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Pesticides in Southern Willamette Valley Groundwater

John Selker

Groundwater is the source of drinking water for the vast majority of rural residents in the Willamette Valley.

The valley is home to the majority of the state's population, and, due to the valley's fertility, favorable climate, and abundant water supply, it is also an area of intensive agriculture.

The region's high winter rainfall provides aquifers that are often within 50 feet of the land surface. In many parts of the United States and in other countries where groundwater is this close to the surface, pesticide contamination has been observed. Thus, with our high population, significant applications of pesticides, and a water table close to the surface, it is natural to wonder whether our aquifers are contaminated. This publication reviews the findings of recent studies.

The Findings

After significant study of this issue, detailed below, we see no indication of even a slight violation of drinking water standards in this area. This is very good news. At the same time, many water samples contained traces of pesticides, indicating that continued care in pesticide use is essential to maintain the quality of the area's groundwater resources.

After further studies of pesticides' effects on human health—in particular, how multiple compounds may generate cumulative effects—it is possible that drinking water standards will be adjusted. In that case, the data that have been collected will require re-analysis.

Findings support continued vigilance in pesticide use.

Details of the Studies

On-farm Study

From 1993 to 1998, an OSU research team worked to identify areas and practices in the southern Willamette Valley that may contribute to groundwater contamination. The 21-farm study sampled soil water from immediately below the plant roots (3 feet below the surface).

The study selected the longest lived and most mobile pesticide compounds applied to the sites for which water quality standards had been established: atrazine, simazine, and terbacil. Atrazine and simazine are possible human carcinogens, but there is evidence that terbacil is not. Analytical methods were sensitive enough that the compounds were always detected.

Though isolated instances of concentrations slightly above drinking water standards were seen, at no site were any of the average concentrations above standards (Gatchel, 1996). Given the distance between where the samples were taken (a 3-foot depth) and the aquifers where water is extracted (typically deeper than 50 feet), we would expect pesticide concentrations to decline as water percolates to the water table.

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Thus, the contribution of pesticides to groundwater contamination from these fields is not a great concern.

Well Studies

From 2000 to 2002, the Oregon Department of Environmental Quality carried out a more comprehensive study of groundwater quality throughout the same area (Eldridge, 2003). The Oregon DEQ collected water samples from 500 domestic wells. Samples were analyzed first for nitrates. Then, the team targeted the 100 wells with the highest nitrate levels to analyze for a spectrum of potential contaminants, including certain common, mobile, and persistent pesticides. These 100 wells were considered most vulnerable to pesticide contamination because of their vulnerability to nitrate contamination, generally from agricultural or gardening activities which are associated with pesticide use.

The study detected 15 pesticides. In order of frequency, they were atrazine, desethyl-atrazine, simazine, terbacil, bromacil, malathion, bisphenol-A, metribuzin, dichloroaniline, clopyralid, diazinon, ethofumesate, metolachlor, p,p-DDT, and picloram. The primary use of atrazine is on weeds in corn fields, roadsides, and railroads. Simazine is used frequently in nurseries and orchards.

Atrazine was found in 33 percent of the wells and its breakdown product, desethyl-atrazine, in 58 percent. However, the highest concentration of atrazine detected was about one-tenth of the drinking water standard set by the U.S. Environmental Protection Agency (EPA). There is no EPA standard for desethyl-atrazine.

Simazine was reported at 12 percent of the sampling locations, but the highest concentration was about one-twentieth of the EPA drinking water standard. The remaining pesticides were detected in 5 percent or fewer of the wells.

In no case did pesticide concentrations exceed human health or public drinking water standards.

What Should You Do?

These findings support continued vigilance in pesticide use. While the news on present contamination is quite good overall, pesticide concentrations below the root zone sometimes are near drinking water levels. Our current practices appear to be sufficient to keep groundwater safe if we continue to be as careful as we have been over the past decade.

If you drink water from a rural well, the fact that minute amounts of pesticides are in many samples may have you wondering whether you are at any risk. While the EPA and toxicologists do their best to determine "safe" levels, it is very difficult to determine the possible effects of consuming low levels of multiple toxins. It is logical to be conservative, filtering your drinking water for organic compounds at a cost of a few dollars per month. However, we do not have data to show that this does reduce your risk of disease.

Citations

Eldridge, A. 2003. Southern Willamette Valley 2002 groundwater study: final report. Oregon Department of Environmental Quality. http://groundwater.oregonstate.edu/willamette/reports.htm

Gatchell, L. 1996. Monitoring potential groundwater contamination due to agricultural production in Lane County, OR. M.S. Thesis. Oregon State University, Corvallis.

Additional Resources

General introduction to the topic of pesticides in drinking water, from the EPA
http://npic.orst.edu/factsheets/drinkingwater.pdf

Overview of pesticides in Oregon groundwater, from the Oregon Pesticide Education Network
http://www.pesticide.org/OF3.pdf

EPA drinking water standards and health advisories
http://www.epa.gov/waterscience/drinking/

Hinkle, S.R.1997. Quality of shallow ground water in alluvial aquifers of the Willamette Basin, Oregon, 1993–95. U.S. Geological Survey Water-Resources Investigations Report 97-4082-B. http://oregon.usgs.gov/pubs_dir/Pdf/97-4082b.pdf

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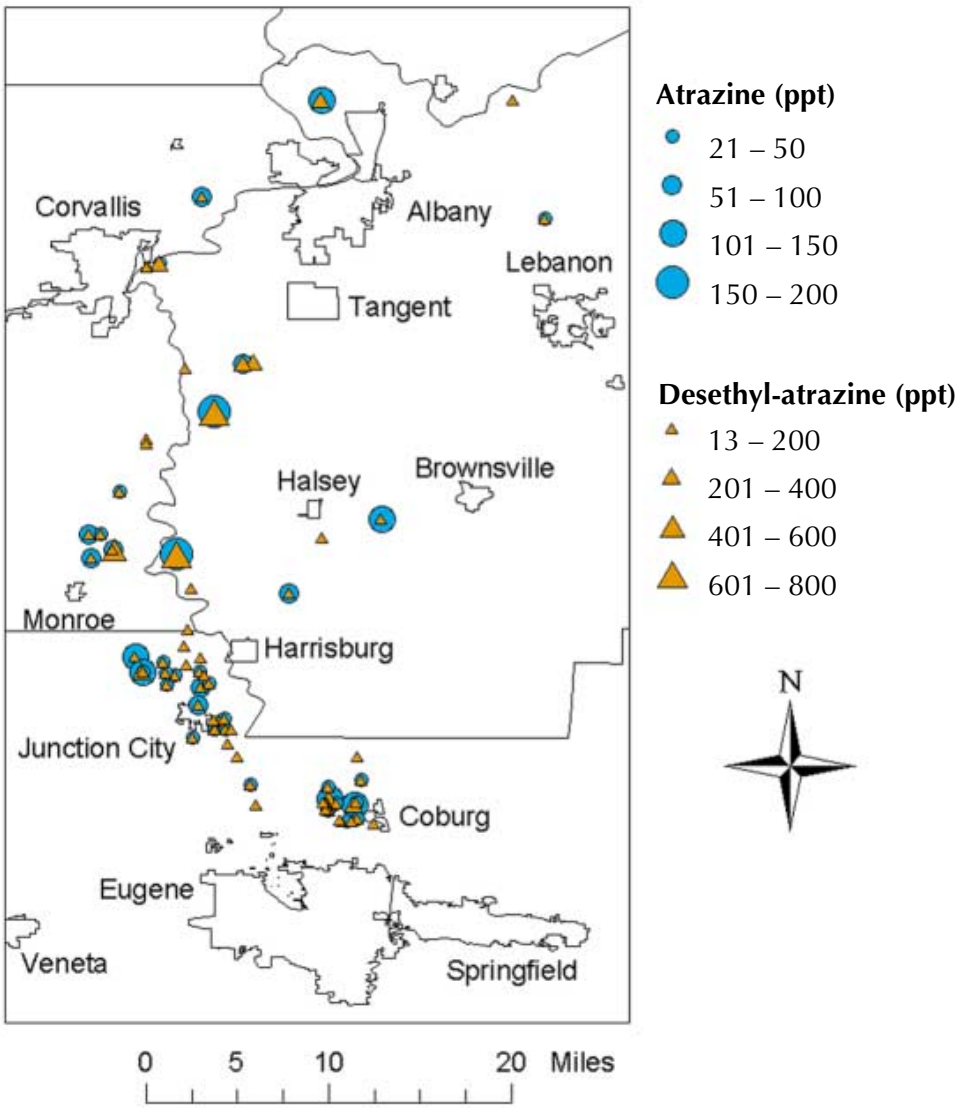

Figure 1. *Concentrations of atrazine and its breakdown product, desethyl-atrazine, detected in well water in the southern Willamette Valley (from Eldridge, 2003). All concentrations of atrazine were far below the EPA drinking water standard of 3000 ppt. There is at present no standard for desethyl-atrazine. Groupings of points in the map do not necessarily indicate a high occurrence of the compounds in groundwater in those areas, but they do reflect where more wells were sampled.*

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