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Ground Water Monitoring Project for Arkansas, Phase III

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Arkansas Water Resources Center

COMPLETION REPORT: GROUND WATER MONITORING PROJECT FOR ARKANSAS, PHASE III

1994

by

PART I

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PREFACE

This report is composed of two parts. The first part is an interpretation of the pesticide and nitrate data collected in Woodruff County based on samples collected during 1994. Because there is an indication that there were hydrological differences between 1994 and 1995, and because most of the pesticide data is from 1994, this interpretive portion is restricted to 1994 data. Six wells initially sampled in 1994 that contained pesticides had continuing contamination in re-sampling in 1994 and 1995. Part I was published with the following citation:

Steele, Kenneth F., Steven S. Hill, Terry W. Nichols, H. Don Scott, Paul Vendrell, and H.S. Lin, 1996, Impact of Agricultural Chemicals on the Alluvial Aquifer, Lower Mississippi River Delta *in* UCOWR '96 Proceedings, Integrated Management of Surface and Ground Water, The Universities Council on Water Resources, Carbondale, IL, p. 50-59.

The second part of the report is a presentation of the quality assurance and quality control of the analyses. Part II lists a seventh well in Woodruff County that contained pesticides in February and May of 1995.

PART I
IMPACT OF AGRICULTURAL CHEMICALS
ON THE ALLUVIAL AQUIFER
LOWER MISSISSIPPI RIVER DELTA

IMPACT OF AGRICULTURAL CHEMICALS ON THE ALLUVIAL AQUIFER, LOWER MISSISSIPPI RIVER DELTA

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ABSTRACT

Because of the widespread use of pesticides and nitrogen fertilizers, there has been concern about ground water contamination of the alluvial aquifer in the Lower Mississippi Valley. The upper most and major aquifer of the region is the alluvial aquifer which is located in the lower sand and gravel unit of Quaternary deposits. At some locations a clay confining unit occurs at the top of the aquifer. In order to evaluate the impact of agricultural chemicals on the ground water quality of this region, Woodruff County which is representative of the area was chosen for study. Woodruff County has an area of about 378,000 acres of which 73 percent is cropland. Irrigated cropland comprises 53 percent of the county and averages 284 Mgal/d of water withdrawal. Well-drained, loamy soils occur in the central portion of the county, and poorly-drained, clayey and loamy soils occur in the extreme west and east portions.

Water samples were collected from 31 wells in the alluvial aquifer in the cropland areas of Woodruff County. Six of the sites were contaminated with pesticides (acifluorfen, bentazon, fluometuron, metolachlor, and metribuzin). All of the pesticide-contaminated wells were less than 61 ft deep. Samples collected from shallow (<50 ft deep) wells had a median concentration of 2.94 mg/L nitrate-N and for deep (50-90 ft deep) wells was 0.13 mg/L. The median iron concentrations for shallow and deep wells were 0.03 and 0.21 mg/L, respectively. High nitrate and high iron concentrations are mutually exclusive. These observations are consistent with the upper portion of the aquifer being more oxidizing.

Fifteen of the 20 wells with nitrate-N above background concentrations (>0.4 mg/L) are located in areas with relatively high sensitivity based on a modified DRASTIC model. Five of the six wells with pesticide contamination are located in areas of relatively high vulnerability. The DRASCTIC model appears to be useful for indicating areas susceptible to contamination from nitrate and pesticides. Although four of the wells with pesticide contamination also have high nitrate-N concentrations, the difference in degradation rates for nitrate and pesticides make the use of elevated nitrate-N concentrations as an indication of potential pesticide difficult.

INTRODUCTION

The use of pesticides and commercial fertilizers for intense crop production in the Lower Mississippi Valley Delta region (Delta) has led to concern about the potential contamination of ground water by agricultural chemicals. Throughout the United States there is a significant increase of nitrate in older wells, poorly constructed wells, and wells poorly sited with respect to point source contamination (Helsel, 1995). Such wells are often the types of wells present in the Delta.

The objective of this study was to determine the impact of nitrate and pesticides on the alluvial aquifer in the Delta. Woodruff County, in eastern Arkansas (Figure 1) was selected as the study area because it is representative of a large part of the Delta. The county covers an area of about 378,000 acres with 73% in cropland. Wheat, rice, soybeans, milo, cotton, and vegetables are the major crops (Scott and Smith, 1993). About 53 percent of the county is irrigated. Ground water provides 258.13 million gallons per day (Mgal/d) and surface water 26.07 Mgal/d for irrigation (Holland et al., 1991). The alluvial aquifer supplies much of these withdrawals and is the major source of drinking water for the rural population.

DESCRIPTION OF THE STUDY AREA

The physiography of Woodruff County consists of floodplains of the White River, the Cache River and the Bayou DeView with oxbow lakes, loessal plains and loessal ridges. The elevation of the land ranges from 190 to 235 feet above sea level, and slopes slightly to the south (Stephenson and Crider, 1916). The slope ranges from less than 1 percent on the floodplains to as much as 8 percent on the loessal plains. Soils are well-

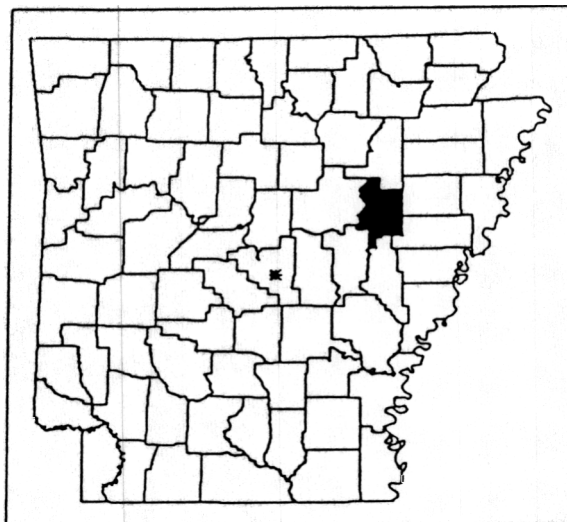


Figure 1. Location of the study area. Little Rock is marked with an asterisk.

drained and loamy in the central portion of the county, and poorly-drained, and clayey and loamy in the extreme west and east.

Three major rivers drain most of Woodruff County. The White River drains the western part of the county, the Cache River the central part, and Bayou DeView the eastern part. Woodruff County has hot humid summers and mild winters. Average air temperatures are 78°F (June) and 44°F (December). Precipitation is about 51 inches a year (1% snow). Short periods of drought, especially during late-summer are frequent (Maxwell et al, 1968). Droughts make irrigation using ground water a common practice.

HYDROGEOLOGY

The principal aquifer in Woodruff County is the alluvial aquifer the Sparta Sand and Wilcox aquifers the next most important aquifers, respectively. Quaternary alluvium of Pleistocene and younger age consists of two units -- a lower sand and gravel water-bearing unit which grades into an upper silt and clay unit that acts as a confining unit (Stephenson and Crider, 1916; Fitzpatrick et al., 1990). Maximum aquifer thickness is about 150 feet in the study area (Broom and Lyford, 1982).

Well yields are 1000 to 3000 gallon per minute (Fitzpatrick et al., 1990). Hydraulic conductivity ranges from 100 to 400 feet per day (Broom and Lyford, 1982). Recharge comes from percolation of rainfall through the silt and clay cover and by inflow from streams. The water moves in the direction of general land slope and toward streams that drain the alluvial lands (Petersen et al., 1985). The natural direction of flow in the aquifer has been altered by intensive pumping for irrigation in the eastern part of the county. Flow toward the pumping-stressed area is eastward from the Cache River (Broom and Lyford, 1982). During flood stage, the streams recharge the aquifer. In areas of large ground water withdrawals, larger streams can be a year-round source of aquifer recharge, and the alluvial aquifers can receive substantial quantities of recharge from underlying aquifers as a result excessive drawdown from irrigation (Petersen et al., 1985). Stream recharge and the pumping stress both may increase the potential for ground water contamination from surface sources.

Water levels increase from a potentiometric surface of 150 feet (60 feet below land surface) in southeastern Woodruff County to about 190 feet (20 feet below land surface) in northwestern Woodruff County (Westerfield and Poynter, 1994). Shallow water tables are generally more susceptible to pesticide contamination. Water levels fluctuate seasonally, typically rising in the winter and spring, and declining in the summer and fall (Parks et al., 1995).

METHODOLOGY

The 31 wells sampled in this study were chosen with an emphasis on shallow wells in vulnerable areas (areas with high pesticide usage, and sensitivity to contamination -- see DRASTIC MODEL section below). In order to obtain ground water samples representative of ambient aquifer conditions, the wells were purged until temperature, conductance and pH of the water stabilized. Sampling commenced before pesticide application in May, during pesticide application, and after pesticide application into September, 1994. Well depths were owner reported. Five of the wells had unknown depths.

Analyses were conducted at the Arkansas Water Resources Center Water Quality Laboratory (WQL) using gas chromatography or liquid chromatography as prescribed by EPA 507.1, EPA 515.2, and National Pesticide Survey #4 methods which involve solid-liquid and liquid-liquid extractions (EPA, 1992, 1991a, and EPA, written communication). Any detections were confirmed by the Arkansas State Plant Board Laboratory using a gas chromatograph with a mass spectrometer detector, or by the WQL using a high performance liquid chromatograph with an alternate column. Any well containing pesticides was sampled again and the confirmation process repeated. A raw water sample and a sample spiked with pesticides of interest were collected and preserved at each site and immediately placed on ice or refrigerated until extracted. All extractions and analyses were performed within regulatory holding times in each method. The spiked sample in conjunction with the raw water was used to determine any pesticide loss from time of collection until analysis. Iron (ferrous + ferric) was analyzed using inductively coupled plasma emission spectrometry (EPA 200.7) (EPA, 1991b) and nitrate-N was analyzed by ion chromatography (EPA 300.0) (Pfaff et al., 1989).

DRASTIC MODEL

Whether a pesticide is likely to migrate to ground water depends on the characteristics of the site where it is applied, and on characteristics of the pesticide such as half-life, solubility in water, volatility, and adsorption. "DRASTIC" is an aquifer sensitivity index developed by the EPA which assesses aquifer sensitivity to contamination (Aller et al., 1987). A modified version of pesticide DRASTIC was developed for Woodruff County and used in a geographical information system (GIS) to generate an aquifer sensitivity map (Lin et al., 1996). The DRASTIC model considers the following factors: (1) depth to water, (2) net recharge, (3) aquifer media, (4) soil media, (5) topography, (6) impact of the vadose zone, and (7) hydraulic conductivity. The weighting factor for impact of the vadose zone was increased from 4 to 7 for this study in order to reflect the significance of the thickness of the clay cap confining unit in the study area. The sensitivity index ranged from 46-84 for Woodruff County. Higher indices indicate greater sensitivity to pollution.

The ground water vulnerability model combines pesticide usage with the sensitivity index to produce a relative vulnerability index (Lin et al., 1996). The vulnerability index was expressed as a percentage of the highest product of the sensitivity index and estimated pesticide application rate. The relative ground water vulnerability index for pesticides ranged from 0-93 for Woodruff County. The lowest vulnerability indices were in the eastern portion of the county where water tables are deeper, soils more impermeable, and the clay confining unit is thicker.

NITRATE

From July 1, 1993 to June 30, 1994 sales of nitrogen containing fertilizer with nitrogen components were 22,745 tons for Woodruff County (Arkansas Agricultural Statistics Service, 1994). Although these quantities of fertilizer have the potential of impacting the ground water, only one well (30 ft deep) with a concentration of 9.26 mg/L nitrate-N was close to the 10 mg/L maximum contaminant level (MCL) for drinking water

(EPA, 1994). Studies in alluvial deposits in other states have reported a relatively high number of wells exceeding 10 mg/L nitrate-N. For example, Detroy et al. (1990) reported 50% of wells less than 40 deep in an alluvial aquifer in Iowa exceeded the MCL for nitrate-N.

The median nitrate-N concentration for shallow wells (<50 ft deep) was 2.94 mg/L compared to a median concentration of only 0.13 mg/L for deep wells (50-90 ft deep) (Table 1). The median nitrate-N concentration for wells in this intensively-cropped alluvial area is much less than that for predominantly agricultural areas in the Northeast, Midwest and West Coast regions of the U.S.A. (Helsel, 1995). In the Southeast increased denitrification rates have been suggested as part of the reason for less nitrate-N contamination (Spalding and Exner, 1993; Jacobs and Gilliam, 1985). The presence of the clay confining unit in certain areas also limits the amount of surface contamination to the aquifer. The trend of decreasing nitrate-N concentration with increasing well depth (Table 1) is consistent with other studies (e.g., Detroy et al., 1990), but these have often used a depth of 100 ft to separate shallow and deep wells (Helsel, 1995).

High iron concentrations in ground water can be used as an indication of conditions favorable for denitrification. High nitrate-N and high iron concentrations are essentially mutually exclusive in this study (Figure 2 and Table 1). Nitrate occurs in shallow, more oxygenated ground water; whereas, iron tends to occur

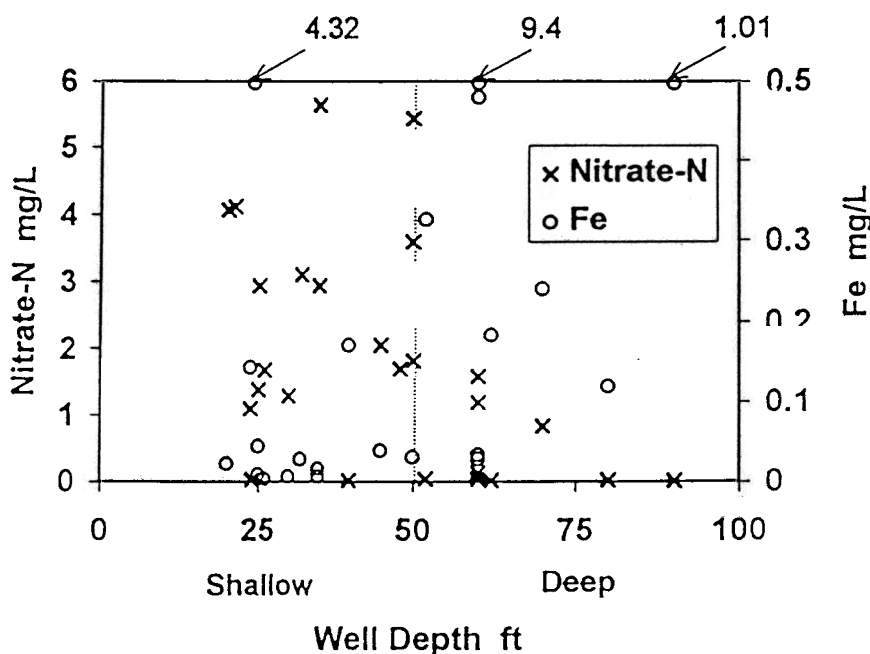


FIGURE 2. Nitrate-N and iron concentrations versus well depth.

TABLE 1. Median concentrations of nitrate-N and iron with respect to well depth. N = number of wells in each category.

WELL DEPTH ft	NITRATE-N mg/L	Fe mg/L
< 50	2.94	0.03
N	15	12
>50-90	0.13	0.21
N	11	10

in deeper, more reduced ground water. Iron in the shallow wells is precipitated as iron oxides or hydroxides leading to lower soluble iron in the ground water. Bacteria utilizing carbon as an electron donor play an important role in the redox reactions of nitrogen and iron. Without bacteria these redox reactions take place slowly. Certain bacteria can use iron as an electron donor in place of organic matter with nitrate acting as the electron acceptor (Korom, 1992). The relationship of iron with depth may involve more than simple lack of oxygen from the surface. Reducing soils cause denitrification; however, denitrification can occur in ground water. Chapelle and Lovely (1992) have described a case where iron has been reduced in a confined aquifer.

Background nitrate-N concentration for Woodruff County is defined as 0.4 mg/L. This background level is based on the median concentration (0.4 mg/L nitrate-N) for another aquifer in Arkansas in a pristine areas with forest cover (Steele et al., 1992). This background level is much less than that of Madison and Brunett (1985) who consider concentrations greater than 3 mg/L nitrate-N as indication of human activities based on a nationwide survey of 87,000 wells, but 0.4 mg/L seems appropriate for this study area (note that the background level for deep wells in this study is 0.13 mg/L).

Utilizing 0.4 mg/L nitrate-N as the background concentration, 20 of the 31 wells may be considered contaminated with nitrate (Table 2). Fifteen of the wells with nitrate exceeding 0.4 mg/L nitrate-N are in high sensitivity areas (sensitivity index greater than 70), and five are located in low sensitivity areas (Figure 3). Ten of the 11 wells not exceeding background concentrations of nitrate-N are in low sensitivity areas.

TABLE 2. Number of wells above and below the background nitrate-N concentration with respect to sensitivity indices (SI) and pesticide contamination.

NITRATE- N mg/L	SI > 70	SI < 70	WITH PESTICIDES	WITHOUT PESTICIDES
> 0.4	15	5	4	16
<0.4	1	10	2	9

PESTICIDES

Pesticide pollution in ground water is potentially harmful to residents, but not much is known about pesticide contamination of ground water in the Delta. Over 345,000 pounds of pesticides with medium to large leaching potentials were used in Woodruff County in 1991 (Ples Spladley, personnel communication, 1992). Mixing/loading sites have a high potential for ground water contamination if proper management is not implemented. Table 3 lists the pesticides that are frequently used in Woodruff County which were monitored by the WQL (Scott and Smith, 1993).

Six of the 31 (19 %) wells monitored in this study contained pesticides (Table 4). This percentage is *not* an indication of the overall of well contamination in the Delta or Woodruff County, because this study focused on shallow wells in the most vulnerable areas of the county. Five of these six sites are in the areas with a vulnerability index greater than 70 (Figure 4). Most of the pesticide concentrations were low, but two wells had bentazon concentrations exceeding the health advisory limit of 20 µg/L (EPA, 1989b) (Table 4). All of the wells had detectable pesticides during re-sampling. Only one well (#9), however, had multiple pesticide detection and these were duplicated in May, June, and July of 1994 and in May, 1995.

Four of the wells with pesticide contamination also contained relatively high concentrations of nitrate-N (i.e., exceeds the background of 0.4 mg/L) (Tables 2 and 4). Detroy et al. (1990) reported nitrate-N concentrations of 15 mg/L for wells with pesticide contamination and 7.3 m/L for those without pesticides. The high solubility of nitrate compounds combined with lack of anion exchange sites in the soil and aquifer make nitrate very mobile in water. Nitrate in shallow, well oxygenated ground water in highly permeable sediment can migrate large distances from input areas (Freeze, 1979). These observations suggest that high nitrate-N concentrations might be useful in predicting potential pesticide contamination. However, as indicated in Table 2, higher nitrate-N concentrations often are not accompanied by pesticide contamination. This situation

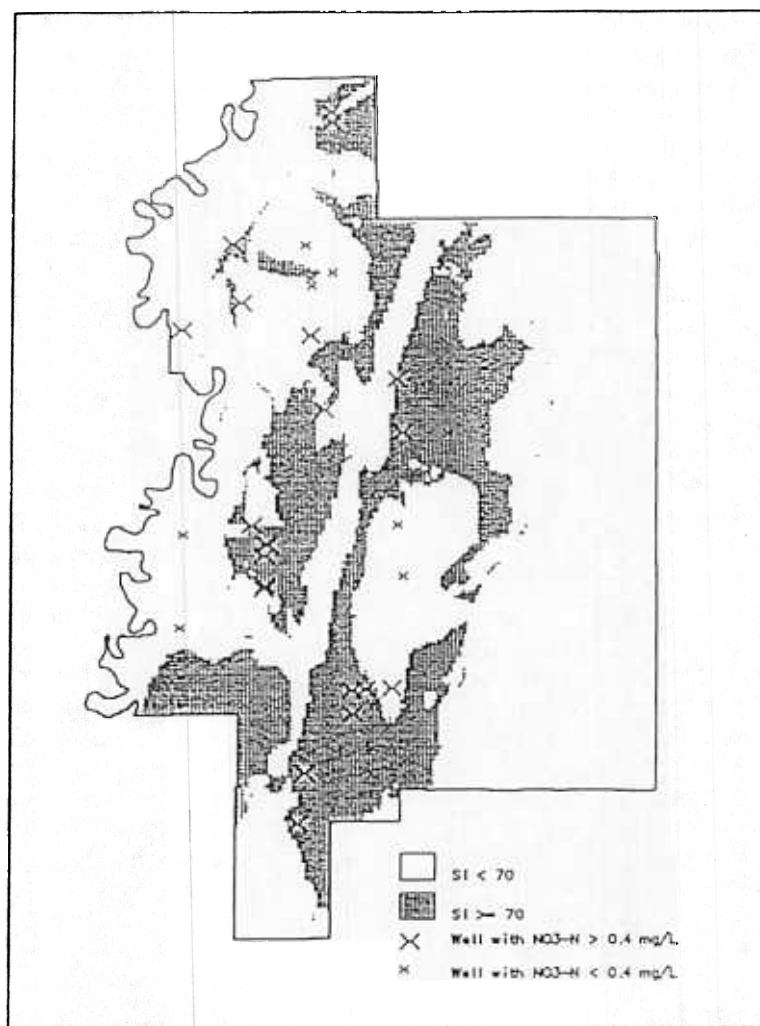


FIGURE 3. Well locations with respect to sensitivity indices (SI) greater than 70 and nitrate-N concentration levels.

TABLE 3. Pesticides in Woodruff County with medium to high large leaching potential that were monitored in this study. Half-life and typical crop usage for these pesticides also are provided. Rank is based on the pounds of pesticide used.

RANK	COMPOUND	CROPS	HALF-LIFE days	LEACHING POTENTIAL
1	Metolachlor	corn, soybeans	90	medium
2	Alachlor	corn, soybeans	60	large
3	Molinate	rice	21	medium
4	Atrazine	corn, sorghum	60	medium
5	2,4-D	pasture, wheat	10	medium
6	Bentazon	soybeans, rice	20	medium
7	Metribuzin	soybeans, potatoes	40	large
8	Acifluorfen	soybeans, peanuts	14	medium
13	Norflurazon	cotton	30	medium
14	Linuron	soybeans, cotton	60	medium
16	Fluometuron	cotton	85	medium
17	Cyanazine	corn, cotton	14	medium

TABLE 4. Data for wells with pesticide contamination.

WELL	DATE	DEPTH ft	PESTICIDE µg/L	NITRATE mg/L	Fe mg/L
7	5/94, 6/94, 7/94 5/95	unknown	bentazon 55, 66, 78, 21	0.01, --, <0.01, <0.01	2.95, --, 2.08, 2.18
9	5/94, 6/94, 5/95	60	bentazon 25, 88, 37 acifluorfen 1.7, 8.6, 6.8 fluometuron 0.9, 0.8, 0.4	0.13, --, 0.31	0.03, --, 0.82
11	7/94, 2/95	35	metolachor 13, 11.5	5.65, 6.47	0.01, 0.01
25	9/94, 2/95	45	bentazon 4.4, 1.9	2.05, 2.87	0.04, 0.04
26	9/94, 2/20	60	bentazon 1.5, 0.9	1.19, 1.72	0.01, 0.70
29	9/94, 2/20	26	metribuzin 0.35, 0.4	1.68, 0.75	0.16, 0.54

may be the result of greater retardation and/or degradation rates for pesticides compared to those for nitrate. The relatively high iron concentration for well #7 (Table 4) indicates that the conditions in this well were favorable for denitrification. The potential for pesticide contamination cannot be ruled out on the basis of low nitrate concentrations because denitrification may have occurred in the vadose zone, or minimal fertilizer may have been used in an area.

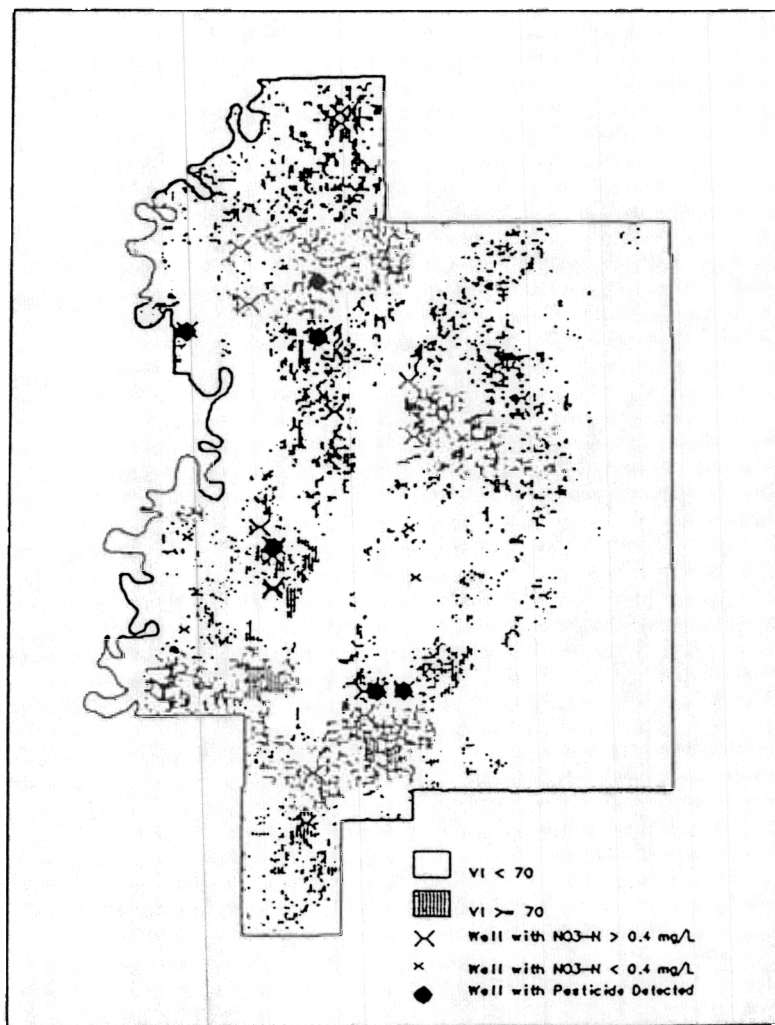


FIGURE 4. Location of wells with respect to vulnerability indices (VI) greater than 70, pesticide contamination, and level of nitrate-N concentration.

CONCLUSIONS

There are higher nitrate-N concentrations in shallow wells (<50 ft deep) than in deeper wells in the alluvial aquifer. These nitrate-N concentrations are lower in Woodruff County than those reported for other regions of the country. Higher rates of denitrification are probably responsible for these differences in combination with lower nitrogen fertilizer application rates and the presence of the clay confining unit in parts of the region. Wells with elevated nitrate-N concentrations are coincident with areas with higher sensitivity indices, and wells with background nitrate-N concentrations are mostly located in areas with lower sensitivity. The modified DRASTIC model is capable of indicating areas that may have elevated nitrate concentrations.

Because of the difference in application rates and in the chemical and biological reactions involving nitrate and pesticides, there are difficulties in using nitrate-N as an indication of potential pesticide contamination. It appears that the modified DRASTIC model may be helpful in delineating areas potentially susceptible to pesticide contamination.

ACKNOWLEDGMENTS

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LITERATURE CITED

Arkansas Agricultural Statistics Service, Arkansas Agricultural Statistics, 1994: Arkansas Agricultural Experiment State, University of Arkansas, Fayetteville, AR

Aller, L., Bennett, T., Hackett, G., Lehr, J., and R.J. Petty, 1987, DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings: Report No. EPA/600/2-87/035. U.S. Environmental Protection Agency, Ada, OK., 643 pp.

Broom, M.E., and Lyford, F.P., 1982, Alluvial Aquifer of the Cache and St. Francis River Basins, Northeastern Arkansas, Water Resources Circular No. 13, U.S. Geological Survey, Little Rock, AR, 77 pp.

Chapelle, F.W. and Lovely, D.R., 1992, Competitive exclusion of sulfate reduction by Fe (III) reducing bacteria: a mechanism for producing discrete zones of high iron water: Ground Water, Vol. 30, p. 29-36.

Detroy, M.G., Clark, M.L., Holub, M.A., Hunt, P.K.B., 1990, Water quality of alluvial aquifers, Carroll and Guthrie counties, Iowa, with emphasis on the occurrence of nitrate and pesticides, 1986-1987: Water Resource Investigations 52, Report # WRI89-4186, U.S. Geological Survey, Denver, CO, 52 pp..

EPA, 1994, Drinking Water Regulations and Health Advisories: Office of Water, U.S. Environmental Protection Agency, Washington, DC, 13 pp.

EPA, 1992, Methods for the Determination of Organic Compounds in Drinking Water: Supplement II. EPA-600/R-92/129, U.S. Environmental Protection Agency, Cincinnati, OH, pp.51-88.

EPA, 1991a, Methods for the Determination of Organic Compounds in Drinking Water: EPA-600/4-88/039, U.S. Environmental Protection Agency, Cincinnati, OH, p. 143-170.

EPA, 1991b, Methods for the Determination of Metals in Environmental Samples: U.S. Environmental Protection Agency, Cincinnati, OH, p. 31-82.

- Fitzpatrick, D.J., Kilpatrick, J.M., and H. McWreath, 1990, Geohydrologic Characteristics and Simulated Response to Pumping Stresses in the Sparta Aquifer in East-Central Arkansas: U.S. Geological Survey Water Resources Investigations Report 88-4201. U.S. Geological Survey, Little Rock, AR., 50 pp.
- EPA, 1989, Health Advisory Summaries: U.S. Environmental Protection Agency, Washington, DC (un-numbered sheets).
- Freeze, R.A., and Cherry, J.A., 1979, Groundwater: Prentice-Hall, Inc., Englewood Cliffs, NJ, 604 pp.
- Helsel, Dennis R., 1995, Nitrate in the nation's waters: a summary of recent studies: Water Resources Update, Issue 101, p.12-17.
- Holland, T.W., Manning, C.A., and K.L. Stafford, 1991, Summary of Reported Agriculture and Irrigation Water Use in Woodruff County, Arkansas, 1991: U.S. Geological Survey Open-File Report 93-634. U.S. Geological Survey, Little Rock, AR., 4 pp.
- Korom, S.F., 1992, Denitrification in the saturated zone: a review: Water Resources Research, Vol. 28, p. 1657-1668.
- Jacobs, T.C., and Gilliam, J.W., 1985, Riparian losses of nitrate from agricultural drainage waters: Journal of Environmental Quality, Vol. 14, p. 472-478.
- Lin, H.S., Scott, H.D., Steele, K.F., 1996, Development of a ground water vulnerability map for pesticide contamination for the Arkansas Delta using GIS: Proceedings of the GIS and Water Resources Symposium, American Water Resources Association, Herndon, VA, in press.
- Madison, R. J., and Brunett, J.O., 1985, Overview of the occurrence of nitrate in ground water of the United States *In* National water summary 1984--Hydrologic events selected water-quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, p. 98-105.
- Maxwell, G.R., Clark, J.V., Dahlke, G.R., and Hoelscher, J.E., 1968, Woodruff County Soil Survey: U.S. Department of Agriculture Soil Conservation Service in cooperation with the Arkansas Agricultural Experiment Station, 60 pp.
- Nichols, T. and S. Wilkes, 1992, Arkansas Agricultural Chemical Ground Water Management Plan: Arkansas Water Resources Research Center, University of Arkansas, Fayetteville, AR., 98 pp.
- Petersen, J.C., Broom, M.E., Bush, W.V., 1985, Geohydrologic Units of the Gulf Coastal Plain in Arkansas: U.S. Geological Survey Water-Resources Investigations Report 85-4116. U.S. Government Printing Office, Washington, DC, 20 pp.
- Pfaff, J.D., Brockhoff, C.A., and O'Dell, J.W., 1989, Test Method, The Determination of Inorganic Anions in Water by Ion Chromatography - Method 300.0: U.S. Environmental Protection Agency, Cincinnati, OH, 9 pp.
- Steele, K.F., Daniel, T.C., Edwards, D.R., 1992, Interaction of poultry waste and limestone terrain on water quality: professional and public information dissemination *in* Hydrology and Water Resources Education, Training and Management, ed. Jose A. Raynal, Water Resources Publications, Littleton, CO, p. 441-448.
- Scott, H.D. and P.A. Smith, 1993, Determination of Areas Vulnerable to Pesticide Contamination of Ground Water by GIS and Satellite Remote Sensing: Arkansas Water Resources Center, University of Arkansas, Fayetteville, AR., 27 pp.
- Spalding, R.F., and Exner, M.E., 1993, Occurrence of nitrate in groundwater - a review: Journal of Environmental Quality, Vol. 22, p. 392-402.

Stephenson L.W. and Crider, A.F., 1916, Geology and Ground Waters, Northeastern Arkansas *In*: U.S. Geological Survey Water Supply Paper No. 399 U.S. Government Printing Office, Washington, DC, pp. 275-280.

Westerfield, P.W., and Poynter, D.T 1994, Water Level Maps of the Mississippi River Valley Alluvial Aquifer in Eastern Arkansas, Spring 1992: U.S. Geological Survey Open File Report 93-374, Little Rock, Ark., 1 p.

BIOGRAPHICAL SKETCHES

K.F. Steele is professor of Geology and Director of the Arkansas Water Resources Center at the University of Arkansas, Fayetteville. Steele's interests are in ground water quality monitoring, protection, and management.

S.S. Hill, is interested in aqueous geochemistry and is presently pursuing a Ph.D. in the Department of Geology, University of Alabama.

T.W. Nichols is a Research Scientist with the Arkansas Water Resources Center, Water Quality Laboratory at the University of Arkansas, Fayetteville. He has been involved in all aspects of monitoring for pesticides in ground water in eastern Arkansas.

H.D. Scott, is a soil physicist with rank of University Professor of Agronomy at the University of Arkansas, Fayetteville. Recently Scott has been involved in the development of models for contaminant transport utilizing geographical information systems.

P.F. Vendrell is Laboratory Manager of the Arkansas Water Resources Center, Water Quality Laboratory, University of Arkansas Fayetteville. He is a soil scientist who holds the rank of Adjunct Assistant Professor in the Departments of Geology and Agronomy.

H.S. Lin holds a post-doctoral position in the Department of Agronomy at the University of Arkansas. His expertise is in the areas of hydrology, modeling and geographical information systems.

PART II

QUALITY ASSURANCE REPORT

AUGUST , 1994 - JULY 31, 1995

PHASE III: WOODRUFF COUNTY

QUALITY ASSURANCE REPORT: ARKANSAS STATE
PESTICIDES IN GROUND WATER MONITORING PROJECT
PHASE III
WOODRUFF COUNTY

T. Nichols, P. Vendrell, K. Steele¹

I. Introduction

Between May, 1994 and May, 1995, seventy water samples were drawn from sixty wells in Woodruff County. Ten liters of water were collected from each well, providing enough water to have a sample and a field fortified sample for each of the three methods, as well as extra water for duplicate analysis. Table 1 shows a list of the pesticides analyzed in these samples and the methods used.

Table 1. Phase III Analytes.

<u>Compound</u>	<u>Source/Method</u>	<u>Matrix</u>	<u>Units</u>	<u>EDL</u>
Metolachlor	EPA/507.1	groundwater	ug/L	0.75
Alachlor	EPA/507.1	groundwater	ug/L	0.38
Molinate	EPA/507.1	groundwater	ug/L	0.15
Atrazine	EPA/507.1	groundwater	ug/L	0.13
Metribuzin	EPA/507.1	groundwater	ug/L	0.15
Norflurazon	EPA/507.1	groundwater	ug/L	0.50
Linuron	NPS/4	groundwater	ug/L	0.25
Flumeturon	NPS/4	groundwater	ug/L	0.10
Cyanazine	NPS/4	groundwater	ug/L	0.58
Diuron	NPS/4	groundwater	ug/L	0.070
2,4-D	EPA/515.2	groundwater	ug/L	0.20
Bentazon	EPA/515.2	groundwater	ug/L	0.20
Acifluorfen	EPA/515.2	groundwater	ug/L	0.096

Of the 60 wells tested, seven showed trace levels of pesticides. Table 2 shows a listing of the contaminated wells including the concentrations detected in samples taken at different times.

II. Interpretation of QC data.

During the project, thirteen trips were made to collect water. The samples collected on each trip were extracted and analyzed as a batch, with each batch being subdivided into the three methods of analysis indicated in Table 1. The tabulated quality control data follow this format. Thus, for each sampling trip the reported analysis results are accompanied by three

¹Arkansas Water Resources Center, University of Arkansas.

Table 2. Wells in Woodruff County Contaminated with Pesticides.

Well #	Date Sampled	Chemical	Conc. (µg/L)	
7	May 23, 1994	Bentazon	55	
	June 29, 1994	Bentazon	66	
		Fluometuron	0.4	
	July 27, 1994	inside	Bentazon	78
		outside	Bentazon	69
	May 15, 1995	Bentazon	21	
9	May 24, 1994	Bentazon	25	
		Aciflurofen	1.7	
		Fluometuron	0.9	
	June 29, 1994	Bentazon	88	
		Aciflurofen	8.6	
		Fluometuron	0.8	
	May 15, 1995	Bentazon	37	
		Aciflurofen	6.8	
		Fluometuron	0.4	
11	July 26, 1994	Metolachlor	13	
	Feb. 20, 1995	Metolachlor	11.5	
25	Sep. 15, 1994	Bentazon	4.4	
	Feb. 20, 1995	Bentazon	1.9	
26	Sep. 15, 1994	Bentazon	1.5	
	Feb. 20, 1995	Bentazon	0.9	
29	Sep. 29, 1994	Metribuzin	0.4	
	Feb. 20, 1995	Metribuzin	0.4	
34 (PB)	Feb. 20, 1995	Alachlor	1.5	
	May 15, 1995	Bentazon	1.5	
		Aciflurofen	0.5	

QC sheets, one for each method. The following paragraphs are intended as an aid in interpreting the QC data.

The major QA/QC concern of this study is to demonstrate an ongoing ability to detect small amounts of pesticides in various ground waters. Primary to this purpose are the three (one for each method) field fortified samples collected from each well and spiked with low levels of the appropriate pesticides. Table 3 shows the concentrations of these pesticides in the "field spikes." Extraction and analysis of these field spikes were done for every well and for every method, far exceeding EPA's recommendation that one in ten samples be field fortified. A consistent, high recovery of the pesticides spiked into the

various ground waters is good indication that sample extraction and analysis are acceptable, that nothing in the ground waters is preventing the detection of pesticides in the non-fortified samples and that sample handling procedures are adequate to avoid pesticide degradation.

As a further check that small amounts of pesticide will not go unnoticed, 2X standards (containing pesticide concentrations at about two times the estimated detection limit for the pesticide) were analyzed with each batch. Concentrations for the 2X standards are also included in Table 2. For each batch and each method, peak areas for a 2X standard are reported to demonstrate instrument capability to detect very small amounts of pesticides. EPA holding times for samples and extracts were met without exception and samples and extracts were held at or below 4°C at all times.

Table 3. Spiking Levels.

METHOD	PESTICIDE	CONCENTRATION (ug/L)	
		FIELD SPIKE	2X STANDARD
507	Molinate	2.00	0.40
	Atrazine	2.06	0.41
	Metribuzin	2.10	0.42
	Alachlor	4.08	0.81
	Metolachlor	13.72	2.74
	Norflurazon	5.90	1.18
515.2	2,4-D	3.00	0.60
	Bentazon	7.21	1.44
	Acifluorfen	3.15	0.63
NPS4	Cyanazine	6.42	1.28
	Fluometuron	1.10	0.22
	Diuron	0.99	0.20
	Linuron	3.03	0.60

Recovery of a spiked pesticide from any field spike should be within the normal range of recovery for the laboratory doing the work. This laboratory has a history of successful analyses from which to determine a "normal" range of recovery for each analyte. Table 4 shows the mean recoveries and associated standard deviations for the pesticides in this study. These were derived from field spikes collected previously in studies of ground water in Ashley and Mississippi Counties.

Table 4. Summary of Recoveries for EPA Methods 507, 515 and National Pesticide Survey Method 4 - Mean, Standard Deviation and Range.

Chemical	N	Mean (M) %	Std. Dev. (s) %	Range (M±3s) %
Molinate	62	91.2	13.5	50.8 - 131.7
Atrazine	67	96.8	13.3	56.9 - 136.7
Metribuzin	67	97.0	16.4	47.8 - 146.2
Alachlor	67	96.7	13.2	57.2 - 136.2
Metolachlor	67	99.1	13.8	57.8 - 140.4
Norflurazon	67	100.1	16.5	50.7 - 149.5
EPA507 surrogate	179	95.8	18.4	41.1 - 151.0
Cyanazine	66	94.7	14.7	50.6 - 138.8
Fluometuron	66	88.0	17.3	42.4 - 133.6
Diuron	65	89.3	12.2	52.8 - 125.8
Linuron	66	85.7	10.6	54.0 - 117.5
NPS4 surrogate	170	84.7	14.8	40.4 - 129.0
2,4-D	38	84.1	19.7	25.1 - 143.1
Bentazon	38	84.6	17.8	31.1 - 138.0
Acifluorfen	38	82.4	18.6	26.7 - 138.2
EPA515 surrogate	86	89.2	20.7	27.2 - 151.2

The normal range of recovery is defined as the mean plus/minus 3 standard deviations. For example the mean recovery for molinate was 91.2% with a standard deviation of 13.5% yielding a range of 50.8 - 131.7% (the mean plus/minus 3 standard deviations). If the recovery of a particular analyte from a field spike is outside the normal range then the result for that analyte for that well is reported as suspect. In addition, surrogate recovery for the non-fortified samples must also fall in the normal range of surrogate recoveries which are defined in the same way. A surrogate is a pure compound not expected to be in the sample. A known amount of surrogate is added to the sample before extraction as a check on the sample preparation procedure. The ranges for surrogate recoveries are also given in Table 4.

Results are reported as suspect due to matrix effects if the spike recovery or the surrogate recovery was not in the specified range. In actuality, none of the recoveries in this study were so low as to cause suspicion of false negatives.

As specified in the Quality Assurance Project Plan (QAPP), QC data for nitrate consist of percent relative standard

deviation (%RSD) between duplicate measurements of one sample and percent recovery (%REC) from a sample spiked with a known amount of nitrate-nitrogen. The maximum allowable %RSD is 10% and the allowable range for %REC is 80-120%. QC measurements are made on one sample from each sampling trip.

III.QA/QC Summary

Appendix A contains analysis results and spike recovery information for all thirteen sampling trips in Woodruff County. For the seventy samples there were a total of 910 data points (70 times 13 pesticides) of which 9, or less than one percent, have been reported as suspect. Suspect results have been highlighted with grey shading on the analysis reports. Three results for Wood #2 are reported as suspect because spike recoveries were too high. Bentazon results for 4 samples from Wood #7 and 2 samples from Wood #9 were reported as suspect because spike recoveries were out of the normal range. Bentazon at high concentrations, 55 and 25 ug/L, was detected in these wells. The spike concentration was so low, 7.21 ug/L, in comparison that it was hard to get good recoveries. However, all these detections were confirmed and the results are reported as suspect only to satisfy EPA rules. The authors feel the QC data for these analysis results are adequate for the stated purposes of the study.




Appendix B contains copies of two corrective action reports filed during the course of this study. The problems encountered were corrected and no significant loss of data resulted from either problem.

APPENDIX A
ANALYSIS RESULTS
AND
QUALITY CONTROL DATA

RESULTS OF PESTICIDE MONITORING : TRIP #1 TO WOODRUFF COUNTY-MAY, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

		2	3	4
WELL ID:	WOOD#1	WOOD#2	WOOD#3	WOOD#4
DATE SAMPLED:	MAY 5,1994	5-May-94	MAY 5,1994	MAY 5,1994
LATITUDE:	35° 18' 03"	35° 09' 04"	35° 07' 45"	35° 13' 30"
LONGITUDE:	91° 21' 32"	91° 20' 38"	91° 20' 39"	91° 14' 01"
DEPTH OF WELL, ft:	50	48	<50	21
pH, standard units:	6.7	6.49	6.36	6.39
CONDUCTIVITY AT 25° C mhos/cm:	126	127	185	266
TEMPERATURE, ° C	16.6	17.7	17.6	16.8
√ NITRATE, mg/L:	5.44	1.71	3.59	4.12
ACIFLUORFEN, ug/L	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	 ND	ND	ND
ATRAZINE,ug/L:	ND	 ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	 ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP # TO WOODRUFF COUNTY MAY, 1994.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
FIELD FORTIFIED SAMPLES							
WOOD #1	93	74	127	90	98	99	107
WOOD #2	133	112	149	133	147	149	149
WOOD #3	63	63	118	85	94	99	98
WOOD #4	76	63	116	85	93	97	137
NON-FORTIFIED SAMPLES							
WOOD #1	61						
WOOD #2	66						
WOOD #3	77						
WOOD #4	60						
∞ LAB BLANKS	p665bl	103					

CONCENTRATIONS FOR LAB BLANKS

p665bl	0	0	0	0	0	0	0
	0	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	IORFLURAZON
2X STANDARD	31969	14888	8658	7398	10536	27271

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

P613	P614	%RSD
141800	143153	0.95

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
225626	206545	8.83

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #1 TO WOODRUFF COUNTY - MAY, 1994.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES	114	84	81	87
WOOD #1	64	86	75	83
WOOD #2	84	71	76	82
WOOD #3	80	65	64	71
WOOD #4				
NON-FORTIFIED SAMPLES				
WOOD #1	95			
WOOD #2	129			
WOOD #3	111			
WOOD #4	109			

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LAB BLANKS

p661b 80

CONCENTRATIONS FOR LAB BLANKS

p661b 0 0

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

p640
42703

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #1 TO WOODRUFF COUNTY - MAY, 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE
FIELD FORTIFIED SAMPLES					
WOOD#1	92	90	93	90	74
WOOD#2	81	82	94	85	73
WOOD#3	83	76	84	77	82
WOOD#4	82	83	89	82	80

NON-FORTIFIED SAMPLES

WOOD#1					101
WOOD#2					92
WOOD#3					98
WOOD#4					99

LAB BLANKS

P664					93
P668					83

CONCENTRATIONS FOR LAB BLANKS

P664	0	0	0	0
P668	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE
2X STANDARD	4850	2417	5999	14739	364872

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

P624	P625	%RSD
330715	356785	7.58

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #1 TO WOODRUFF COUNTY - MAY, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 2	100%

DUPLICATE ANALYSIS





1ST MEASUREMENT	2ND MEASUREMENT	% RSD
5.44	5.43	0.12%

RESULTS OF PESTICIDE MONITORING : TRIP #2 TO WOODRUFF COUNTY-MAY, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( = suspect, see text)

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	5	6	7	8	9
WELL ID:	WOOD#5	WOOD#6	WOOD#7	WOOD#8	WOOD#9
DATE SAMPLED:	MAY 23,1994	MAY 23,1994	MAY 23,1994	MAY 24,1994	MAY 24,1994
LATITUDE:	35° 24' 41"	35° 25' 26"	35° 19' 27"	35° 20' 41"	35° 17' 09"
LONGITUDE:	91° 17' 16"	91° 17' 19"	91° 18' 20"	91° 21' 55"	91° 18' 29"
DEPTH OF WELL, ft:	60	unk	unk	32	60
pH, standard units:	6.57	6.31	6.82	6.71	6.89
CONDUCTIVITY AT 25° C mhos/cm:	98	139	149	136	198
TEMPERATURE, ° C	17.3	17.3	18.8	16.6	17.5
NITRATE, mg/L:	1.58	9.26	0.01	3.11	0.13
ACIFLUORFEN, ug/L	ND	ND	ND	ND	1.7
ALACHLOR, ug/L:	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	 55 	ND	 25 
CYANAZINE, ug/L:	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	0.9
LINURON, ug/L:	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #2 TO WOODRUFF COUNTY - MAY, 1994.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
FIELD FORTIFIED SAMPLES							
WOOD #5	70	77	86	80	90	88	95
WOOD #6	72	83	99	93	101	100	105
WOOD #7	121	104	109	101	107	103	108
WOOD #8	74	78	92	92	86	86	93
WOOD #9	120	86	89	82	88	85	89
NON-FORTIFIED SAMPLES							
WOOD #5	110						
WOOD #6	114						
WOOD #7	104						
WOOD #8	106						
WOOD #9	63						
LAB BLANKS	p760bl	129					

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CONCENTRATIONS FOR LAB BLANKS

p760bl	0	0	0	0	0	0	0
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PEAK AREAS FOR A 2X* STANDARD

	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
2X STANDARD	12765	25684	10606	9673	29219	32641

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

P713	P715	%RSD
236292	244181	3.28

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #2 TO WOODRUFF COUNTY - MAY, 1994.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES				
WOOD #5	omitted	67	65	65
WOOD #6	omitted	90	89	91
WOOD #7	omitted	87	.31 [^]	86
WOOD #8	omitted	78	79	77
WOOD #9	omitted	66	18 [^]	95
NON-FORTIFIED SAMPLES				
WOOD #5	80			
WOOD #6	86			
WOOD #7	119			
WOOD #8	123			
WOOD #9	77			
LAB BLANKS				
p768	85			
P766	73			

CONCENTRATIONS FOR LAB BLANKS

p768	0	0	0
P766	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	SURROGATE	2,4-D	BENTAZON	ACIFLUROFEN
2X STANDARD	68054	46209	34599	217456

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

p739	p730	%RSD
64016	52517	19.74

[^]THE HIGH BENTAZON CONCENTRATION IN THE SAMPLE RELATIVE TO THE SPIKE AND VARIABILITY WITHIN THE METHOD, RESULTED IN MEANINGLESS RECOVERY NUMBERS FOR THESE SPIKES.

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #2 TO WOODRUFF COUNTY MAY, 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE
FIELD FORTIFIED SAMPLES					
WOOD #5	66	79	81	73	89
WOOD #6	65	75	61	65	108
WOOD #7	94	68	60	61	88
WOOD #8	57	73	67	70	70
WOOD #9	73	76	61	67	87
NON-FORTIFIED SAMPLES					
WOOD #5					82
WOOD #6					70
WOOD #7					93
WOOD #8					84
WOOD #9					78
LAB BLANKS					
p763					94
p764					64

CONCENTRATIONS FOR LAB BLANKS

p763	0	0	0	0
p764	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE
2X STANDARD	2982	1055	4250	11786	364450

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

p734	p735	%RSD
383890	335832	13.35

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

FIRST	SECOND	%RSD
193880	224263	14.53

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #2 TO WOODRUFF COUNTY - MAY, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 6	97%

DUPLICATE ANALYSIS



1ST MEASUREMENT	2ND MEASUREMENT	% RSD
58 mg/l	58 mg/L	0.00%

RESULTS OF PESTICIDE MONITORING : TRIP #3 TO WOODRUFF COUNTY-JUNE 1994.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

17

	10	11	12
WELL ID:	WOOD#7R1	WOOD#9R1	WOOD#10
DATE SAMPLED:	JUN 29,1994	JUN 29,1994	JUN 29,1994
LATITUDE:	35° 19' 27"	35° 17' 09"	35° 19' 10"
LONGITUDE:	91° 18' 20"	91° 18' 29"	91° 18' 16"
DEPTH OF WELL, ft:	unk	40-60	80-100
pH, standard units:	6.77	6.97	7.24
CONDUCTIVITY AT 25° C , umhos/cm:	138	199	460
TEMPERATURE, ° C	17.7	18.6	17
NITRATE, mg/L:	NC	NC	<0.01
ACIFLUORFEN, ug/L	ND	8.6*	ND
ALACHLOR, ug/L:	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND
BENTAZON, ug/L	 66*	 88*	ND
CYANAZINE, ug/L:	ND	ND	ND
DIURON, ug/L:	ND	ND	ND
FLUOMETURON, ug/L:	0.4	0.8	ND
LINURON, ug/L:	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND
2,4-D, ug/L	ND	ND	ND

*DUE TO A RECENTLY DISCOVERED SPREADSHEET ERROR, THESE CONCENTRATIONS HAVE BEEN REVISED UPWARD SINCE THE DATA WERE ORIGINALLY REPORTED IN JULY, 1994.

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #3 TO WOODRUFF COUNTY-JUNE 1994.

EPA METHOD 507

PERCENT RECOVERIES

		SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
FIELD FORTIFIED SAMPLES								
	WOOD #7R1	65	88	98	99	96	96	114
	WOOD #9R1	63	85	96	90	92	93	116
	WOOD #10	71	76	88	70	69	89	97
NON-FORTIFIED SAMPLES								
	WOOD #7R1	75						
	WOOD #9R1	80						
	WOOD #10	81						
18	LAB BLANKS							
	P933	71						
	P934	80						

CONCENTRATIONS FOR LAB BLANKS

P933	0	0	0	0	0	0	0
P934	0	0	0	0	0	0	0

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

P903	P905	%RSD
168289	138413	19.48

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #3 TO WOODRUFF COUNTY-JUNE 1994.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES				
WOOD #7R1	103	87	144^	94
WOOD #9R1	95	68	-26^	37
WOOD #10	94	87	100	96
NON-FORTIFIED SAMPLES				
WOOD #7R1	105			
WOOD #9R1	115			
WOOD #10	122			

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LAB BLANKS

930b	90
931b	84

CONCENTRATIONS FOR LAB BLANKS

930b	0	0	0
931b	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	SURROGATE	2,4-D	BENTAZON	ACIFLUROFEN
2X STANDARD	46660	25889	19141	112045

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

P929	P920	%RSD
61772	52208	16.78

^THE HIGH BENTAZON CONCENTRATION IN THE SAMPLE RELATIVE TO THE SPIKE AND VARIABILITY WITHIN THE METHOD RESULTED, IN MEANINGLESS RECOVERY NUMBERS FOR THESE SPIKES.

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #3 TO WOODRUFF COUNT -JUNE 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE
FIELD FORTIFIED SAMPLES					
WOOD #7R1	48	62	61	53	64
WOOD #9R1	48	64	56	49	74
WOOD #10	60	104	76	65	89

NON-FORTIFIED SAMPLES

WOOD #7R1					92
WOOD #9R1					71
WOOD #10					96

LAB BLANKS

936B					70
937B					111

CONCENTRATIONS FOR LAB BLANKS

936B	0	0	0	0
937B	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE
2X STANDARD	5494	927	5303	17798	

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

P914	P915	%RSD
281982	292026	3.50

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #3 TO WOODRUFF COUNTY-JUNE 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	% RECOVERY
NONE	



DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
<0.01 mg/L	<0.01 mg/L	NC

RESULTS OF PESTICIDE MONITORING : TRIP #4 TO WOODRUFF COUNTY-JULY, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

	13	14	15	15a	16	17
WELL ID:	WOOD#11	WOOD#12	WOOD#7R2 (outside)	WOOD#7R2 (inside)	WOOD#13	WOOD#14
DATE SAMPLED:	JUL 26,1994	JUL 26,1994	JUL 27,1994	JUL 27,1994	JUL 27,1994	JUL 27,1994
LATITUDE:	35° 09' 23"	35° 09' 11"	35° 19' 27"	NC	35° 10' 02"	35° 07' 04"
LONGITUDE:	91° 20' 33"	91° 20' 31"	91° 18' 20"	91° 18' 20"	91° 20' 59"	91° 20' 35"
DEPTH OF WELL, ft:	35	35	unk	unk	30	unk
pH, standard units:	6.28	5.95	6.47	6.47	6.26	5.92
CONDUCTIVITY AT 25° C , umhos/cm:	149	120	146	146	61	134
TEMPERATURE, ° C	18.2	17.5	17.6	17.6	18.6	18.3
NITRATE, mg/L:	5.65	2.94	<0.01	NC	1.28	4.49
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	NC	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	NC	ND	ND
BENTAZON, ug/L	ND	ND	 69	 79	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	NC	ND	ND
DIURON, ug/L:	ND	ND	ND	NC	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	NC	ND	ND
LINURON, ug/L:	ND	ND	ND	NC	ND	ND
METOLACHLOR, ug/L:	13	ND	ND	NC	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	NC	ND	ND
MOLINATE, ug/L:	ND	ND	ND	NC	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	NC	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #4 TO WOODRUFF COUNTY-JULY 1994.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.	
FIELD FORTIFIED SAMPLES									
	WOOD #11	86	112	106	100	121	97	108	83
	WOOD #12	89	123	123	123	114	127	125	102
	WOOD #7R2	101	112	102	100	110	111	112	77
	WOOD #13	84	91	87	89	93	96	94	102
	WOOD #14	123	115	106	104	108	111	109	84
NON-FORTIFIED SAMPLES									
	WOOD #11	102							92
	WOOD #12	72							97
	WOOD #7R2	114							86
	WOOD #13	82							102
	WOOD #14	104							108
23	LAB BLANKS	066BL	106						
		083BL	92						

CONCENTRATIONS FOR LAB BLANKS

066BL	0	0	0	0
083BL	0	0	0	0

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON		
1023	1025	%RSD
57971	152730	3.37

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #4 TO WOODRUFF COUNTY-JULY 1994.

EPA METHOD 515

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PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD #11	96	110	88	103	110
WOOD #12	105	125	86	127	122
WOOD #7R2 (out)	98	114	93	171^	107
WOOD #7R2 (in)	95	130	87	35^	123
WOOD #13	100	110	94	107	101
WOOD #14	77	92	99	89	88
NON-FORTIFIED SAMPLES					
WOOD #11	102		102		
WOOD #12	105		93		
WOOD #7R2 (out)	90		97		
WOOD #7R2 (in)	102		109		
WOOD #13	110		110		
WOOD #14	107		98		
LAB BLANKS					
1061B	96		118		
1063B	79		108		

CONCENTRATIONS FOR LAB BLANKS

1061B	0	0	0
1063B	0	0	0

PEAK AREAS FOR A 2X* STANDARD

2X STANDARD	2,4-D 39283	BENTAZON 17955	ACIFLUROFEN 103365
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DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE CONCENTRATION COMPARISON		
P1059	P1050	%RSD
4.277	4.49	16.78
MACHINE DUPLICATE - SURROGATE CONCENTRATION COMPARISON		
FIRST	SECOND	%RSD
4.168	3.523	16.77

^THE HIGH BENTAZON CONCENTRATION IN THE SAMPLE RELATIVE TO THE SPIKE AND VARIABILITY WITHIN THE METHOD, RESULTED IN MEANINGLESS RECOVERY NUMBERS FOR THESE SPIKES.

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #4 TO WOODRUFF COUNTY - JULY, 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD #11	61	93	92	67	77	99
WOOD #12	78	80	94	83	66	103
WOOD #7R2	86	93	92	85	78	93
WOOD #13	79	73	85	75	86	97
WOOD #14	72	93	80	73	74	110
NON-FORTIFIED SAMPLES						
WOOD #11					81	99
WOOD #12					79	100
WOOD #7R2					78	99
WOOD #13					83	99
WOOD #14					81	105

25

LAB BLANKS

1072
1073

CONCENTRATIONS FOR LAB BLANKS

1072	0	0	0	0
1073	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	5860	3085	6624	3422

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON		
		%RSD
1034	1035	
29701	33202	11.13

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #4 TO WOODRUFF COUNTY - JULY, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 11	102%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
9.70 mg/L	9.73 mg/L	0.31%

RESULTS OF PESTICIDE MONITORING : TRIP #5 TO WOODRUFF COUNTY-AUGUST, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( = suspect, see text)

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	18	19	20	21	23	
WELL ID:	WOOD#15	WOOD#16	WOOD#17	WOOD#18	WOOD#19	WOOD#20
DATE SAMPLED:	AUG. 15, 1994	AUG. 15, 1994	AUG. 15, 1994	AUG. 15, 1994	AUG. 16, 1994	AUG. 17, 1994
LATITUDE:	17° 03"	5° 15' 30"	35° 13' 03"	35° 14' 21"	35°09' 58"	35°08' 10"
LONGITUDE:	18° 24"	1° 13' 58"	91° 11' 56"	91° 17' 48"	91° 14' 15"	91° 13' 55"
DEPTH OF WELL, ft:	unk	50	62	70	80	unk
pH, standard units:	6.4	6	7.1	6.6	7.4	7.5
CONDUCTIVITY AT 25° C , umhos/cm:	117	157	244	230	567	318
TEMPERATURE, ° C	17.1	17.2	17.5	21	19	18
NITRATE, mg/L:	1.9	1.82	0.01	0.82	0.02	<0.01
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #5 TO WOODRUFF COUNTY - AUGUST, 1994.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD	
FIELD FORTIFIED SAMPLES									
	WOOD #15	68	74	80	74	79	87	77	107
	WOOD #16	78	74	83	81	85	89	81	96
	WOOD #17	84	76	76	73	81	83	76	97
	WOOD #18	93	82	80	78	85	86	81	95
	WOOD #19	87	75	74	73	75	78	78	108
	WOOD#20	78	69	70	69	71	73	72	114
NON-FORTIFIED SAMPLES									
	WOOD #15	84							118
	WOOD #16	98							101
	WOOD #17	119							95
	WOOD #18	89							96
	WOOD #19	106							104
	WOOD#20	92							101
28	LAB BLANKS								
	1098bl	103							102
	1099bl	118							100

CONCENTRATIONS FOR LAB BLANKS

1098bl	0	0	0	0	0	0	0
1099bl	0	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
2X STANDARD	1440	2623	1307	1662	3930	3994

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1103	1105	%RSD
30182	29545	2.13

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
27302	28005	2.54

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #5 TO WOODRUFF COUNTY - AUGUST, 1994.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN	
FIELD FORTIFIED SAMPLES						
WOOD #15	82	116	135	89	70	
WOOD #16	86	0	123	0	0	spike omitted in field
WOOD #17	105	91	122	92	73	
WOOD #18	97	90	125	104	81	
WOOD #19	89	86	129	87	74	
WOOD#20	70	80	137	82	68	
NON-FORTIFIED SAMPLES						
WOOD #15	72		133			
WOOD #16	77		126			
WOOD #17	111		115			
WOOD #18	108		105			
WOOD #19	106		107			
WOOD#20	83		112			
LAB BLANKS						
1095bl	59		121			

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CONCENTRATIONS FOR LAB BLANKS

1095bl	0	0	0
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DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1129	1120	%RSD
246003	189023	26.20

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
219134	204602	6.86

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #5 TO WOODRUFF COUNTY - AUGUST, 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD #15	75	71	80	73	73	114
WOOD #16	79	75	85	78	77	109
WOOD #17	77	70	82	71	68	116
WOOD #18	83	81	94	83	84	97
WOOD #19	69	80	83	77	76	112
WOOD#20	75	70	79	69	67	114
NON-FORTIFIED SAMPLES						
WOOD #15					59	117
WOOD #16					74	115
WOOD #17					69	114
WOOD #18					68	120
WOOD #19					79	110
WOOD#20					68	114
LAB BLANKS						
1164					78	112
1165						115

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CONCENTRATIONS FOR LAB BLANKS

1164	0	0	0	0
1165	0	0	0	0

PEAK AREAS FOR A 2X * STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	4195	2092	7248	14362

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1124	1125	%RSD
324208	352373	8.33

MACHINEDUPLICATE - SURROGATE AREA COMPARISON

1ST. RUN	2ND. RUN	%RSD
412342	422983	2.55

* ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #5 TO WOODRUFF COUNTY - AUGUST, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 16	103.00%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
.90 mg/L	1.89 mg/L	0.58%

RESULTS OF PESTICIDE MONITORING : TRIP #6 TO WOODRUFF COUNTY-SEPTEMBER, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( = suspect, see text)

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	24	25	26	27	28	29
WELL ID:	WOOD#21	WOOD#22	WOOD#23	WOOD#24	WOOD#25	WOOD#26
DATE SAMPLED:	EPT. 14, 1994	EPT. 14, 1994	SEPT. 14, 1994	SEPT. 15, 1994	SEPT. 15, 1994	SEPT. 15, 1994
LATITUDE:	35°09' 01"	35°06' 13"	35° 19' 24"	35° 20' 36"	35° 17' 08"	35° 03' 51"
LONGITUDE:	91° 24' 19"	91° 24' 23"	91° 18' 08"	91° 17' 16"	91° 24' 08"	91° 14' 39"
DEPTH OF WELL, ft:	60	40	52	24	45	60
pH, standard units:	7	6.8	7.6	6.9	6.4	7.1
CONDUCTIVITY AT 25° C , umhos/cm:	510	315	411	189	210	504
TEMPERATURE, ° C	18.5	19.6	18	18.4	18	18.1
NITRATE, mg/L:	0.04	0.02	0.03	0.03	2.05	1.19
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND	4.4	1.5
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND
.4-D, ug/L	ND	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #6 TO WOODRUFF COUNTY - SEPTEMBER, 1994.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.	
FIELD FORTIFIED SAMPLES									
	WOOD #21	88	77	96	92	85	90	100	93
	WOOD #22	93	75	88	87	85	86	92	92
	WOOD #23	93	76	92	91	88	89	100	90
	WOOD #24	90	72	86	84	79	86	92	83
	WOOD #25	82	71	88	85	83	85	91	97
	WOOD#26	98	84	91	87	85	85	87	99
NON-FORTIFIED SAMPLES									
	WOOD #21	71							94
	WOOD #22	71							103
	WOOD #23	99							94
	WOOD #24	73							92
	WOOD #25	78							100
	WOOD#26	83							98
33	LAB BLANKS								
	1273	77							90
	1275	97							88
	1276	88							96

CONCENTRATIONS FOR LAB BLANKS

1273	0	0	0	0	0	0	0
1275	0	0	0	0	0	0	0
1276	0	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
2X STANDARD	4749	8432	4941	3410	11244	12727

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1313	1315	%RSD
61246	60908	0.55

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
70356	70990	0.90

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #6 TO WOODRUFF COUNTY-SEPTEMBER, 1994.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD #21	77	92	109	105	96
WOOD #22	71	62	98	55	57
WOOD #23	62	72	126	68	64
WOOD #24	92	102	107	103	87
WOOD #25	79	93	108	117	80
WOOD#26	92	88	110	93	73
NON-FORTIFIED SAMPLES					
WOOD #21	83		90		
WOOD #22	109		94		
WOOD #23	93		92		
WOOD #24	67		90		
WOOD #25	66		109		
WOOD#26	59		126		
LAB BLANKS					
1281BL	69		103		
1278BL	105		116		

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CONCENTRATIONS FOR LAB BLANKS

1281BL	0	0	0
1278BL	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
2X STANDARD	141123	110609	679867	77285	377036

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1329	1320	%RSD
73789	117228	45.48

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
182674	185646	1.61

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #6 TO WOODRUFF COUNTY - SEPTEMBER, 1994.

NPS METHOD 4

PERCENT RECOVERIES

(mistakes corrected 1/23/96)

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD #21	84	85	103	89	91	91
WOOD #22	73	74	85	78	86	103
WOOD #23	76	73	89	79	85	99
WOOD #24	58	70	70	63	81	109
WOOD #25	79	74	93	80	83	96
WOOD#26	80	80	92	85	92	99
NON-FORTIFIED SAMPLES						
WOOD #21					70	119
WOOD #22					69	93
WOOD #23					73	105
WOOD #24					80	108
WOOD #25					79	98
WOOD#26					78	108
LAB BLANKS						
1270					69	115
1272					70	101

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CONCENTRATIONS FOR LAB BLANKS

1164	0	0	0	0
1165	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	4576	2492	5586	13448

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1304	1305	%RSD
330307	341756	3.41

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #6 TO WOODRUFF COUNTY - SEPTEMBER, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 22	107%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
0.04 mg/L	0.04 mg/L	0.00%

RESULTS OF PESTICIDE MONITORING : TRIP #7 TO WOODRUFF COUNTY-SEPTEMBER, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

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	30	31	32	33	34	35
WELL ID:	WOOD 27 (aka PR#1)	WOOD 28	WOOD 29	WOOD 30	WOOD 31	WOOD 32
DATE SAMPLED:	sept. 28, 1994	SEPT. 28, 1994	SEPT. 29, 1994	SEPT. 29, 1994	SEPT. 29, 1994	SEPT. 29, 1994
LATITUDE:	35° 00' 28"	34° 59' 04"	35° 03' 50"	35° 00' 53"	35° 02' 57"	35° 03' 47"
LONGITUDE:	91° 23' 58"	91° 19' 10"	91° 15' 51"	91° 18' 56"	91° 16' 28"	91° 16' 28"
DEPTH OF WELL, ft:	32	25	26	25	23	20
pH, standard units:	6.8	6.6	7.3	6.3	6.8	6.7
CONDUCTIVITY AT 25° C , umhos/cm:	846	126	143	110	246	177
TEMPERATURE, ° C	17	18	18.2	17.3	17.9	18.6
NITRATE, mg/L:	0.02	2.94	1.68	3.81	1.09	4.07
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	0.35&	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #7 TO WOODRUFF COUNTY - SEPTEMBER, 1994.

EPA METHOD 507

GH

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.
FIELD FORTIFIED SAMPLES								
	WOOD #27	130	126	121	121	119	116	115
	WOOD #28	133	123	121	119	119	114	111
	WOOD #29	102	89	99	87	95	92	109
	WOOD #30	81	88	94	89	90	93	100
	WOOD #31	83	85	95	86	91	89	92
	WOOD#32	81	82	70	66	74	84	92
NON-FORTIFIED SAMPLES								
	WOOD #27	128						117
	WOOD #28	109						97
	WOOD #29	126						114
	WOOD #30	96						113
	WOOD #31	83						99
	WOOD#32	80						96
LAB BLANKS								
	1370	110						119
	1373	123						107

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CONCENTRATIONS FOR LAB BLANKS

1370	0	0	0	0	0	0
1373	0	0	0	0	0	0

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1423	1425	%RSD
102677	80769	23.88

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
73935	74015	0.11

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #7 TO WOODRUFF COUNT -SEPTEMBER, 1994.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD #28	126	79	85	85	89
WOOD #29	128	81	87	82	96
WOOD #30	121	61	95	61	64
WOOD #31	121	73	93	84	88
NON-FORTIFIED SAMPLES					
WOOD #27	102		105		
WOOD #28	133		79		
WOOD #29	121		78		
WOOD #30	110		79		
WOOD #31	130		80		
WOOD#32	128		79		
LAB BLANKS					
1379	111		96		

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CONCENTRATIONS FOR LAB BLANKS

1379	0	0	0
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PEAK AREAS FOR A 2X* STANDARD

2X STANDARD	2,4-D 83018	BENTAZON 100689	ACIFLUROFEN 407516
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DUPLICATE ANALYSIS

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
82582	83022	0.53

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #7 TO WOODRUFF COUNTY - SEPTEMBER, 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD #27	102	73	84	77	81	none
WOOD #28	86	76	88	82	83	none
WOOD #29	112	90	95	87	98	91
WOOD #30	86	82	87	82	87	99
WOOD #31	85	84	83	77	89	98
WOOD#32	98	94	99	95	97	91
NON-FORTIFIED SAMPLES						
WOOD #27					95	90
WOOD #28					83	102
WOOD #29					92	114
WOOD #30					85	96
WOOD #31					103	98
WOOD#32					98	87
						82
LAB BLANKS						
1374					96	91
1376					89	89

40

CONCENTRATIONS FOR LAB BLANKS

1374	0	0	0	0
1376	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	4180	2663	5463	11785

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON		
		%RSD
1444	1445	
364593	310823	15.92

MACHINEDUPLICATE - SURROGATE AREA COMPARISON		
1ST. RUN	2ND. RUN	%RSD
325353	328857	1.07

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #7 TO WOODRUFF COUNTY - SEPTEMBER, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 28	99%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
0.02 mg/L	0.03. mg/L	38.25%

RESULTS OF PESTICIDE MONITORING : TRIP #8 TO WOODRUFF COUNTY-NOVEMBER, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

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	36	37	38	39	40	41
WELL ID:	WOOD 33 (SW)	WOOD 34 (SW)	WOOD 35 (SW)	WOOD 36 (SW)	WOOD 37 (SW)	WOOD 38 (SW)
DATE SAMPLED:	16-Nov-94	16-Nov-94	16-Nov-94	16-Nov-94	16-Nov-94	16-Nov-94
LATITUDE:	35° 20' 25"	35° 14' 08"	35° 13' 19"	35° 13' 59"	35° 02' 25"	5° 02' 23"
LONGITUDE:	91° 05' 01"	91° 05' 43"	91° 05' 33"	91° 02' 23"	91° 02' 34"	1° 02' 23"
DEPTH OF WELL, ft:	60	120	90+	120?	140	500
pH, standard units:	7.3	7.4	7.1	6.8	6.5	7.1
CONDUCTIVITY AT 25° C , umhos/cm:	660	600	567	815	1247	598
TEMPERATURE, ° C	16	16	15.5	15.5	16	19
NITRATE, mg/L:	0.01	0.04	0.06	0.02	0.14	0.01
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #8 TO WOODRUFF COUNTY - NOVEMBER, 1994.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.	
FIELD FORTIFIED SAMPLES									
	WOOD 33 (SW)	93	100	56	86	61	108	116	78
	WOOD 34 (SW)	65	98	104	108	110	113	117	68
	WOOD 35 (SW)	83	99	102	104	106	105	107	89
	WOOD 36 (SW)	91	101	106	115	106	108	115	79
	WOOD 37 (SW)	69	82	93	101	92	94	105	78
	WOOD 38 (SW)	83	88	98	103	97	100	115	94
NON-FORTIFIED SAMPLES									
	WOOD 33 (SW)	78							99
	WOOD 34 (SW)	82							81
	WOOD 35 (SW)	106							82
	WOOD 36 (SW)	94							79
	WOOD 37 (SW)	91							89
	WOOD 38 (SW)	75							83
43	LAB BLANKS								
	1560	73							93
	1562	69							91

CONCENTRATIONS FOR LAB BLANKS

1560	0	0	0	0	0	0	0
1562	0	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
2101	5509	2862	2519	8581	7401

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1603	1605	%RSD
59806	42450	33.95

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
88547	92520	4.39

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #8 TO WOODRUFF COUNTY - NOVEMBER, 1994

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD 33 (SW)	60	72	85	68	70
WOOD 34 (SW)	65	67	97	60	63
WOOD 35 (SW)	58	80	104	63	73
WOOD 36 (SW)	77	67	108	56	64
WOOD 37 (SW)	55	75	107	64	66
WOOD 38 (SW)	66	145	74	86	118
NON-FORTIFIED SAMPLES					
WOOD 33 (SW)	81		74		
WOOD 34 (SW)	93		79		
WOOD 35 (SW)	72		80		
WOOD 36 (SW)	99		83		
WOOD 37 (SW)	60		128		
WOOD 38 (SW)	90		118		
LAB BLANKS					
1571BL	72		97		
1573BL	103		69		

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CONCENTRATIONS FOR LAB BLANKS

1571BL	0	0	0
1573BL	0	0	0

PEAK AREAS FOR A 2X* STANDARD

2X STANDARD	2,4-D 65685	BENTAZON 77813	ACIFLUROFEN 359064
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DUPLICATE ANALYSIS

FIRLD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

1629	1620	%RSD
2.893	2.565	12.02

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
235312	243893	3.58

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #8 TO WOODRUFF COUNTY - NOVEMBER, 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD 33 (SW)	84	80	85	81	74	108
WOOD 34 (SW)	93	83	93	88	74	91
WOOD 35 (SW)	88	77	89	83	78	105
WOOD 36 (SW)	86	73	86	78	72	90
WOOD 37 (SW)	82	83	84	77	73	108
WOOD 38 (SW)	86	82	88	83	77	104
NON-FORTIFIED SAMPLES						
WOOD 33 (SW)					78	99
WOOD 34 (SW)					78	104
WOOD 35 (SW)					73	106
WOOD 36 (SW)					74	102
WOOD 37 (SW)					71	97
WOOD 38 (SW)					64	98
LAB BLANKS						
1563					79	108
1565					71	105

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CONCENTRATIONS FOR LAB BLANKS

1563	0	0	0	0
1565	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	5212	3002	5784	14538

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1614	1615	%RSD
373258	374868	0.43

MACHINEDUPLICATE - SURROGATE AREA COMPARISON

1ST. RUN	2ND. RUN	%RSD
460576	459891	0.15

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #8 TO WOODRUFF COUNTY - NOVEMBER, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RSD
WOOD 34	96%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
0.01 mg/L	0.02 mg/L	66.60%

RESULTS OF PESTICIDE MONITORING : TRIP #9 TO WOODRUFF COUNTY-NOVEMBER, 1994.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

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	42	43	44	45	46	47
WELL ID:	WOOD 39(SW)	WOOD 40 (SW)	WOOD 41 (SW)	WOOD 42 (SW)	WOOD 43 (SW)	WOOD 44 (SW)
DATE SAMPLED:	30-Nov-94	30-Nov-94	30-Nov-94	30-Nov-94	30-Nov-94	30-Nov-94
LATITUDE:	35° 00' 18"	35° 00' 24"	35° 03' 11"	35° 02' 49"	35° 03' 49"	35° 03' 38"
LONGITUDE:	91° 14' 53"	91° 09' 04"	91° 07' 26"	91° 04' 51"	91° 05' 19"	91° 10' 11"
DEPTH OF WELL, ft:	275	140	350	100-140	100-140	40-50
pH, standard units:	7.4	7.3	7.1	7.1	7.2	7
CONDUCTIVITY AT 25° C , umhos/cm:	259	585	513	950	664	756
TEMPERATURE, ° C	15	16.5	18	16.6	17	17
NITRATE, mg/L:	<0.01	0.03	0.02	0.04	0.03	0.04
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #9 TO WOODRUFF COUNTY NOVEMBER, 1994.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.	
FIELD FORTIFIED SAMPLES									
	WOOD 39 (SW)	76	78	91	94	102	102	85	90
	WOOD 40 (SW)	87	87	94	87	101	103	95	88
	WOOD 41 (SW)	88	92	100	104	105	107	107	91
	WOOD 42 (SW)	103	102	107	107	112	113	111	89
	WOOD 43 (SW)	95	102	105	103	106	109	109	91
	WOOD 44 (SW)	100	91	96	93	115	97	99	85
NON-FORTIFIED SAMPLES									
	WOOD 39 (SW)	74							68
	WOOD 40 (SW)	97							73
	WOOD 41 (SW)	87							87
	WOOD 42 (SW)	130							90
	WOOD 43 (SW)	78							97
	WOOD 44 (SW)	75							106
LAB BLANKS									
	1576bl	111							
	1578bl	81							

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CONCENTRATIONS FOR LAB BLANKS

1576bl	0	0	0	0	0	0
1578bl	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
3879	8056	4088	3836	12025	9353

FIELD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

1703	1705	%RSD
0.74	0.88	17.28

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
81683	77366	5.43

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #9 TO WOODRUFF COUNTY - NOVEMBER, 1994

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
	WOOD 39 (SW)	70	94	77	90
	WOOD 40 (SW)	27	76	89	66
	WOOD 41 (SW)	105	87	95	84
	WOOD 42 (SW)	79	64	97	61
	WOOD 43 (SW)	73	81	103	77
	WOOD 44 (SW)	NONE*	72	101	52
	NON-FORTIFIED SAMPLES				
	WOOD 39 (SW)	91	92		
	WOOD 40 (SW)	50	100		
	WOOD 41 (SW)	113	108		
	WOOD 42 (SW)	99	105		
49	WOOD 43 (SW)	74	108		
	WOOD 44 (SW)	NONE*	106		
AB BLANKS					
	1585BL	85	102		
	1588BL	98	108		

CONCENTRATIONS FOR LAB BLANKS

1585BL	0	0
1588BL	0	0

DUPLICATE ANALYSIS

FIRLD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

1729	1720	%RSD
4.2	4.6	9.09

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
		#VALUE!

*NO RESULT DUE TO INTERFERENCE

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #9 TO WOODRUFF COUNTY - NOVEMBER, 1994.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD 39 (SW)	78	69	88	78	80	98
WOOD 40 (SW)	86	83	93	86	88	97
WOOD 41 (SW)	86	79	95	84	87	96
WOOD 42 (SW)	100	89	101	88	88	93
WOOD 43 (SW)	82	75	90	78	81	100
WOOD 44 (SW)	90	59	92	81	84	97
NON-FORTIFIED SAMPLES						
WOOD 39 (SW)					80	95
WOOD 40 (SW)					92	94
WOOD 41 (SW)					91	95
WOOD 42 (SW)					85	94
WOOD 43 (SW)					83	96
WOOD 44 (SW)					80	95
LAB BLANKS						
1580					82	98
1583					71	96

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CONCENTRATIONS FOR LAB BLANKS

1580	0	0	0	0
1583	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	4895	2526	5577	13038

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1714	1715	%RSD
386542	341145	12.48

MACHINEDUPLICATE - SURROGATE AREA COMPARISON

1ST. RUN	2ND. RUN	%RSD
378652	378164	0.13

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #9 TO WOODRUFF COUNTY - NOVEMBER, 1994.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 40	99%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
<0.01 mg/L	<0.01 mg/L	NC

RESULTS OF PESTICIDE MONITORING : TRIP #10 TO WOODRUFF COUNTY-FEBRUARY, 1995.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

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	48	49	50	51	52	53
WELL ID:	WOOD 11R1	WOOD 25 R1	WOOD26R1	WOOD29R1	WOOD33(PB)	WOOD34(PB)
DATE SAMPLED:	20-FEB-95	20-FEB-95	20-FEB-95	20-FEB-95	20-FEB-95	20-FEB-95
LATITUDE:	35° 17' 08"	35° 17' 08"	35° 03' 51"	35° 03' 50"	5° 09' 25"	35° 03' 21"
LONGITUDE:	91° 24' 08"	91° 24' 08"	91° 14' 39'	91° 15' 51"	1° 20' 35"	91° 13' 13"
DEPTH OF WELL, ft:	45	45	60	26	62	62
pH, standard units:	6.2	6.2	6.6	6.1	6.3	6.5
CONDUCTIVITY AT 25° C , umhos/cm:	150	213	562	138	160	129
TEMPERATURE, ° C	17.4	17.7	17.5	17	16.7	17.5
NITRATE, mg/L:	NA	NA	NA	NA	4.77	2.6
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	1.5&
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	1.9	0.9	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	11.5	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	0.4	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #10 TO WOODRUFF COUNTY FEBRUARY, 1995.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.	
FIELD FORTIFIED SAMPLES									
	WOOD 11R1	73	85	75	82	102	98	92	93
	WOOD 25 R1	69	74	66	68	74	94	82	88
	WOOD26R1	82	85	73	75	81	102	86	80
	WOOD29R1	65	75	70	70	76	96	89	79
	WOOD33(PB)	95	94	77	79	86	106	88	78
	WOOD34(PB)	68	76	69	70	57	95	84	75
NON-FORTIFIED SAMPLES									
	WOOD 11R1	70							76
	WOOD 25 R1	64							70
	WOOD26R1	72							72
	WOOD29R1	75							69
	WOOD33(PB)	72							66
	WOOD34(PB)	67							69
53	LAB BLANKS								
	1794b	82							76
	1796b	73							71
	1798b	76							66

CONCENTRATIONS FOR LAB BLANKS

1794b	0	0	0	0	0	0	0
1796b	0	0	0	0	0	0	0
1798b	0	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
11284	14665	9548	6216	14678	12149

FIELD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

1813	1815	%RSD
279293	329294	16.43

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
454713	457926	0.70

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #10 TO WOODRUFF COUNT -FEBRUARY, 1995.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD 11R1	85	100	97	100	111
WOOD 25 R1	102	89	96	84	90
WOOD26R1	98	94	97	87	99
WOOD29R1	126	92	95	81	95
WOOD33(PB)	89	103	101	92	101
WOOD34(PB)	107	114	103	99	119
NON-FORTIFIED SAMPLES					
WOOD 11R1	89		104		
WOOD 25 R1	102		103		
WOOD26R1	120		107		
WOOD29R1	72		109		
WOOD33(PB)	78		108		
WOOD34(PB)	99		112		
LAB BLANKS					
1863b	76		114		
1799b	77		100		
1860b	88		105		
1863b		0		0	0
1799b		0		0	0
1860b		0		0	0

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PEAK AREAS FOR A 2X* STANDARD

2,4-D	BENTAZON	ACIFLUROFEN
107668	243177	479156

DUPLICATE ANALYSIS

FIRLD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

1859	1850	%RSD
303117	293235	3.31

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
327860	335415	2.28

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #10 TO WOODRUFF COUNTY - FEBRUARY, 1995.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD 11R1	99	105	122	96	95	88
WOOD 25 R1	85	79	86	79	80	83
WOOD26R1	95	94	97	92	94	92
WOOD29R1	95	97	100	94	94	80
WOOD33(PB)	120	82	87	79	83	97
WOOD34(PB)	82	74	86	75	81	96
NON-FORTIFIED SAMPLES						
WOOD 11R1					81	94
WOOD 25 R1					70	98
WOOD26R1					91	94
WOOD29R1					86	97
WOOD33(PB)					74	97
WOOD34(PB)					90	94
LAB BLANKS						
1789					88	94
1791					83	101
1792					87	93
1789	0	0	0	0		
1791	0	0	0	0		
1792	0	0	0	0		

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	2461	1050	3238	6498

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1804	1805	%RSD
125396	135377	7.65

MACHINEDUPLICATE - SURROGATE AREA COMPARISON

1ST. RUN	2ND. RUN	%RSD
128696	130978	1.76

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #10 TO WOODRUFF COUNTY - FEBRUARY, 1995.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 34	108%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
4.765 mg/L	4.771 mg/L	0.10%

RESULTS OF PESTICIDE MONITORING : TRIP #11 TO WOODRUFF COUNTY-MARCH, 1995.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

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	54	55	56	55	56	57
WELL ID:	WOOD35(PB)	WOOD 36(PB)	WOOD 37(PB)	WOOD 38(PB)	WOOD 39(PB)	WOOD 40(PB)
DATE SAMPLED:	13-Mar-95	13-Mar-95	13-Mar-95	14-Mar-95	14-Mar-95	14-Mar-95
LATITUDE:	35° 07' 03"	35° 07' 02"	35° 09' 36"	35° 12' 44"	35° 13' 42"	35° 13' 34"
LONGITUDE:	91° 22' 02"	91° 22' 00"	91° 18' 27"	91° 19' 16"	91° 16' 32"	91° 16' 26'
DEPTH OF WELL, ft:	30	37	50	35	35	40
pH, standard units:	6.9	6.7	7.2	7	6.5	7.1
CONDUCTIVITY AT 25° C , umhos/cm:	237	219	158	179	163	295
TEMPERATURE, ° C	16.8	17.1	17.4	14.5	16.6	16.7
NITRATE, mg/L:	<0.01	<0.01	<0.01	0.75	0.42	<0.01
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND	ID	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #11 TO WOODRUFF COUNTY - MARCH, 1995.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.	
FIELD FORTIFIED SAMPLES									
	WOOD35(PB)	90	79	80	84	84	97	62	112
	WOOD 36(PB)	85	77	81	86	82	95	69	98
	WOOD 37(PB)	90	82	85	91	84	97	77	104
	WOOD 38(PB)	72	73	80	84	76	88	75	100
	WOOD 39(PB)	68	77	83	92	80	102	89	90
	WOOD 40(PB)	68	81	89	95	77	90	113	110
NON-FORTIFIED SAMPLES									
	WOOD35(PB)	68							101
	WOOD 36(PB)	59							102
	WOOD 37(PB)	82							109
	WOOD 38(PB)	68							112
	WOOD 39(PB)	64							111
	WOOD 40(PB)	70							106
LAB BLANKS									
	1873bl	76	0	0	0	0	0	0	97
	1876bl	70	0	0	0	0	0	0	108
CONCENTRATIONS FOR LAB BLANKS									
	1873bl		0	0	0	0	0	0	
	1876bl		0	0	0	0	0	0	

PEAK AREAS FOR A 2X* STANDARD

MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
9250	10847	6269	5987	13598	6680

FIELD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

1902	1905	%RSD
554504	661614	17.62

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
930921	902399	3.11

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #11 TO WOODRUFF COUNTY - MARCH, 1995.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD35(PB)	71	73	103	71	73
WOOD 36(PB)	148	100	102	102	111
WOOD 37(PB)	70	69	103	67	73
WOOD 38(PB)	73	86	105	85	93
WOOD 39(PB)	60	57	103	56	59
WOOD 40(PB)	112	90	94	94	102
NON-FORTIFIED SAMPLES					
WOOD35(PB)	87		109		
WOOD 36(PB)	87		106		
WOOD 37(PB)	79		109		
WOOD 38(PB)	93		97		
WOOD 39(PB)	128		106		
WOOD 40(PB)	interference		109		
LAB BLANKS					
1881BL	102		114		
1884B	121		100		

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CONCENTRATIONS IN BLANKS

1881BL	0	0	0
1884B	0	0	0

PEAK AREAS FOR A 2X* STANDARD

2,4-D	BENTAZON	ACIFLUROFEN
175384	330781	905810

DUPLICATE ANALYSIS

FIRLD DUPLICATE - SURROGATE AREA COMPARISON

1959	1950	%RSD
1315122	1132614	14.91

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
218972	224043	2.29

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #11 TO WOODRUFF COUNTY - MARCH, 1995.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD35(PB)	99	100	103	103	90	99
WOOD 36(PB)	86	74	83	84	71	106
WOOD 37(PB)	90	91	90	95	81	101
WOOD 38(PB)	83	71	82	80	64	106
WOOD 39(PB)	99	91	106	102	83	99
WOOD 40(PB)	82	77	86	90	77	93
NON-FORTIFIED SAMPLES						
WOOD35(PB)					78	100
WOOD 36(PB)					77	97
WOOD 37(PB)					67	95
WOOD 38(PB)					74	98
WOOD 39(PB)					77	101
WOOD 40(PB)					78	101
LAB BLANKS						
1877bl					74	101
1879bl					74	95
1877bl	0	0	0	0		
1879bl	0	0	0	0		

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PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	2350	970	3057	6487

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

1914	1915	%RSD
124530	122255	1.84

MACHINEDUPLICATE - SURROGATE AREA COMPARISON

1ST. RUN	2ND. RUN	%RSD
136023	136140	0.09

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #11 TO WOODRUFF COUNTY - MARCH, 1995.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 35 PB	96%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
<0.01 mg/L	<0.01 mg/L	NC

RESULTS OF PESTICIDE MONITORING : TRIP #12 TO WOODRUFF COUNTY-APRIL, 1995.

(unk = unknown, NC = not collected, ND = not detected)

( = suspect, see text)

	60	61	62	63	64	65	
WELL ID:	WOOD 41(PB)	WOOD 42(PB)	WOOD 43(PB)	WOOD 44(PB)	WOOD 45(PB)	WOOD 46(PB)	WOOD 47(PB)
DATE SAMPLED:	11-Apr-95	11-Apr-95	12-Apr-95	12-Apr-95	13-Apr-95	13-Apr-95	13-Apr-95
LATITUDE:	35° 13' 29"	35° 13' 29"	35° 01' 26"	35° 02' 06"	34° 57' 35"	34° 57' 35"	35° 05' 21"
LONGITUDE:	91° 11' 09"	91° 10' 08"	91° 19' 33"	91° 19' 22"	91° 18' 31"	91° 18' 31"	1° 12' 32"
DEPTH OF WELL, ft:	24	20	20	20	60	50	60
pH, standard units:	6.1	7.5	6.6	7.3	6.1	6.1	6.2
CONDUCTIVITY AT 25° C , umhos/cm:	89	392	154	298	203	136	152
TEMPERATURE, ° C	16.8	16.4	17.3	17.3	16.7	unk	17.8
NITRATE, mg/L:	1.7	<0.01	0.5	0.04	10.17	2.5	0.06
ACIFLUORFEN, ug/L	ND	ND	ND	ND	ND	ND	ND
ALACHLOR, ug/L:	ND	ND	ND	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND	ND	ND	ND
BENTAZON, ug/L	ND	ND	ND	ND	ND	ND	ND
CYANAZINE, ug/L:	ND	ND	ND	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	ND	ND	ND	ND	ND
LINURON, ug/L:	ND	ND	ND	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND	ND	ND	ND
4-D, ug/L	ND	ND	ND	ND	ND	ND	ND

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QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #12 TO WOODRUFF COUNTY - APRIL, 1995.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.
FIELD FORTIFIED SAMPLES								
WOOD 41(PB)	72	78	100	96	84	87	91	108
WOOD 42(PB)	72	72	83	87	75	82	85	98
WOOD 43(PB)	81	86	100	99	90	96	99	98
WOOD 44(PB)	74	82	93	97	85	89	93	103
WOOD 45(PB)	92	93	101	101	90	98	102	100
WOOD 46(PB)	72	73	87	91	78	84	91	97
WOOD 47(PB)	78	79	89	91	81	85	92	98
NON-FORTIFIED SAMPLES								
WOOD 41(PB)	75							91
WOOD 42(PB)	76							95
WOOD 43(PB)	103							102
WOOD 44(PB)	92							98
WOOD 45(PB)	80							97
WOOD 46(PB)	124							118
WOOD 47(PB)	100							107
LAB BLANKS								
1988BL	82							96
1990BL	92							98

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CONCENTRATIONS FOR LAB BLANKS

1988BL	0	0	0	0	0	0	0
1990BL	0	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
27138	24558	18091	11929	35143	33556

FIELD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

2013	2015	%RSD
928130	1068490	14.06

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
993611	883679	11.71

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #12 TO WOODRUFF COUNTY - APRIL, 1995.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD 41(PB)	76	78	94	78	71
WOOD 42(PB)	71	66	93	67	61
WOOD 43(PB)	78	81	94	82	77
WOOD 44(PB)	69	59	97	60	54
WOOD 45(PB)	88	77	96	79	76
WOOD 46(PB)	96	79	98	80	75
WOOD 47(PB)	100	82	98	83	80
NON-FORTIFIED SAMPLES					
WOOD 41(PB)	72		97		
WOOD 42(PB)	131		98		
WOOD 43(PB)	69		99		
WOOD 44(PB)	84		104		
WOOD 45(PB)	77		104		
WOOD 46(PB)	106		102		
WOOD 47(PB)	108		105		
LAB BLANKS					
1993	90		95		
1994	72		99		
1995	66		103		

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CONCENTRATIONS IN BLANKS

1993	0	0	0
1994	0	0	0
1995	0	0	0

PEAK AREAS FOR A 2X* STANDARD

2,4-D	BENTAZON	ACIFLUROFEN
185983	394742	1023574

DUPLICATE ANALYSIS

FIRLD DUPLICATE - SURROGATE AREA COMPARISON

2039	2030	%RSD
254532	385351	40.89

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
196699	187904	4.57

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #12 TO WOODRUFF COUNTY - APRIL, 1995.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD 41(PB)	84	103	88	87	89	106
WOOD 42(PB)	81	97	84	81	83	103
WOOD 43(PB)	89	105	91	92	97	102
WOOD 44(PB)	81	97	82	79	85	105
WOOD 45(PB)	85	108	89	88	90	106
WOOD 46(PB)	81	103	84	83	86	92
WOOD 47(PB)	97	116	101	104	95	105
NON-FORTIFIED SAMPLES						
WOOD 41(PB)					103	93
WOOD 42(PB)					104	91
WOOD 43(PB)					103	93
WOOD 44(PB)					108	90
WOOD 45(PB)					107	92
WOOD 46(PB)					94	97
WOOD 47(PB)					106	91
LAB BLANKS						
1985					105	98
1991					100	92
1985	0	0	0	0		
1991	0	0	0	0		

PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	2286	1354	2982	6056

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

2004	2005	%RSD
156391	142082	9.59

MACHINEDUPLICATE - SURROGATE AREA COMPARISON

1ST. RUN	2ND. RUN	%RSD
158492	160627	1.34

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #12 TO WOODRUFF COUNTY - APRIL, 1995.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 42	93%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
1.70 mg/L	71 mg/L	0.32%

RESULTS OF PESTICIDE MONITORING : TRIP #13 TO WOODRUFF COUNTY-MAY, 1995.

(unk = unknown, NC = not collected, ND = not detected)

( =suspect, see text)

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	67	68	69	70
WELL ID:	WOOD48(PB)	WOOD#7R3	WOOD#9R2	WOOD 34(PB)
DATE SAMPLED:	15-May-95	15-May-95	15-May-95	15-May-95
LATITUDE:	35° 19' 50"	35° 19' 27"	35° 17' 09"	35° 03' 21"
LONGITUDE:	91° 21' 28"	91° 18' 20"	91° 18' 29"	91° 13' 13"
DEPTH OF WELL, ft:	65	unk	40-60	62
pH, standard units:	6.7	6.6	6.6	6.3
CONDUCTIVITY AT 25° C , umhos/cm:	205	193	262	259
TEMPERATURE, ° C :	19	17	19	19
NITRATE, mg/L:	2.09	<0.01	0.31	4.9
ACIFLUORFEN, ug/L	ND	ND	6.8	0.5
ALACHLOR, ug/L:	ND	ND	ND	ND
ATRAZINE,ug/L:	ND	ND	ND	ND
BENTAZON, ug/L	ND	21.1	36.6	1.5
CYANAZINE, ug/L:	ND	ND	ND	ND
DIURON, ug/L:	ND	ND	ND	ND
FLUOMETURON, ug/L:	ND	ND	0.4	ND
LINURON, ug/L:	ND	ND	ND	ND
METOLACHLOR, ug/L:	ND	ND	ND	ND
METRIBUZIN, ug/L:	ND	ND	ND	ND
MOLINATE, ug/L:	ND	ND	ND	ND
NORFLURAZON, ug/L	ND	ND	ND	ND
2,4-D, ug/L	ND	ND	ND	ND

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #13 TO WOODRUFF COUNTY MAY, 1995.

EPA METHOD 507

PERCENT RECOVERIES

	SURROGATE	MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON	INT. STD.
FIELD FORTIFIED SAMPLES								
WOOD #48	63	73	104	89	83	86	88	102
WOOD #7R3	65	74	100	88	81	87	90	102
WOOD #9R2	66	75	88	89	81	86	85	101
WOOD#34(PB)R1	65	77	91	94	85	87	89	97

NON-FORTIFIED SAMPLES

WOOD #48	63							92
WOOD #7R3	100							124
WOOD #9R2	73							111
WOOD#34(PB)R1	89							87

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LAB BLANKS

2162bl	71
2164bl	75

CONCENTRATIONS FOR LAB BLANKS

2162bl	0	0	0	0	0	0
2164bl	0	0	0	0	0	0

PEAK AREAS FOR A 2X* STANDARD

MOLINATE	ATRAZINE	METRIBUZIN	ALACHLOR	METOLACHLOR	NORFLURAZON
14948	14659	8447	7479	19351	18500

FIELD DUPLICATE - SURROGATE CONCENTRATION COMPARISON

2133	2135	%RSD
792533	778011	1.85

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
663087	695389	4.76

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #13 TO WOODRUFF COUNTY - MAY, 1995.

EPA METHOD 515

PERCENT RECOVERIES

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
FIELD FORTIFIED SAMPLES					
WOOD #48	73	73	108	73	71
WOOD #7R3	63	62	104	81	62
WOOD #9R2	73	67	110	66	50
WOOD#34(PB)R1	62	64	110	56	55

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
NON-FORTIFIED SAMPLES					
WOOD #48	81		101		
WOOD #7R3	omitted		109		
WOOD #9R2	69		107		
WOOD#34(PB)R1	75		114		

	SURROGATE	2,4-D	INT. STD.	BENTAZON	ACIFLUROFEN
LAB BLANKS					
2168	64		109		
2169	58		117		

CONCENTRATIONS IN BLANKS

2168	0	0	0
2169	0	0	0

PEAK AREAS FOR A 2X* STANDARD

2,4-D	BENTAZON	ACIFLUROFEN
73805	161401	498026

DUPLICATE ANALYSIS

FIRLD DUPLICATE - SURROGATE AREA COMPARISON

2119	2110	%RSD
omitted	102785	

MACHINE DUPLICATE - SURROGATE AREA COMPARISON

1ST RUN	2ND RUN	%RSD
114931	106188	7.91

ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #13 TO WOODRUFF COUNTY - MAY, 1995.

NPS METHOD 4

PERCENT RECOVERIES

	CYANAZINE	FLUOMETURON	DIURON	LINURON	SURROGATE	INT. STD.
FIELD FORTIFIED SAMPLES						
WOOD #48	97	87	96	90	94	102
WOOD #7R3	92	77	90	84	88	100
WOOD #9R2	88	84	88	73	91	108
WOOD#34(PB)R1	89	73	89	75	75	104
WOOD #48					79	102
WOOD #7R3					86	105
WOOD #9R2					90	103
WOOD#34(PB)R1					85	106
LAB BLANKS						
2166bl					89	103
2167bl					75	104
2166bl	0	0	0	0		
2167bl	0	0	0	0		

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PEAK AREAS FOR A 2X* STANDARD

	CYANAZINE	FLUOMETURON	DIURON	LINURON
2X STANDARD	2734	1190	3610	7640

DUPLICATE ANALYSIS

FIELD DUPLICATE - SURROGATE AREA COMPARISON

2104	2105	%RSD
134484	152636	12.64

MACHINEDUPLICATE - SURROGATE AREA COMPARISON

1ST. RUN	2ND. RUN	%RSD
148627	148668	0.03

*ANALYTE CONCENTRATIONS ARE ABOUT 2 TIMES THE EPA ESTIMATED DETECTION LIMIT

QUALITY CONTROL DATA FOR PESTICIDE MONITORING: TRIP #13 TO WOODRUFF COUNTY - MAY, 1995.

NITRATE

SPIKE RECOVERY

WELL NUMBER	%RECOVERY
WOOD 18	100%

DUPLICATE ANALYSIS

1ST MEASUREMENT	2ND MEASUREMENT	% RSD
2.0336 mg/L	2.0340 mg/L	0.02%

APPENDIX B

CORRECTIVE ACTION REPORTS

AWRC WATER QUALITY LABORATORY

June 15, 1994

CORRECTIVE ACTION REPORT

On May 26, 1994, after some liquid was inadvertently drawn into it, our Eppendorf automatic pipet (adjustable from 200-1000 uL) was found to be poorly calibrated and inconsistent. Efforts to calibrate the pipet were unsuccessful and the pipet was returned to Eppendorf for repair. Today, eppendorpf sent us a new pipet-at no cost as the old one was under warranty. QC on the pipet shows good accuracy and consistency. All the pipets used in the pesticide project will be tested daily for accuracy and consistency.

Terry Nichols



Research Assistant

AWRC WATER QUALITY LABORATORY

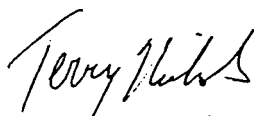
July 21, 1994

CORRECTIVE ACTION REPORT

On July 19th it was determined that Steve Hill, a graduate student working at the lab doing extractions for pesticides, was following improper procedures during removal of the extracts from the concentrator tubes. He was rinsing the tube sidewalls with the extract rather than with clean solvent. Up to 20 percent of the recovered pesticides were being lost due to this error. This determination was made by rerinsing some concentrator tubes after the extracts had been brought to volume. The rinsate was then subjected to gc or hplc analysis depending on the method for which the original extractions were done. Mr. Hill began doing these extractions on May 23 after being trained during the previous week. Poor and variable recoveries have been noticed during this time.

Since then Mr. Hill has been instructed in the proper rinsing procedure and was observed carrying out the process for several extractions. Several concentrator tubes were rerinsed after he was finished extracting. The rinsates were subjected to the same analysis as detailed above and no pesticides were detected. To guard against this happening again, at least one concentrator tube from each day's work will be rerinsed and the rinsate analyzed for pesticide residue.

Terry Nichols



Research Assistant