--	--	--	--	--	.22	--	--	--	--
	--	--	--	--	--	--	<.10	.13	<.10	<.10
40	--	--	--	--	--	<.20	--	--	--	--
					Daviess County--Continued					
41	--	--	--	--	--	<0.20	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
42	--	--	--	--	--	<.20	--	--	--	--
43	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
44	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
45	--	--	--	--	--	<.20	--	--	--	--
46	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	1.20	<.10	<.10	<.10
47	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
48	--	--	--	--	--	<.20	--	--	--	--
49	--	--	--	--	--	<.20	--	--	--	--
50	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	--

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Agency analyzing sample	Triazine herbicides						
				Total triazines by ELISA	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Daviess County--Continued						
51	07-16-91	0945	USGS	<0.20	--	--	--	--	--	--
	07-16-91	0945	IOWA	--	<0.10	--	--	--	<0.10	<0.10
52	07-16-91	1900	USGS	<.20	--	--	--	--	--	--
	07-16-91	1900	USGS	<.20	--	--	--	--	--	--
	07-16-91	1900	IOWA	--	<.10	--	--	--	<.10	<.10
53	07-16-91	1330	USGS	<.20	--	--	--	--	--	--
	07-16-91	1330	USGS	.13	--	--	--	--	--	--
	07-16-91	1330	IOWA	--	<.10	--	--	--	<.10	<.10
54	07-15-91	1845	USGS	<.20	--	--	--	--	--	--
55	07-16-91	1050	USGS	<.20	--	--	--	--	--	--
	07-16-91	1050	USGS	.10	--	--	--	--	--	<.20
	07-16-91	1050	IOWA	--	<.10	--	--	--	<.10	<.10
	07-16-91	1050	USGS	--	.05	0.05	<0.05	<0.05	--	<.02
56	07-16-91	1600	USGS	.39	--	--	--	--	--	--
	07-16-91	1601	USGS	.34	--	--	--	--	--	--
	07-16-91	1602	IOWA	--	.27	--	--	--	<.10	<.10
57	07-16-91	1230	USGS	<.20	--	--	--	--	--	--
58	07-16-91	1145	USGS	<.20	--	--	--	--	--	--
59	07-16-91	1515	USGS	4.6	--	--	--	--	--	--
	07-16-91	1515	USGS	9.6	--	--	--	--	--	--
	07-16-91	1515	IOWA	--	9.6	--	--	--	<.10	<.10
60	07-16-91	1415	USGS	<.20	--	--	--	--	--	--
				Gentry County						
61	07-10-91	1000	USGS	<0.20	--	--	--	--	--	--
62	07-10-91	1100	USGS	<.20	--	--	--	--	--	--
	07-10-91	1100	IOWA	--	<0.10	--	--	--	<0.10	<0.10
63	07-09-91	1405	USGS	<.20	--	--	--	--	--	--
64	07-10-91	1145	USGS	<.20	--	--	--	--	--	--
65	07-10-91	1255	USGS	<.20	--	--	--	--	--	--
	07-10-91	1255	USGS	<.05	--	--	--	--	--	--
	07-10-91	1255	IOWA	--	<.10	--	--	--	<.10	<.10
	07-10-91	1255	USGS	--	<.05	<0.05	<0.05	<0.05	--	<.20
66	07-10-91	1315	USGS	<.20	--	--	--	--	--	--
	07-10-91	1315	IOWA	--	<.10	--	--	--	<.10	<.10
	07-10-91	1315	USGS	--	<.05	<.05	<.05	<.05	--	<.20
67	07-09-91	1305	USGS	<.20	--	--	--	--	--	--
	07-09-91	1305	IOWA	--	<.10	--	--	--	<.10	<.10
68	07-09-91	1220	USGS	<.20	--	--	--	--	--	--
69	07-10-91	1230	USGS	<.20	--	--	--	--	--	--
70	07-09-91	1505	USGS	<.20	--	--	--	--	--	--

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Triazine herbicides--Continued					Cl-acetamide herbicides				
	Prometon	Prometryn	Propazine	Simazine	Terbutryn	Total Cl-acetamides by ELISA	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Daviess County--Continued					
51	--	--	--	--	--	<0.20	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
52	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
53	--	--	--	--	--	.12	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
54	--	--	--	--	--	<.20	--	--	--	--
55	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	--	<.10	<.10	<.10
	<0.05	<0.05	<0.05	<0.05	<0.05	--	--	<.05	<.05	--
56	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	.69	<.10
57	--	--	--	--	--	<.20	--	--	--	--
58	--	--	--	--	--	<.20	--	--	--	--
59	--	--	--	--	--	3.5	--	--	--	--
	--	--	--	--	--	3.6	--	--	--	--
	--	--	--	--	--	--	1.7	<.10	3.0	.10
60	--	--	--	--	--	<.20	--	--	--	--
					Gentry County--Continued					
61	--	--	--	--	--	<0.20	--	--	--	--
62	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
63	--	--	--	--	--	<.20	--	--	--	--
64	--	--	--	--	--	<.20	--	--	--	--
65	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<0.05	<0.05	<0.05	<0.05	<0.05	--	<.05	<.05	<.05	--
66	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
67	--	--	--	--	--	.50	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
68	--	--	--	--	--	<.20	--	--	--	--
69	--	--	--	--	--	<.20	--	--	--	--
70	--	--	--	--	--	<.20	--	--	--	--

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Agency analyzing sample	Triazine herbicides						
				Total triazines by ELISA	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Gentry County--Continued						
71	07-09-91	1715	USGS	<0.20	--	--	--	--	--	--
72	07-10-91	0915	USGS	<.20	--	--	--	--	--	--
	07-10-91	0917	IOWA	--	<0.10	--	--	--	<0.10	0.13
73	07-09-91	1610	USGS	<.20	--	--	--	--	--	--
74	07-10-91	1130	USGS	<.20	--	--	--	--	--	--
75	07-10-91	1045	USGS	<.20	--	--	--	--	--	--
76	07-10-91	1130	USGS	<.20	--	--	--	--	--	--
77	07-10-91	1140	USGS	<.20	--	--	--	--	--	--
78	07-10-91	1230	USGS	<.20	--	--	--	--	--	--
79	07-10-91	1020	USGS	<.20	--	--	--	--	--	--
80	07-15-91	0800	USGS	<.20	--	--	--	--	--	--
81	07-10-91	0930	USGS	<.20	--	--	--	--	--	--
	07-10-91	0930	IOWA	--	<.10	--	--	--	<.10	<.10
82	07-10-91	1300	USGS	.32	--	--	--	--	--	--
	07-10-91	1300	USGS	.31	--	--	--	--	--	--
	07-10-91	1300	IOWA	--	.30	--	--	--	<.10	<.10
83	07-10-91	1100	USGS	<.20	--	--	--	--	--	--
84	07-15-91	0730	USGS	<.20	--	--	--	--	--	--
	07-15-91	0730	IOWA	--	<.10	--	--	--	<.10	<.10
85	07-15-91	1500	USGS	<.20	--	--	--	--	--	--
	07-15-91	1500	USGS	<.05	--	--	--	--	--	--
	07-15-91	1500	IOWA	--	<.10	--	--	--	<.10	<.10
86	07-15-91	1600	USGS	<.20	--	--	--	--	--	--
87	07-15-91	0015	USGS	<.20	--	--	--	--	--	--
	07-15-91	0015	USGS	<.05	--	--	--	--	--	--
	07-15-91	0015	IOWA	--	<.10	--	--	--	<.10	<.10
				Nodaway County						
88	07-09-91	1400	USGS	<0.20	--	--	--	--	--	--
	07-09-91	1400	USGS	--	<0.05	<0.05	<0.05	<0.05	--	<0.20
89	07-09-91	1110	USGS	<.20	--	--	--	--	--	--
	07-09-91	1110	IOWA	--	<.10	--	--	--	<0.10	<.10
90	07-09-91	1215	USGS	<.20	--	--	--	--	--	--
	07-09-91	1215	IOWA	--	<.10	--	--	--	<.10	<.10
91	07-09-91	1300	USGS	.39	--	--	--	--	--	--
	07-09-91	1300	USGS	.34	--	--	--	--	--	--
	07-09-91	1300	IOWA	--	<.10	--	--	--	<.10	<.10
92	07-09-91	1100	USGS	<.20	--	--	--	--	--	--
	07-09-91	1100	IOWA	--	<.10	--	--	<.10	<.10	<.10
	07-09-91	1100	IOWA	--	<.10	--	--	<.10	<.10	<.10

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Triazine herbicides--Continued					Cl-acetamide herbicides				
	Prometon	Prometryn	Propazine	Simazine	Terbutryn	Total Cl-acetamides by ELISA	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Gentry County--Continued					
71	--	--	--	--	--	<0.20	--	--	--	--
72	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
73	--	--	--	--	--	<.20	--	--	--	--
74	--	--	--	--	--	<.20	--	--	--	--
75	--	--	--	--	--	<.20	--	--	--	--
76	--	--	--	--	--	<.20	--	--	--	--
77	--	--	--	--	--	<.20	--	--	--	--
78	--	--	--	--	--	<.20	--	--	--	--
79	--	--	--	--	--	<.20	--	--	--	--
80	--	--	--	--	--	<.20	--	--	--	--
81	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
82	--	--	--	--	--	.72	--	--	--	--
	--	--	--	--	--	.29	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
83	--	--	--	--	--	<.20	--	--	--	--
84	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
85	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	.14	<.10	<.10	<.10
86	--	--	--	--	--	<.20	--	--	--	--
87	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
					Nodaway County--Continued					
88	--	--	--	--	--	--	<0.20	--	--	--
	<0.05	<0.05	<0.05	<0.05	<0.05	--	--	<0.05	<0.05	--
89	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	<0.10	--	<.10	<.10	<0.10
90	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
91	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	--	.24	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
92	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
	--	--	--	--	--	<.10	--	<.10	<.10	<.10

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Agency analyzing sample	Triazine herbicides						
				Total triazines by ELISA	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Nodaway County--Continued						
93	07-08-91	1900	USGS	<0.20	--	--	--	--	--	--
94	07-09-91	1015	USGS	4.3	--	--	--	--	--	--
	07-09-91	1015	USGS	2.2	--	--	--	--	--	--
	07-09-91	1015	IOWA	--	1.5	--	--	--	<0.10	1.30
95	07-08-91	1740	USGS	<.20	--	--	--	--	--	--
	07-08-91	1740	USGS	<.05	--	--	--	--	--	--
	07-08-91	1740	IOWA	--	<.10	--	--	--	<.10	<.10
96	07-08-91	1800	USGS	<.20	--	--	--	--	--	--
	07-08-91	1800	USGS	<.05	--	--	--	--	--	--
	07-08-91	1800	IOWA	--	<.10	--	--	--	<.10	<.10
97	07-09-91	1025	USGS	<.20	--	--	--	--	--	--
	07-09-91	1025	USGS	<.05	--	--	--	--	--	--
	07-09-91	1025	IOWA	--	<.10	--	--	--	<.10	<.10
	07-09-91	1025	USGS	--	<.05	<0.05	<0.05	<0.05	--	<.05
98	07-09-91	0940	USGS	.21	--	--	--	--	--	--
	07-09-91	0940	USGS	.05	--	--	--	--	--	--
	07-09-91	0940	IOWA	--	<.10	--	--	--	<.10	<.10
99	07-09-91	0915	USGS	.30	--	--	--	--	--	--
	07-09-91	0915	USGS	.33	--	--	--	--	--	--
	07-09-91	0915	IOWA	--	<.10	--	--	--	<.10	<.10
100	07-08-91	1645	USGS	<.20	--	--	--	--	--	--
	07-08-91	1645	USGS	<.05	--	--	--	--	--	--
	07-08-91	1645	IOWA	--	<.10	--	--	--	<.10	<.10
101	07-09-91	1750	USGS	<.20	--	--	--	--	--	--
	07-09-91	1750	USGS	<.05	--	--	--	--	--	--
	07-09-91	1750	IOWA	--	<.10	--	--	--	<.10	<.10
102	07-18-91	1800	USGS	.37	--	--	--	--	--	--
	07-18-91	1800	USGS	.09	--	--	--	--	--	--
	07-18-91	1800	IOWA	--	<.10	--	--	--	<.10	<.10
103	07-09-91	1810	USGS	2.9	--	--	--	--	--	--
	07-09-91	1810	USGS	3.6	--	--	--	--	--	--
	07-09-91	1810	IOWA	--	2.0	--	--	--	<.10	<.10
104	07-08-91	1520	USGS	<.20	--	--	--	--	--	--
	07-08-91	1520	USGS	.30	--	--	--	--	--	--
	07-08-91	1520	IOWA	--	<.10	--	--	--	<.10	<.10
105	07-08-91	1615	USGS	<.20	--	--	--	--	--	--
	07-08-91	1615	USGS	<.05	--	--	--	--	--	--
106	07-08-91	1650	USGS	<.20	--	--	--	--	--	--
107	07-09-91	0840	USGS	.30	--	--	--	--	--	--
	07-09-91	0840	USGS	<.05	--	--	--	--	--	--
	07-09-91	0840	IOWA	--	<.10	--	--	--	<.10	<.10
	07-09-91	0840	USGS	--	<.05	<.05	<.05	<.05	--	<.20

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Triazine herbicides--Continued					Cl-acetamide herbicides				
	Prometon	Prometryn	Propazine	Simazine	Terbutryn	Total Cl-acetamides by ELISA	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Nodaway County--Continued					
93	--	--	--	--	--	--	<0.20	--	--	--
94	--	--	--	--	--	--	.28	--	--	--
	--	--	--	--	--	--	.09	--	--	--
	--	--	--	--	--	<0.10	--	<0.10	<0.10	<0.10
95	--	--	--	--	--	.26	--	--	--	--
	--	--	--	--	--	.09	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
96	--	--	--	--	--	.32	--	--	--	--
	--	--	--	--	--	.23	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
97	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<0.05	<0.05	<0.05	<0.05	<0.05	--	<.05	<.05	<.05	--
98	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	--	.13	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
99	--	--	--	--	--	--	.90	--	--	--
	--	--	--	--	--	--	.61	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
100	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	--	.14	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
101	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	--	.09	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
102	--	--	--	--	--	--	<.20	--	--	--
	--	--	--	--	--	--	<.05	--	--	--
	--	--	--	--	--	<.10	--	<.10	<.10	<.10
103	--	--	--	--	--	--	1.7	--	--	--
	--	--	--	--	--	--	1.4	--	--	--
	--	--	--	--	--	<.10	--	.22	<.10	<.10
104	--	--	--	--	--	.25	--	--	--	--
	--	--	--	--	--	.20	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
105	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	.08	--	--	--	--
106	--	--	--	--	--	<.20	--	--	--	--
107	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	.06	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Agency analyzing sample	Triazine herbicides						
				Total triazines by ELISA	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Nodaway County--Continued						
108	07-08-91	1535	USGS	0.48	--	--	--	--	--	--
	07-08-91	1536	USGS	.06	--	--	--	--	--	--
	07-08-91	1537	IOWA	--	<0.10	--	--	<0.10	<0.10	<0.10
	07-08-91	1538	USGS	--	<.05	<0.05	<0.05	<.05	--	<.20
109	07-08-91	1850	USGS	.27	--	--	--	--	--	--
	07-08-91	1850	USGS	<.05	--	--	--	--	--	--
	07-08-91	1850	IOWA	--	<.10	--	--	--	<.10	<.10
	07-08-91	1850	USGS	--	<.05	<.05	<.05	<.05	--	<.20
110	07-09-91	0745	USGS	.33	--	--	--	--	--	--
	07-09-91	0745	USGS	<.05	--	--	--	--	--	--
	07-09-91	0745	IOWA	--	<.10	--	--	--	<.10	<.10
	07-09-91	0745	USGS	--	<.05	<.05	<.05	<.05	--	<.20
111	07-08-91	1810	USGS	<.20	--	--	--	--	--	--
112	07-08-91	0720	USGS	<.20	--	--	--	--	--	--
113	07-08-91	1700	USGS	.20	--	--	--	--	--	--
	07-08-91	1700	USGS	.47	--	--	--	--	--	--
	07-08-91	1700	IOWA	--	<.10	--	--	--	<.10	<.10
	07-08-91	1700	USGS	--	.12	<.05	<.05	<.05	--	<.20
114	07-08-91	1600	USGS	<.20	--	--	--	--	--	--
115	07-09-91	1830	USGS	<.20	--	--	--	--	--	--
	07-09-91	1830	USGS	<.05	--	--	--	--	--	--
	07-09-91	1830	IOWA	--	<.10	--	--	--	<.10	<.10
	07-09-91	1830	USGS	--	<.05	<.05	<.05	<.05	--	<.20
116	07-09-91	1000	USGS	<.02	--	--	--	--	--	--
117	07-08-91	1800	USGS	.40	--	--	--	--	--	--
	07-08-91	1800	USGS	<.05	--	--	--	--	--	--
	07-08-91	1800	IOWA	--	<.10	--	--	--	<.10	<.10
	07-08-91	1800	USGS	--	<.05	<.05	<.05	<.05	--	<.20
118	07-08-91	1300	USGS	<.20	--	--	--	--	--	--
	07-08-91	1300	USGS	.30	--	--	--	--	--	--
	07-08-91	1300	IOWA	--	.20	--	--	--	<.10	<.10
119	07-09-91	1100	USGS	<.20	--	--	--	--	--	--
	07-09-91	1100	USGS	.08	--	--	--	--	--	--
	07-09-91	1100	IOWA	--	<.10	--	--	--	<.10	<.10
120	07-08-91	0920	USGS	<.20	--	--	--	--	--	--
121	07-09-91	1715	USGS	1.3	--	--	--	--	--	--
	07-09-91	1715	USGS	.17	--	--	--	--	--	--
	07-09-91	1715	IOWA	--	.17	--	--	--	<.10	<.10
	07-09-91	1715	USGS	--	.22	<.05	.08	<.05	--	<.20

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Triazine herbicides--Continued					Cl-acetamide herbicides				
	Prometon	Prometryn	Propazine	Simazine	Terbutryn	Total Cl-acetamides by ELISA	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Nodaway County--Continued					
108	--	--	--	--	--	<0.20	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	<.05	<0.10	<0.10	<0.10	<0.10
	<0.05	<0.05	<0.05	<0.05	<0.05	--	<.05	<.05	<.05	--
109	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	.08	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
110	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	.09	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
111	--	--	--	--	--	<.20	--	--	--	--
112	--	--	--	--	--	<.20	--	--	--	--
113	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
114	--	--	--	--	--	<.20	--	--	--	--
115	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
116	--	--	--	--	--	<.20	--	--	--	--
117	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
118	--	--	--	--	--	1.8	--	--	--	--
	--	--	--	--	--	.89	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
119	--	--	--	--	--	.72	--	--	--	--
	--	--	--	--	--	.26	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
120	--	--	--	--	--	<.20	--	--	--	--
121	--	--	--	--	--	1.9	--	--	--	--
	--	--	--	--	--	1.4	--	--	--	--
	--	--	--	--	--	--	.21	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	.29	<.05	<.05	--

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Agency analyzing sample	Triazine herbicides						
				Total triazines by ELISA	Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Nodaway County--Continued						
122	07-09-91	1700	USGS	<0.20	--	--	--	--	--	--
	07-09-91	1700	USGS	<.05	--	--	--	--	--	--
	07-09-91	1700	IOWA	--	<0.10	--	--	--	<0.10	<0.10
123	07-09-91	1230	USGS	<.20	--	--	--	--	--	--
	07-09-91	1230	USGS	<.05	--	--	--	--	--	--
	07-09-91	1230	IOWA	--	<.10	--	--	--	<.10	<.10
124	07-09-91	1230	USGS	<.20	--	--	--	--	--	--
	07-09-91	1230	USGS	.07	--	--	--	--	--	--
	07-09-91	1230	IOWA	--	.14	--	-	--	<.10	<.10
	07-09-91	1230	USGS	--	.15	0.12	0.09	<0.05	--	<.20
125	07-09-91	1145	USGS	<.20	--	--	--	--	--	--
	07-09-91	1145	USGS	--	<.05	<.05	<.05	<.05	--	<.20
126	07-09-91	1545	USGS	.84	--	--	--	--	--	--
	07-09-91	1545	USGS	.37	--	--	--	--	--	--
	07-09-91	1545	IOWA	--	.28	--	--	--	<.10	<.10
127	07-09-91	1615	USGS	.68	--	--	--	--	--	--
	07-09-91	1615	USGS	.33	--	--	--	--	--	--
	07-09-91	1615	IOWA	--	<.10	--	--	--	<.10	<.10
128	07-09-91	1445	USGS	<.20	--	--	--	--	--	--
	07-09-91	1445	USGS	<.05	--	--	--	--	--	--
129	07-09-91	1345	USGS	<.20	--	--	--	--	--	--
	07-09-91	1345	USGS	<.05	--	--	--	--	--	--
	07-09-91	1345	USGS	--	<.05	<.05	<.05	<.05	--	<.20
130	07-09-91	1120	USGS	<.20	--	--	--	--	--	--
	07-09-91	1120	USGS	<.05	--	--	--	--	--	--
	07-09-91	1120	IOWA	--	<.10	--	--	--	<.10	<.10
	07-09-91	1120	USGS	--	<.05	<.05	<.05	<.05	--	<.20

Table 6. Herbicide concentrations in water samples collected from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Triazine herbicides--Continued					Cl-acetamide herbicides				
	Prometon	Prometryn	Propazine	Simazine	Terbutryn	Total Cl-acetamides by ELISA	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Nodaway County--Continued					
122	--	--	--	--	--	0.53	--	--	--	--
	--	--	--	--	--	.26	--	--	--	--
	--	--	--	--	--	--	<0.10	<0.10	<0.10	<0.10
123	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	.26	--	--	--	--
	<0.10	--	--	--	--	--	<.10	<.10	<.10	<.10
124	--	--	--	--	--	.22	--	--	--	--
	--	--	--	--	--	.10	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<0.05	<0.05	<0.05	<0.05	--	<.05	<.05	<.05	--
125	--	--	--	--	--	<.20	--	--	--	--
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
126	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	<.05	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
127	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	.12	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
128	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	.49	--	--	--	--
129	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--
130	--	--	--	--	--	<.20	--	--	--	--
	--	--	--	--	--	--	--	--	--	--
	--	--	--	--	--	--	<.10	<.10	<.10	<.10
	<.05	<.05	<.05	<.05	<.05	--	<.05	<.05	<.05	--

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992

[IOWA, University of Iowa Hygienic Laboratory, Ames, Iowa; <, less than; --, indicates value not determined; USGS, U.S. Geological Survey National Water-Quality Laboratory, Arvada, Colorado; herbicide concentrations are total recoverable in micrograms per liter]

Well number (fig. 2)	Date	Time	Agency analyzing sample	Triazine herbicides					
				Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Audrain County					
1	07-14-92	1320	IOWA	<0.10	--	--	--	<0.10	<0.10
2	07-13-92	1045	IOWA	<.10	--	--	--	<.10	<.10
3	07-13-92	1000	USGS	<.05	<0.05	<0.05	<0.05	--	<.20
	07-13-92	1000	IOWA	<.10	--	--	--	<.10	<.10
4	07-14-92	1250	IOWA	<.10	--	--	--	<.10	<.10
5	07-14-92	1345	IOWA	<.10	--	--	--	<.10	<.10
6	07-14-92	1405	IOWA	<.10	--	--	--	<.10	<.10
7	07-13-92	1200	IOWA	<.10	--	--	--	<.10	<.10
8	07-14-92	1220	USGS	<.05	<.05	<.05	<.05	--	<.20
	07-14-92	1220	IOWA	<.10	--	--	--	<.10	<.10
9	07-14-92	1205	IOWA	<.10	--	--	--	<.10	<.10
10	07-14-92	1145	IOWA	<.10	--	--	--	<.10	<.10
11	07-13-92	1230	IOWA	<.10	--	--	--	<.10	<.10
12	07-13-92	1115	IOWA	<.10	--	--	--	<.10	<.10
	07-13-92	1115	IOWA	<.10	--	--	--	<.10	<.10
13	07-13-92	0000	IOWA	<.10	--	--	--	<.10	<.10
14	07-13-92	1346	IOWA	<.10	--	--	--	<.10	<.10
15	07-13-92	1315	IOWA	<.10	--	--	--	<.10	<.10
16	07-13-92	2000	IOWA	<.10	--	--	--	<.10	<.10
17	07-13-92	1700	IOWA	<.10	--	--	--	<.10	<.10
18	07-13-92	1635	IOWA	<.10	--	--	--	<.10	<.10
19	07-14-92	1550	IOWA	<.10	--	--	--	<.10	<.10
	07-14-92	1550	IOWA	<.10	--	--	--	<.10	<.10
20	07-13-92	1805	IOWA	<.10	--	--	--	<.10	<.10
21	07-13-92	1900	IOWA	<.10	--	--	--	<.10	<.10
22	07-13-92	1935	IOWA	<.10	--	--	--	<.10	<.10
23	07-13-92	1320	IOWA	<.10	--	--	--	<.10	<.10
24	07-14-92	1055	IOWA	<.10	--	--	--	<.10	<.10
25	07-14-92	1701	IOWA	<.10	--	--	--	<.10	<.10
26	07-13-92	1535	USGS	.11	.07	<.05	<.05	--	<.20
	07-13-92	1535	IOWA	.10	--	--	--	<.10	<.10
27	07-14-92	1734	IOWA	<.10	--	--	--	<.10	<.10
28	07-13-92	1346	IOWA	<.10	--	--	--	<.10	<.10
				Clark County					
29	07-07-92	1125	IOWA	0.17	--	--	--	<0.10	<0.10
30	07-07-92	1110	IOWA	<.10	--	--	--	<.10	<.10
31	07-07-92	1455	IOWA	.10	--	--	--	<.10	<.10
32	07-07-92	1155	IOWA	<.10	--	--	--	<.10	<.10
33	07-07-92	1520	IOWA	<.10	--	--	--	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Agency analyzing sample	Triazine herbicides				Cl-actemide herbicides			
		Prometon	Prometryn	Propazine	Simazine	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Audrain County--Continued				
1	IOWA	--	--	--	--	<0.10	<0.10	<0.10	<0.10
2	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
3	USGS	<0.05	<0.05	<0.05	<0.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
4	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
5	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
6	USGS	--	--	--	--	<.10	<.10	<.10	<.10
7	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
8	USGS	<.05	<.05	<.05	<.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
9	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
10	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
11	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
12	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
13	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
14	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
15	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
16	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
17	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
18	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
19	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
20	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
21	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
22	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
23	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
24	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
25	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
26	USGS	<.05	<.05	<.05	<.05	.07	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
27	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
28	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
					Clark County--Continued				
29	IOWA	--	--	--	--	<0.10	<0.10	<0.10	<0.10
30	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
31	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
32	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
33	IOWA	--	--	--	--	<.10	<.10	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Date	Time	Agency analyzing sample	Triazine herbicides					
				Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Clark County--Continued					
34	07-06-92	1025	USGS	<0.05	<0.05	--	<0.05	--	<0.20
	07-06-92	1025	IOWA	<.10	--	--	--	<0.10	<.10
35	07-07-92	1230	IOWA	<.10	--	--	--	<.10	<.10
36	07-07-92	1740	IOWA	<.10	--	--	--	<.10	<.10
37	07-06-92	2050	IOWA	<.10	--	--	--	<.10	<.10
38	07-06-92	1120	USGS	<.05	<.05	<0.05	<.05	--	<.20
	07-06-92	1120	IOWA	<.10	--	--	--	<.10	<.10
39	07-06-92	1210	IOWA	<.10	--	--	--	<.10	<.10
40	07-06-92	1240	IOWA	<.10	--	--	--	<.10	<.10
41	07-07-92	0825	IOWA	<.10	--	--	--	<.10	<.10
42	07-06-92	1930	IOWA	<.10	--	--	--	<.10	<.10
43	07-07-92	1320	IOWA	<.10	--	--	--	<.10	<.10
44	07-07-92	0930	IOWA	<.10	--	--	--	<.10	<.10
45	07-06-92	1705	IOWA	<.10	--	--	--	<.10	<.10
46	07-07-92	1425	IOWA	.94	--	--	--	<.10	<.10
47	07-07-92	0930	IOWA	<.10	--	--	--	<.10	<.10
48	07-07-92	0930	IOWA	<.10	--	--	--	<.10	<.10
49	07-06-92	1630	IOWA	<.10	--	--	--	<.10	<.10
50	07-06-92	1515	IOWA	<.10	--	--	--	<.10	<.10
51	07-06-92	1800	IOWA	<.10	--	--	--	<.10	<.10
52	07-06-92	1545	IOWA	1.50	--	--	--	<.10	<.10
53	07-06-92	1605	IOWA	<.10	--	--	--	<.10	<.10
54	07-06-92	1435	IOWA	<.10	--	--	--	<.10	<.10
	07-06-92	1435	IOWA	<.10	--	--	--	<.10	<.10
				Lewis County					
55	07-06-92	1430	IOWA	4.30	--	--	--	<0.10	<0.10
56	07-06-92	0935	USGS	<.05	<0.05	<0.05	<0.05	--	<.20
	07-06-92	0935	IOWA	<.10	--	--	--	<.10	<.10
57	07-06-92	1050	IOWA	<.10	--	--	--	<.10	<.10
58	07-06-92	1100	IOWA	<.10	--	--	--	<.10	<.10
59	07-06-92	1330	IOWA	<.10	--	--	--	<.10	<.10
60	07-06-92	1410	IOWA	.22	--	--	--	<.10	<.10
61	07-06-92	0955	USGS	.83	<.05	.12	<.05	--	<.20
	07-06-92	0955	IOWA	.89	--	--	--	<.10	<.10
62	07-06-92	1120	IOWA	<.10	--	--	--	<.10	<.10
63	07-06-92	1015	IOWA	<.10	--	--	--	<.10	<.10
	07-06-92	1015	IOWA	<.10	--	--	--	<.10	<.10
64	07-06-92	1350	IOWA	<.10	--	--	--	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Agency analyzing sample	Triazine herbicides				Cl-actemide herbicides			
		Prometon	Prometryn	Propazine	Simazine	Alachlor	Metolachlor	Metribuzin	Trifluralin
					Clark County--Continued				
34	USGS	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<0.10
35	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
36	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
37	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
38	USGS	<.05	<.05	<.05	<.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
39	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
40	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
41	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
42	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
43	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
44	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
45	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
46	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
47	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
48	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
49	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
50	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
51	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
52	IOWA	--	--	--	--	.42	.28	.14	<.10
53	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
54	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
					Lewis County--Continued				
55	IOWA	--	--	--	--	<0.10	24.0	2.50	<0.10
56	USGS	<0.05	<0.05	<0.05	<0.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
57	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
58	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
59	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
60	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
61	USGS	<.05	<.05	<.05	<.05	.05	.88	<.05	--
	IOWA	--	--	--	--	<.10	1.00	<.10	<.10
62	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
63	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
64	IOWA	--	--	--	--	<.10	<.20	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Date	Time	Agency analyzing sample	Triazine herbicides					
				Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Lewis County--Continued					
65	07-06-92	1230	IOWA	<0.10	--	--	--	<0.10	<0.10
66	07-06-92	1205	IOWA	<.10	--	--	--	<.10	<.10
67	07-07-92	0834	IOWA	<.10	--	--	--	<.10	<.10
68	07-07-92	0850	IOWA	<.10	--	--	--	<.10	<.10
69	07-06-92	1455	IOWA	<.10	--	--	--	<.10	<.10
70	07-06-92	1515	IOWA	<.10	--	--	--	<.10	<.10
71	07-06-92	1250	IOWA	<.10	--	--	--	<.10	<.10
72	07-07-92	1300	IOWA	<.10	--	--	--	<.10	<.10
73	07-07-92	1135	IOWA	<.10	--	--	--	<.10	<.10
74	07-07-92	1340	IOWA	<.10	--	--	--	<.10	<.10
	07-07-92	1340	IOWA	<.10	--	--	--	<.10	<.10
75	07-07-92	0910	IOWA	<.10	--	--	--	<.10	<.10
76	07-07-92	1320	IOWA	<.10	--	--	--	<.10	<.10
77	07-07-92	1100	IOWA	<.10	--	--	--	<.10	<.10
78	07-07-92	1045	IOWA	<.10	--	--	--	<.10	<.10
79	07-07-92	1230	IOWA	<.10	--	--	--	<.10	<.10
80	07-07-92	1200	IOWA	<.10	--	--	--	<.10	<.10
81	07-07-92	1410	IOWA	<.10	--	--	--	<.10	<.10
82	07-07-92	0955	IOWA	<.10	--	--	--	<.10	<.10
				Monroe County					
83	07-13-92	1210	IOWA	<0.10	--	--	--	<0.10	<0.10
	07-13-92	1210	IOWA	<.10	--	--	--	<.10	<.10
84	07-13-92	1120	IOWA	<.10	--	--	--	<.10	<.10
85	07-13-92	1050	IOWA	<.10	--	--	--	<.10	<.10
86	07-13-92	1305	USGS	<.05	<0.05	<0.05	<0.05	--	<.20
	07-13-92	1305	IOWA	<.10	--	--	--	<.10	<.10
87	07-13-92	1325	IOWA	<.10	--	--	--	<.10	<.10
88	07-23-92	1245	IOWA	<.10	--	--	--	<.10	<.10
89	07-13-92	1030	IOWA	<.10	--	--	--	<.10	<.10
90	07-13-92	1355	IOWA	<.10	--	--	--	<.10	<.10
91	07-13-92	1140	IOWA	<.10	--	--	--	<.10	<.10
92	07-14-92	0900	IOWA	<.10	--	--	--	<.10	<.10
93	07-14-92	1240	IOWA	<.10	--	--	--	<.10	<.10
	07-14-92	1240	IOWA	<.10	--	--	--	<.10	<.10
94	07-14-92	1030	IOWA	<.10	--	--	--	<.10	<.10
95	07-13-92	1425	IOWA	1.90	--	--	--	<.10	<.10
96	07-14-92	1000	IOWA	<.10	--	--	--	<.10	<.10
	07-14-92	1000	IOWA	<.10	--	--	--	<.10	<.10
97	07-14-92	1140	IOWA	<.10	--	--	--	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Agency analyzing sample	Triazine herbicides				Cl-actemide herbicides			
		Prometon	Prometryn	Propazine	Simazine	Alachlor	Metolachlor	Metribuzin	Trifluralin
				Lewis County--Continued					
65	IOWA	--	--	--	--	<0.10	<0.10	<0.10	<0.10
66	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
67	IOWA	--	--	--	--	<.10	<.20	<.10	<.10
68	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
69	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
70	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
71	IOWA	--	--	--	--	<.10	<.20	<.10	<.10
72	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
73	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
74	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
75	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
76	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
77	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
78	IOWA	--	--	--	--	<.10	<.20	<.10	<.10
79	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
80	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
81	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
82	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
				Monroe County--Continued					
83	IOWA	--	--	--	--	<0.10	<0.10	<0.10	<0.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
84	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
85	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
86	USGS	<0.05	<0.05	<0.05	<0.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
87	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
88	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
89	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
90	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
91	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
92	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
93	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
94	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
95	IOWA	--	--	--	--	<.10	.47	.36	<.10
96	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
97	IOWA	--	--	--	--	<.10	<.10	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Date	Time	Agency analyzing sample	Triazine herbicides					
				Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Monroe County--Continued					
98	07-14-92	1155	IOWA	<0.10	--	--	--	<0.10	<0.10
99	07-13-92	1655	IOWA	<.10	--	--	--	<.10	<.10
100	07-13-92	1450	IOWA	<.10	--	--	--	<.10	<.10
101	07-14-92	1530	IOWA	<.10	--	--	--	<.10	<.10
102	07-13-92	1625	IOWA	<.10	--	--	--	<.10	<.10
103	07-14-92	1200	IOWA	<.10	--	--	--	<.10	<.10
104	07-13-92	1425	IOWA	<.10	--	--	--	<.10	<.10
105	07-14-92	1410	IOWA	<.10	--	--	--	<.10	<.10
106	07-13-92	1500	IOWA	<.10	--	--	--	<.10	<.10
107	07-14-92	1500	IOWA	<.10	--	--	--	<.10	<.10
				Scotland County					
108	07-07-92	1230	IOWA	<0.10	--	--	--	<0.10	<0.10
	07-07-92	1230	IOWA	<.10	--	--	--	<.10	<.10
109	07-07-92	1200	IOWA	.36	--	--	--	<.10	<.10
110	07-07-92	1300	IOWA	<.10	--	--	--	<.10	<.10
111	07-07-92	1400	IOWA	<.10	--	--	--	<.10	<.10
112	07-08-92	1500	IOWA	<.10	--	--	--	<.10	<.10
	07-08-92	1500	IOWA	<.10	--	--	--	<.10	<.10
113	07-06-92	1830	IOWA	.17	--	--	--	--	.15
114	07-06-92	0000	IOWA	.16	--	--	--	<.10	<.10
115	07-06-92	1730	IOWA	<.10	--	--	--	<.10	<.10
116	07-06-92	1945	IOWA	<.10	--	--	--	<.10	<.10
117	07-06-92	2000	IOWA	.63	--	--	--	<.10	.56
118	07-06-92	1700	USGS	<.05	<0.05	<0.05	--	--	<.20
	07-06-92	1700	IOWA	<.10	--	--	--	<.10	<.10
119	07-06-92	1430	IOWA	<.10	--	--	--	<.10	<.10
120	07-06-92	1400	USGS	.18	.09	<.05	<0.05	--	<.20
	07-06-92	1400	IOWA	.17	--	--	--	<.10	<.10
121	07-06-92	1600	IOWA	<.10	--	--	--	<.10	<.10
122	07-06-92	1500	IOWA	<.10	--	--	--	<.10	<.10
				Shelby County					
123	07-14-92	2000	IOWA	<0.10	--	--	--	<0.10	<0.10
124	07-15-92	1100	IOWA	<.10	--	--	--	<.10	<.10
125	07-14-92	2000	IOWA	3.10	--	--	--	<.10	.10
126	07-14-92	2000	IOWA	<.10	--	--	--	<.10	<.10
127	07-15-92	1100	IOWA	<.10	--	--	--	<.10	<.10
128	07-15-92	1100	IOWA	<.10	--	--	--	<.10	<.10
129	07-14-92	1500	USGS	<.05	<0.05	<0.05	<0.05	--	<.20
	07-14-92	1500	IOWA	<.10	--	--	--	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Agency analyzing sample	Triazine herbicides				Cl-actemide herbicides			
		Prometon	Prometryn	Propazine	Simazine	Alachlor	Metolachlor	Metribuzin	Trifluralin
				Monroe County--Continued					
98	IOWA	--	--	--	--	<0.10	<0.10	<0.10	<0.10
99	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
100	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
101	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
102	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
103	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
104	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
105	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
106	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
107	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
				Scotland County--Continued					
108	IOWA	--	--	--	--	<0.10	<0.10	<0.10	<0.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
109	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
110	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
111	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
112	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
113	IOWA	--	--	--	--	<.10	<.20	<.10	<.10
114	IOWA	--	--	--	--	.20	<.20	<.10	<.10
115	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
116	IOWA	--	--	--	--	<.10	<.20	<.10	<.10
117	IOWA	--	--	--	--	.11	.11	<.10	<.10
118	USGS	<0.05	--	<0.05	<0.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.20	<.10	<.10
119	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
120	USGS	<.05	<0.05	<.05	<.05	<.05	.06	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
121	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
122	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
				Shelby County--Continued					
123	IOWA	--	--	--	--	0.10	0.23	<0.10	<0.10
124	IOWA	--	--	--	--	2.7	<.10	<.10	<.10
125	IOWA	--	--	--	--	<.10	.10	<.10	<.10
126	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
127	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
128	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
129	USGS	<0.05	<0.05	<0.05	<0.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Date	Time	Agency analyzing sample	Triazine herbicides					
				Atrazine	Desethyl-atrazine	Deisopropyl-atrazine	Ametryne	Butylate	Cyanazine
				Shelby County--Continued					
130	07-14-92	1500	IOWA	<0.10	--	--	--	<0.10	<0.10
131	07-14-92	1520	IOWA	<.10	--	--	--	<.10	<.10
132	07-14-92	1545	USGS	<.05	<0.05	<0.05	<0.05	--	<.20
	07-14-92	1545	IOWA	<.10	--	--	--	<.10	<.10
133	07-14-92	1500	IOWA	.61	--	--	--	<.10	<.10
	07-14-92	1500	IOWA	.17	--	--	--	<.10	<.10
134	07-14-92	2030	IOWA	<.10	--	--	--	<.10	<.10
135	07-14-92	2000	IOWA	.21	--	--	--	<.10	<.10
	07-14-92	2000	IOWA	.22	--	--	--	<.10	<.10
136	07-14-92	1600	IOWA	<.10	--	--	--	<.10	<.10
	07-14-92	1600	IOWA	<.10	--	--	--	<.10	<.10
137	07-13-92	1900	IOWA	<.10	--	--	--	<.10	<.10
138	07-13-92	1820	IOWA	<.10	--	--	--	<.10	<.10
139	07-13-92	1400	IOWA	<.10	--	--	--	<.10	<.10
140	07-13-92	1700	IOWA	<.10	--	--	--	<.10	<.10
141	07-13-92	1530	USGS	<.05	<.05	<.05	<.05	--	<.20
	07-13-92	1530	IOWA	<.10	--	--	--	<.10	<.10
142	07-13-92	1615	IOWA	<.10	--	--	--	<.10	<.10
143	07-13-92	1600	IOWA	<.10	--	--	--	<.10	<.10
144	07-13-92	1730	IOWA	<.10	--	--	--	<.10	<.10
145	07-13-92	1740	IOWA	<.10	--	--	--	<.10	<.10
146	07-13-92	0000	IOWA	<.10	--	--	--	<.10	<.10
147	07-14-92	1500	IOWA	<.10	--	--	--	<.10	<.10

Table 8. Herbicide concentrations in water samples collected from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Agency analyzing sample	Triazine herbicides				Cl-actemide herbicides			
		Prometon	Prometryn	Propazine	Simazine	Alachlor	Metolachlor	Metribuzin	Trifluralin
				Shelby County--Continued					
130	IOWA	--	--	--	--	<0.10	<0.10	<0.10	<0.10
131	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
132	USGS	<0.05	<0.05	<0.05	<0.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
133	IOWA	--	--	--	--	.28	<.10	<.10	<.10
	IOWA	--	--	--	--	.32	<.10	<.10	<.10
134	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
135	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
136	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
137	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
138	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
139	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
140	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
141	USGS	<.05	<.05	<.05	<.05	<.05	<.05	<.05	--
	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
142	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
143	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
144	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
145	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
146	IOWA	--	--	--	--	<.10	<.10	<.10	<.10
147	IOWA	--	--	--	--	<.10	<.10	<.10	<.10

Table 9. Selected trace elements, nitrite plus nitrate concentrations, and physical properties of water samples from wells sampled in northwestern Missouri during 1991

[Specific conductance in microsiemens per centimeter at 25 degrees Celsius; pH in standard units; temperature in degrees Celsius; arsenic, iron, and manganese concentrations are total recoverable in micrograms per liter; nitrite plus nitrate concentrations are in milligrams per liter from unfiltered samples; samples analyzed by Missouri Department of Health Laboratory, Jefferson City, Missouri; --, indicates value not determined; <, less than]

Well number (fig. 1)	Date	Time	Specific conductance	pH	Temperature	Arsenic	Iron	Manganese	Nitrite plus nitrate
					Caldwell County				
1	07-15-91	1745	760	--	--	<5	480	60	4.0
2	07-15-91	1615	755	--	--	<5	140	20	<.05
3	07-15-91	1715	650	--	--	<5	130	20	4.3
4	07-15-91	1845	450	--	--	<5	<50	<20	2.0
5	07-15-91	1530	690	--	--	<5	130	<20	5.9
6	07-15-91	1320	845	--	--	<5	<50	<20	8.5
7	07-15-91	0720	780	--	--	<5	90	<20	8.8
8	07-15-91	1930	725	--	--	<5	140	70	4.4
9	07-16-91	1300	1,050	7.0	17.0	<5	<50	50	2.5
10	07-15-91	1245	645	--	13.0	<5	<50	<20	1.8
11	07-15-91	1430	620	--	--	<5	160	110	6.5
12	07-15-91	0000	800	--	--	<5	830	110	1.7
13	07-16-91	1400	380	6.7	21.5	<5	180	<20	.99
14	07-15-91	1400	800	--	16.0	<5	<50	70	33.0
15	07-16-91	1230	795	7.0	17.0	<5	110	<20	3.5
16	07-16-91	1130	875	6.8	19.5	<5	<50	<20	19
					Clinton County				
17	07-16-91	1200	460	--	--	<5	1,610	1,190	<0.05
18	07-16-91	1000	690	--	--	<5	<50	<20	1.2
19	07-16-91	1115	525	--	--	<5	<50	<20	.15
20	07-16-91	1130	710	--	16.0	<5	1,700	<20	8.2
21	07-16-91	0930	920	--	19.5	<5	110	20	5.6
22	07-16-91	1000	680	--	18.0	<5	130	<20	8.0
23	07-16-91	1100	550	--	20.0	<5	<50	<20	1.3
24	07-16-91	0930	750	--	--	<5	80	<20	2.1
25	07-16-91	1215	530	--	--	<5	380	<20	.69
26	07-16-91	1250	550	--	--	<5	70	<20	6.3
27	07-16-91	1230	550	--	--	<5	120	<20	1.2
28	07-16-91	1320	545	--	--	<5	<50	<20	4.0
29	07-15-91	1845	715	--	19.0	<5	<50	<20	12
30	07-16-91	1030	610	--	--	<5	<50	<20	3.3
31	07-16-91	0945	330	--	--	<5	220	20	2.6
32	07-16-91	1130	1,020	--	--	<5	<50	<20	28
33	07-16-91	0820	--	--	--	<5	200	20	8.2
34	07-15-91	1630	865	--	21.0	<5	<50	<20	32
35	07-15-91	1700	280	--	18.0	<5	240	140	2.3
36	07-15-91	1510	655	--	20.0	<5	<50	<20	2.2

Table 9. Selected trace elements, nitrite plus nitrate concentrations, and physical properties of water samples from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Specific conductance	pH	Temperature	Arsenic	Iron	Manganese	Nitrite plus nitrate
					Clinton County--Continued				
37	07-15-91	1530	845	--	18.0	<5	120	<20	24
38	07-15-91	1430	720	--	20.0	<5	<50	<20	1.6
39	07-15-91	1800	665	--	22.0	<5	50	<20	1.8
40	07-15-91	1345	790	--	16.0	<5	50	<20	10
					Daviess County				
41	07-16-91	0820	645	--	20.5	<5	640	440	1.3
42	07-15-91	1430	885	7.0	17.5	<5	140	<20	5.9
	07-15-91	1430	--	--	--	--	--	--	.54
43	07-16-91	1030	740	7.0	19.0	<5	70	<20	6.9
	07-16-91	1030	--	--	--	--	--	--	7.5
44	07-15-91	1600	730	--	19.0	<5	<50	<20	7.0
45	07-16-91	1000	905	7.4	16.0	<5	1,170	80	<.05
46	07-16-91	0930	1,740	7.0	15.0	<5	70	<20	44
47	07-16-91	0830	1,380	7.1	14.5	<5	1,290	1,000	<.05
48	07-15-91	1646	915	7.0	22.5	<5	<50	190	1.9
49	07-15-91	1730	680	--	20.0	<5	<50	<20	10
	07-15-91	1730	--	--	--	--	--	--	9.9
50	07-15-91	1640	555	6.9	16.5	<5	60	<20	<.05
51	07-16-91	0945	540	--	14.0	<5	130	50	3.2
52	07-16-91	1900	175	6.9	15.0	<5	710	320	.58
53	07-16-91	1330	705	--	17.0	<5	60	<20	13
54	07-15-91	1845	775	--	19.5	<5	70	<20	6.2
55	07-16-91	1050	675	--	14.5	<5	300	<20	6.4
56	07-16-91	1600	640	--	--	<5	<50	<20	13
57	07-16-91	1230	570	--	17.0	<5	730	60	.05
58	07-16-91	1145	1,480	--	15.0	<5	80	20	4.1
	07-16-91	1145	--	--	--	--	--	--	3.5
59	07-16-91	1515	965	--	15.0	<5	<50	<20	7.2
60	07-16-91	1415	570	--	20.0	<5	90	20	8.2
					Gentry County				
61	07-10-91	1000	755	7.1	19.5	<5	<50	<20	5.2
62	07-10-91	1100	935	7.0	22.0	<5	<50	20	.22
63	07-09-91	1406	275	--	22.0	<5	990	<20	6.0
64	07-10-91	1145	720	7.3	20.5	<5	<50	<20	3.2
65	07-10-91	1255	970	--	22.5	<5	1,090	20	4.9
66	07-10-91	1315	755	7.2	--	<5	650	170	<.05
67	07-09-91	1305	1,020	--	22.0	9	1,550	1,000	<.05
68	07-09-91	1221	430	--	22.0	<5	140	40	.61

Table 9. Selected trace elements, nitrite plus nitrate concentrations, and physical properties of water samples from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Specific conductance	pH	Temperature	Arsenic	Iron	Manganese	Nitrite plus nitrate
				Gentry County--Continued					
69	07-10-91	1230	1,070	6.9	20.5	<5	170	250	7.7
70	07-09-91	1505	690	--	22.5	<5	<50	<20	5.4
71	07-09-91	1715	840	6.9	17.0	<5	100	<20	2.2
72	07-10-91	0915	680	--	21.0	<5	210	80	1.0
73	07-09-91	1610	2,590	--	16.0	<5	4,850	170	.07
74	07-10-91	1130	365	--	21.0	<5	<50	<20	8.3
75	07-10-91	1045	640	--	14.0	<5	110	240	4.0
76	07-10-91	1130	2,300	--	15.0	<5	910	120	<.05
77	07-10-91	1140	720	--	22.0	<5	50	140	1.8
78	07-10-91	1230	850	--	17.0	<5	1,210	90	<.05
79	07-10-91	1020	830	--	16.0	<5	220	<20	14
80	07-15-91	0800	985	--	--	<5	1,490	150	<.05
81	07-10-91	0931	200	--	20.0	<5	200	<20	1.6
82	07-10-91	1300	445	--	--	<5	60	<20	25
83	07-10-91	1100	1,040	--	14.0	<5	<50	<20	16
84	07-15-91	0730	735	--	19.5	<5	50	<20	--
85	07-15-91	1500	430	--	20.0	<5	430	150	.73
86	07-15-91	1600	500	--	20.0	<5	810	630	1.4
87	07-15-91	0015	865	--	13.5	<5	130	110	20
				Nodaway County					
88	07-09-91	1400	508	6.7	21.0	<5	230	30	5.5
89	07-09-91	1110	1,110	--	21.0	<5	<50	40	5.5
90	07-09-91	1215	200	6.0	21.0	<5	<50	<20	3.6
91	07-09-91	1300	235	6.7	16.5	<5	50	<20	4.3
92	07-09-91	1100	450	7.0	19.0	<5	190	20	.12
	07-09-91	1100	--	--	--	<5	180	20	.13
93	07-08-91	1900	275	6.8	19.5	<5	<50	<20	5.2
94	07-09-91	1015	455	--	--	<5	920	100	<.05
95	07-08-91	1740	1,070	--	18.5	<5	<50	<20	36
96	07-08-91	1800	1,020	--	16.5	<5	1,710	40	3.2
97	07-09-91	1025	740	--	14.5	<5	300	190	1.9
98	07-09-91	0940	375	--	16.5	<5	450	<20	8.6
99	07-09-91	0915	1,050	7.1	14.5	<5	190	<20	60
	07-09-91	0915	--	--	--	--	--	--	63
100	07-08-91	1645	755	7.1	15.5	<5	<50	<20	18
101	07-09-91	1750	1,040	--	14.5	<5	<50	<20	55
102	07-18-91	1800	830	--	18.0	<5	<50	<20	24

Table 9. Selected trace elements, nitrite plus nitrate concentrations, and physical properties of water samples from wells sampled in northwestern Missouri during 1991--Continued

Well number (fig. 1)	Date	Time	Specific conductance	pH	Temperature	Arsenic	Iron	Manganese	Nitrite plus nitrate
				Nodaway County--Continued					
103	07-09-91	1810	665	--	--	<5	60	20	12
104	07-08-91	1520	515	7.2	18.0	<5	<50	<20	13
105	07-08-91	1615	535	--	21.5	<5	100	1,660	.17
106	07-08-91	1650	1,060	--	18.5	<5	<50	500	1.1
107	07-09-91	0840	400	--	22.0	<5	480	80	.09
108	07-08-91	1535	460	--	18.0	<5	440	540	1.8
109	07-08-91	1850	525	--	14.5	<5	890	230	6.4
110	07-09-91	0745	1,570	--	12.5	<5	<50	<20	10
111	07-08-91	1810	440	--	24.5	<5	110	30	6.0
112	07-08-91	0720	295	--	14.5	<5	<50	<20	2.4
113	07-08-91	1700	1,080	--	17.0	7	4,940	2,600	<.05
	07-08-91	1700	--	--	--	--	--	--	<.05
114	07-08-91	1600	680	--	13.5	<5	<50	30	8.5
115	07-09-91	1830	460	--	17.0	<5	50	<20	3.4
116	07-09-91	1000	495	--	14.5	<5	6,600	630	<.05
117	07-08-91	1800	600	--	14.5	<5	180	160	7.3
118	07-08-91	1300	1,300	--	15.0	<5	170	<20	53
119	07-09-91	1100	495	--	14.0	<5	640	60	13
	07-09-91	1100	--	--	--	--	--	--	13
120	07-08-91	0920	625	--	--	<5	<50	<20	23
121	07-09-91	1715	780	--	13.0	<5	100	20	32
122	07-09-91	1700	380	--	17.0	<5	150	20	7.7
123	07-09-91	1230	530	--	15.0	<5	<50	<20	9.9
124	07-09-91	1230	1,090	--	14.0	<5	200	60	41
125	07-09-91	1146	375	--	12.5	<5	100	<20	7.30
126	07-09-91	1545	740	--	17.0	<5	210	40	1.0
127	07-09-91	1615	1,090	--	--	<5	120	<20	30
128	07-09-91	1445	650	--	19.0	<5	100	<20	21
129	07-09-91	1345	410	--	14.0	<5	<50	30	3.5
130	07-09-91	1120	975	--	15.0	<5	<50	<20	36

Table 11. Selected trace elements and nitrite plus nitrate concentrations in water samples from wells sampled in northeastern Missouri during 1992

[Well depth in feet; iron and manganese concentrations are total recoverable in micrograms per liter; nitrite plus nitrate concentrations are in milligrams per liter on unfiltered samples; samples analyzed by the Missouri Department of Health Laboratory, Jefferson City, Missouri; <, less than; --, indicates values not determined]

Well number (fig. 2)	Date	Time	Well depth	Iron	Manganese	Nitrite plus nitrate
			Audrain County			
1	07-14-92	1320	740	3,370	30	<0.05
2	07-13-92	1045	650	340	<20	<.05
3	07-13-92	1001	165	2,260	30	<.05
4	07-14-92	1250	20	350	60	6.7
5	07-14-92	1345	325	60	<20	5.3
6	07-14-92	1405	320	70	20	1.2
7	07-13-92	1200	590	90	<20	1.6
8	07-14-92	1221	50	22,100	460	<.05
9	07-14-92	1207	175	830	30	<.05
10	07-14-92	1145	--	800	20	<.05
11	07-13-92	1232	500	110	<20	<.05
12	07-13-92	1115	20	<50	<20	20
13	07-13-92	0000	270	150	<20	.07
14	07-13-92	1345	640	<50	<20	<.05
15	07-13-92	1315	600	<50	<20	.18
16	07-13-92	2000	25	120	<20	60
17	07-13-92	1700	--	230	30	.15
18	07-13-92	1635	460	120	<20	<.05
19	07-14-92	1550	28	<50	<20	13
20	07-13-92	1805	687	540	20	<.05
21	07-13-92	1900	650	140	<20	.17
22	07-13-92	1935	590	60	<20	<.05
23	07-13-92	1320	500	120	<20	<.05
24	07-14-92	1055	630	<50	<20	.79
25	07-14-92	1700	600	480	20	.08
26	07-13-92	1536	27	<50	<20	22
27	07-14-92	1733	475	<50	<20	.55
28	07-14-92	1000	200	380	<20	.26
			Clark County			
29	07-07-92	1125	35	360	50	0.81
30	07-07-92	1110	25	<50	360	2.6
31	07-07-92	1454	167	3,390	40	<.05
32	07-07-92	1155	345	750	20	<.05
33	07-07-92	1520	137	1,360	20	<.05
34	07-06-92	1023	15	1,500	280	<.05
35	07-07-92	1230	65	1,640	30	<.05
36	07-07-92	1740	--	210	2,190	.19

Table 11. Selected trace elements and nitrite plus nitrate concentrations in water samples from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Date	Time	Well depth	Iron	Manganese	Nitrite plus nitrate
			Clark County--Continued			
37	07-06-92	2050	18	<50	<20	11
38	07-06-92	1121	--	570	40	3.9
39	07-06-92	1210	319	280	<20	.28
40	07-06-92	1240	30	3750	210	4.2
41	07-07-92	0825	30	1,310	1,070	<.05
42	07-06-92	1932	481	740	<20	<.05
43	07-07-92	1322	200	2,830	50	<.05
44	07-07-92	0930	50	450	<20	11
45	07-06-92	1705	20	140	60	7.0
46	07-07-92	1425	--	<50	<20	1.5
47	07-07-92	0930	180	<50	<20	15
48	07-07-92	0930	25	1,070	20	<.05
49	07-06-92	1630	45	70	<20	34
50	07-06-92	1515	35	<50	<20	16
51	07-06-92	1800	28	350	20	1.2
52	07-06-92	1545	65	<50	<20	19
53	07-06-92	1605	50	50	<20	36
54	07-06-92	1435	--	90	<20	.09
			Lewis County			
55	07-06-92	1430	12	130	140	3.4
56	07-06-92	0936	35	15,300	3,020	<.05
57	07-06-92	1050	115	1,870	130	<.05
58	07-06-92	1100	100	<50	20	.07
59	07-06-92	1330	140	2,150	60	<.05
60	07-06-92	1410	--	<50	20	10
61	07-06-92	0956	14	<50	190	9.9
62	07-06-92	1120	60	140	70	2.1
63	07-06-92	1015	--	1,450	490	<.05
	07-06-92	1015	--	1,460	490	<.05
64	07-06-92	1350	135	1,710	30	<.05
65	07-06-92	1230	160	620	60	<.05
66	07-06-92	1205	65	180	<20	41
67	07-07-92	0833	145	1,320	120	<.05
68	07-07-92	0850	268	80	40	<.05
69	07-06-92	1455	150	3,150	110	<.05
70	07-06-92	1515	150	3,490	50	<.05
71	07-06-92	1250	250	1,810	20	<.05
72	07-07-92	1300	--	430	<20	<.05
73	07-07-92	1135	150	1,750	100	<.05

Table 11. Selected trace elements and nitrite plus nitrate concentrations in water samples from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Date	Time	Well depth	Iron	Manganese	Nitrite plus nitrate
			Lewis County--Continued			
74	07-07-92	1340	118	90	<20	<0.05
75	07-07-92	0910	400	290	30	<.05
76	07-07-92	1320	242	110	<20	<.05
77	07-07-92	1100	188	970	220	.39
78	07-07-92	1045	200	2,190	30	<.05
79	07-07-92	1230	140	440	170	6.8
80	07-07-92	1200	187	9,800	110	<.05
81	07-07-92	1410	195	2,450	20	<.05
82	07-07-92	0955	--	1,110	130	.56
			Monroe County			
83	07-13-92	1210	150	4,790	40	<0.05
84	07-13-92	1120	350	70	<20	<.05
85	07-13-92	1050	690	230	<20	.34
86	07-13-92	1305	40	<50	<20	37
87	07-13-92	1325	199	110	20	3.8
88	07-23-92	1245	110	110	<20	24
89	07-13-92	1030	600	<50	<20	24
90	07-13-92	1355	--	90	30	34
91	07-13-92	1140	--	<50	20	.24
92	07-14-92	0900	212	8,700	80	<.05
93	07-14-92	1240	--	140	20	<.05
94	07-14-92	1030	200	300	20	<.05
95	07-13-92	1425	25	50	20	.44
96	07-14-92	1000	150	680	60	<.05
97	07-14-92	1140	340	180	20	<.05
98	07-14-92	1155	192	100	30	.09
99	07-13-92	1655	151	450	150	<.05
100	07-13-92	1450	--	330	20	52
101	07-14-92	1530	120	1,580	170	<.05
102	07-13-92	1625	160	230	110	.16
103	07-14-92	1200	--	<50	<20	18
104	07-13-92	1425	186	370	<20	.14
105	07-14-92	1410	--	150	30	1.2
106	07-13-92	1500	--	2,030	190	<.05
107	07-14-92	1500	400	<50	<20	22
108	07-07-92	1230	28	1,030	680	<.05
109	07-07-92	1200	24	150	<20	.79
110	07-07-92	1300	200	<50	110	9.2
111	07-07-92	1400	--	<50	<20	2.5

Table 11. Selected trace elements and nitrite plus nitrate concentrations in water samples from wells sampled in northeastern Missouri during 1992--Continued

Well number (fig. 2)	Date	Time	Well depth	Iron	Manganese	Nitrite plus nitrate
			Scotland County			
112	07-08-92	1500	30	<50	<20	17
113	07-06-92	1830	20	270	20	2.2
114	07-06-92	0000	50	50	<20	56
115	07-06-92	1730	40	50	<20	40
116	07-06-92	1945	24	350	50	1.4
117	07-06-92	2000	30	<50	<20	1.4
118	07-06-92	1701	30	50	140	21
119	07-06-92	1430	20	<50	<20	32
120	07-06-92	1401	28	90	40	5.2
121	07-06-92	1600	28	920	370	<.05
122	07-06-92	1500	24	<50	<20	1.5
			Shelby County			
123	07-14-92	2000	180	--	--	--
124	07-15-92	1100	60	20	<20	0.12
125	07-14-92	2000	220	--	--	--
126	07-14-92	2000	38	--	--	--
127	07-15-92	1100	50	130	<20	.39
128	07-15-92	1100	180	780	40	<.05
129	07-14-92	1501	75	160	20	1.8
130	07-14-92	1500	550	670	160	<.05
131	07-14-92	1520	130	1,150	60	<.05
132	07-14-92	1546	32	<50	<20	13
133	07-14-92	1500	30	50	<20	9.9
134	07-14-92	2030	120	1,050	120	<.05
135	07-14-92	2000	14	120	30	19
136	07-14-92	1600	100	490	90	<.05
137	07-13-92	1900	132	4,050	190	<.05
138	07-13-92	1820	110	<50	40	19
139	07-13-92	1400	240	<50	<20	<.05
140	07-13-92	1700	87	160	<20	.82
141	07-13-92	1530	120	1,670	30	<.05
142	07-13-92	1615	155	2,250	150	<.05
143	07-13-92	1600	350	1,690	40	<.05
144	07-13-92	1730	--	5,050	60	<.05
145	07-13-92	1740	159	1,020	180	<.05
146	07-13-92	0000	318	510	20	<.05
147	07-14-92	1500	--	3,710	90	<.05