PESTICIDES IN THE NATION'S STREAMS AND GROUND WATER, 1992–2001

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The use of pesticides to control weeds, insects, and other pests has resulted in a range of benefits, including increased food production and reduction of insect-borne disease, but also raises questions about possible adverse effects on the environment, including water quality.

Water samples collected from 1992 through 2001 from 186 streams and rivers and from 5,047 wells in 51 of the nation's major river basins and aquifer systems were summarized to provide the most comprehensive national-scale analysis of pesticide occurrence to date. At least one pesticide was detected in water from all streams studied, and at least one pesticide was detected more than 90 percent of the time in water from streams draining agricultural, urban, or mixed land uses. Pesticides were less common in groundwater than in streams, but were detected in more than 50 percent of the sampled shallow wells beneath agricultural and urban areas. About one-third of the deeper wells sampled, which tap major aquifers used for water supply, contained one or more pesticides or pesticide degradates.

Concentrations of pesticides in streams and groundwater were typically below water-quality benchmarks for human health. Only 11 of 186 streams had pesticide concentrations (usually atrazine or cyanazine) greater than a human-health benchmark (benchmarks are annual average concentrations). Only about 1 percent of the 2,720 domestic-supply and public-supply wells sampled had pesticide concentrations (usually dieldrin) greater than a human-health benchmark. Concentrations of pesticides in streams were typically above aquatic-life benchmarks (benchmarks are single sample concentrations or moving average concentrations). One or more pesticides exceeded benchmarks for aquatic life in 83 percent of urban, 57 percent of agricultural, and 42 percent of mixed-land-use streams. The insecticides diazinon, chlorpyrifos, and malathion were frequently above benchmarks for aquatic life in urban streams whereas chlorpyrifos, azinphos-methyl, atrazine, *p,p'*-DDE, and alachlor were frequently above benchmarks in agricultural streams.

Results of the assessment show that pesticide use is a major determining factor in pesticide occurrence, particularly for streams. Concentrations of atrazine, metolachlor, simazine, acetochlor, 2,4-D, chlorpyrifos, and diazinon in streams directly correlate with areas where they are used on crops. As use changes over time, concentrations in stream water samples also change. National-scale models of pesticides in streams also show that pesticide use is the most important explanatory variable for predicting concentrations.

The national assessment serves as a foundation for improving water resource assessment and management, but major gaps in critical information about pesticides still persist and continue to present challenges to scientists, managers, and policymakers. Some of the most important steps needed to fill gaps are:

1. Improve tracking of pesticide use, particularly in urban areas.
2. Add assessments of pesticides not yet studied.

3. Improve assessment of pesticide degradates, including their distribution and potential effects.
4. Evaluate toxicities of pesticide mixtures and their potential to affect humans and aquatic life.
5. Evaluate the performance of pesticide-management practices.
6. Improve methods for prediction of pesticide concentrations in unmonitored areas.
7. Sustain and expand long-term monitoring for trends.

Information for this presentation was taken from U.S. Geological Survey Circular 1291 "*The Quality of Our Nation's Waters—Pesticides in the Nation's Streams and Ground Water, 1992–2001*." The report and supporting information are available at http://ca.water.usgs.gov/pnsp/pubs/circ1291/