Agricultural Chemicals in Shallow Ground Water in Southwestern Georgia

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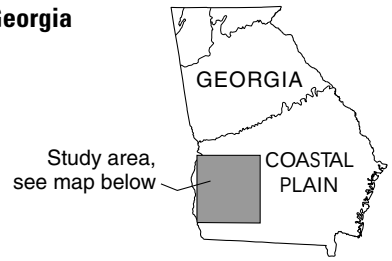
Cooperator Georgia Department of Agriculture
Year Started 1999



Problem

Modern agricultural practices include the use of pesticides and fertilizers to increase crop yields. Application of these chemicals involves some risk of contamination to surface- and ground-water resources through runoff and infiltration. The Georgia Department of Agriculture has primary responsibility for pesticide regulation and is the lead agency for Georgia's ground-water protection program for pesticides. Data on the occurrence, in shallow ground water, of frequently used pesticides are not available throughout agricultural areas of Georgia. A ground-water-quality monitoring program is critical to determine if agricultural pesticide use contaminates ground-water resources, and if so, where.

Objectives

- Assess the quality of shallow ground-water resources in relation to agricultural chemical use in the Coastal Plain physiographic province in southwestern Georgia.
- Provide data on the occurrence of nitrate and pesticides in shallow ground water to help design a monitoring network for examining long-term trends in ground-water quality related to agricultural practices in Georgia.

Progress and Significant Results, 2001

- Eighteen ground-water samples were collected from 17 wells during 2001. Samples were analyzed for pesticides and nitrate. Twenty-eight wells and 11 springs were sampled during 1999 and 23 wells were sampled during 2000.
- The pesticides detected in ground water during 2001 included 10 herbicides, 4 degradation products of atrazine, 2 degradation products of the insecticide aldicarb, and 1 fungicide.
- In the 13 wells sampled for nitrate during 2001, concentrations ranged from 0.1 to 10 milligrams per liter (mg/L). The median nitrate concentration was 1.6 mg/L. The water sample from one well had a nitrate concentration of 10 mg/L, which is equal to the Maximum Contaminant Level (U.S. Environmental Protection Agency, 2000); however, no pesticides were detected in this sample. The water sample from another well had a nitrate concentration of 9.0 mg/L and five pesticides were detected.

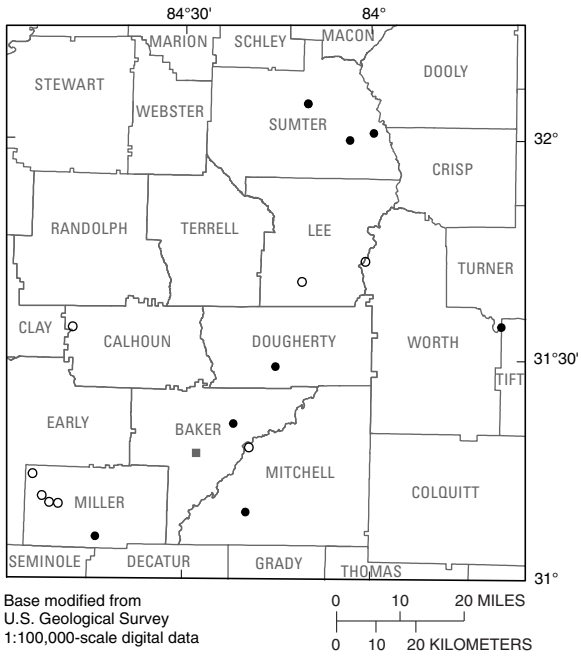
References Cited

Georgia Agricultural Statistics Service, 1998 and 2002, Georgia Agricultural Facts: Athens, Ga., Georgia Department of Agriculture, variously paginated.

Koterba, M.T., Wilde, F.D., and Lapham, W.W., 1995, Ground-water data-collection protocols and procedures for the National Water-Quality Assessment Program: Collection and documentation of water-quality samples and related data: U.S. Geological Survey Open-File Report 95-399, 113 p. [Available at URL: *http://water.usgs.gov/nawqa/OFR95-399.html*; accessed October 22, 2002.]

Nowell, L.H. and Resek, E.A., 1994, National standards and guidelines for pesticides in water, sediment, and aquatic organisms: Application to water-quality assessments, *in* Reviews in Environmental Contamination and Toxicology: v. 140, New York, N.Y., Springer-Verlag, 164 p.

U.S. Environmental Protection Agency, 2000, Maximum contaminant levels (Subpart B of part 141, National Primary Drinking-Water Regulations): U.S. Code of Federal Regulations, Title 40, parts 100-149, revised as of July 1, 2000, p. 334-560. [Available at URL: *http://www.epa.gov/safewater/mcl.html*; EPA 816-F-02-013; revised July 2002.]



EXPLANATION

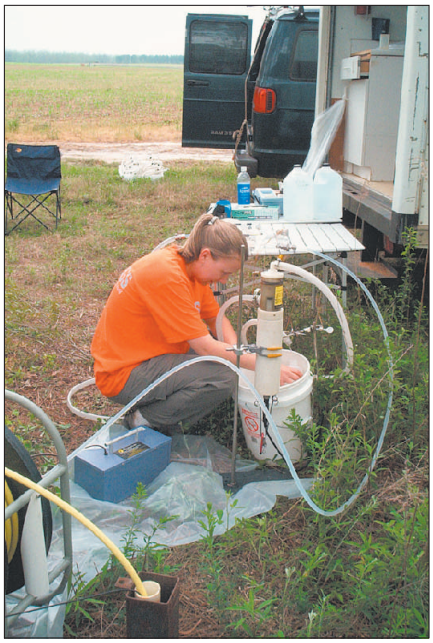
Well adjacent to agricultural field

- One or more pesticides detected
- No pesticides detected

Well in forested area

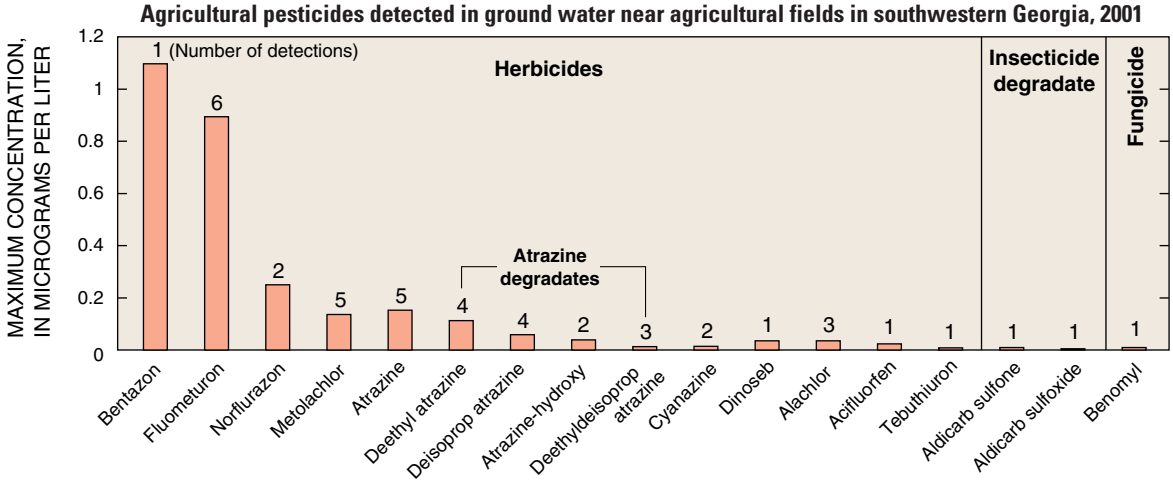
- No pesticides detected

Wells sampled during 2001 for the U.S. Geological Survey/Georgia Department of Agriculture pesticide monitoring study.



The sampling protocols followed for this pesticide monitoring study are the same as those used for the National Water-Quality Assessment Program (Koterba and others, 1995). These protocols require rigorous cleaning of sampling equipment and strict handling procedures to ensure that there is no sample contamination. These protocols are necessary to achieve detection levels as low as 0.001 micrograms per liter. Photo by Andrew C. Hickey, USGS.

As the distribution of crops grown changes from year to year, the types and quantities of pesticides and fertilizer applied also changes. This is particularly true in Georgia where the number of acres planted in cotton has more than tripled in the last decade (Georgia Agricultural Statistics Service, 1998, 2002); cotton production relies on more pesticides and defoliants than other crops commonly grown within Georgia. Pesticides have the potential for leaching into shallow ground water and, in some cases, into the underlying aquifers that are used for drinking-water supplies. A monitoring program is essential to ensure that drinking water is protected. Photo by William B. Hughes, USGS.



Ten herbicides, four degradates of the herbicide atrazine, two degradates of the insecticide aldicarb, and one fungicide were detected in the 18 ground-water samples collected during 2001. Fluometuron, metolachlor, and atrazine were detected in approximately one-third of the samples. Fluometuron is a pre- and post-emergence herbicide used on cotton. Metolachlor is a selective herbicide commonly used on corn, soybeans, peanuts, and cotton. Atrazine is used as a selective herbicide on a wide variety of crops. At higher application rates, it is used for nonselective weed control in noncropped areas. The pesticide concentrations measured were less than applicable maximum contaminant levels or lifetime health advisory levels (Nowell and Resek, 1994).