NRDC Report

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Poisoning the Well:

How the EPA is Ignoring Atrazine Contamination in Surface and Drinking Water in the Central United States

The full report on atrazine contamination is available at **www.nrdc.org/policy**

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Banned in the European Union and clearly linked to harm to wildlife and potentially to humans, the pesticide atrazine provides little benefit to offset its risks. In a new report, NRDC brings together for the first time the results of surface water and drinking water monitoring required by the U.S. EPA to create a more comprehensive analysis of atrazine pollution across the Midwestern and Southern United States. We found that the U.S. EPA's inadequate monitoring systems and weak regulations have compounded the problem, allowing levels of atrazine in watersheds and drinking water to peak at extremely high concentrations. Given the pesticide's limited usefulness and the ease with which safer agricultural methods can be substituted to achieve similar results, NRDC recommends phasing out the use of atrazine, more effective atrazine monitoring, the adoption of farming techniques that can help minimize the use of atrazine and prevent it from running into waterways, and the use of home filtration systems by consumers.

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An Atrazine Primer

Atrazine is a selective herbicide applied to fields at the beginning of the growing season to kill weeds.[1] In the United States alone, between 60 and 80 million pounds of atrazine are used each year, mainly on corn crops. Because of its widespread use, atrazine is the most commonly detected pesticide in U.S. waters. Approximately 75 percent of stream water and about 40 percent of all groundwater samples from agricultural areas tested in an extensive U.S. Geological Survey study contained atrazine.[2] Although the European Union banned the pesticide in 2004, atrazine is still widely used in the United States.

The U.S. Environmental Protection Agency (EPA) regulates the use of atrazine as well as the presence of atrazine in drinking water. Under the Safe Drinking Water Act (SDWA), the EPA has determined that no more than 3 parts per billion (ppb) of atrazine (as a running annual average)[3] may be present in drinking water. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the EPA allows atrazine to be used on, among other things, corn, sorghum, sugarcane, and lawns. Despite the fact that atrazine used in fields eventually ends up in surface water and treated drinking water, the regulation of atrazine under these two statutes is not coordinated.

The Dangers of Atrazine Are Well Documented

The toxicity associated with atrazine has been documented extensively. The adverse reproductive effects of atrazine have been seen in amphibians, mammals, and humans—even at low levels of exposure. Concentrations as low as 0.1 ppb have been shown to alter the development of sex characteristics in male frogs, resulting in male frogs with female sex characteristics, hermaphroditism and the presence of eggs in male frog testes.[4] When exposure coincides with the development of the brain and reproductive organs, that timing may be even more critical than the dose.[5,6] Also of great concern is the potential for atrazine to act synergistically with other pesticides to increase their toxic effects.

NRDC's New Analysis Reveals Widespread Atrazine Contamination and Inadequate Regulation and Monitoring

NRDC analyzed—in combination for the first time—the results of surface water and drinking water monitoring required by the EPA across the Midwestern and Southern United States. NRDC obtained these data from the EPA's Ecological Watershed Monitoring Program (surface water) and the EPA's Atrazine Monitoring Program (drinking water) as part of the settlement of litigation brought against the EPA and in response to two Freedom of Information Act (FOIA) requests submitted to the agency. Our analysis resulted in seven major findings:

Watersheds are Pervasively Contaminated with Atrazine

Our analysis of the Ecological Monitoring Program data confirms that the surface waters of the Midwestern and Southern United States suffer from pervasive contamination with atrazine.

- All 40 watersheds tested showed detectable levels of atrazine, and 25 had average concentrations above 1 ppb, which is the concentration at which the primary production of aquatic non-vascular plants (such as algae) is reduced.

Table 1: Ten watersheds with the highest peak concentrations of atrazine

Watershed name	Sampling year	Atrazine concentration (ppb)		
		Max. peak	75th percentile	Average
Little Pigeon Creek, IN	2005	237.50	5.02	18.56
South Fabius River, MO*	2005	182.75	8.82	9.61
Big Blue River, Upper Gage, NE	2006	125.00	5.10	17.61
Big Blue River, Lower Gage, NE	2005	112.19	1.54	7.85
Middle Loup Creek, NE	2006	82.00	0.40	2.79
Rock Creek, IN	2004	78.1	0.68	2.76
Little Sni-A-Bar Creek, MO	2004	59.03	3.88	4.42
Youngs Creek, MO	2004	53.75	9.69	8.89
Horse Creek, IL	2006	50.7	0.85	2.58
Muddy Creek, NE	2005	49.87	1.97	4.67

Source: U.S. EPA Ecological Watershed Monitoring Program
* The South Fabious River wastershed had 3 of the 15 highest peak concentrations: 182.75 ppb (2005); 106 ppb (2006); and 82.8 ppb (2006).

- The watersheds with the 10 highest peak concentrations of atrazine are in Indiana, Missouri, and Nebraska.
- Nine of the monitored watersheds (22 percent) had at least one sample showing atrazine levels above 50 ppb, and four watersheds (10 percent) had peak maximum concentrations of atrazine exceeding 100 ppb. At Little Pigeon Creek in Indiana, the annual average atrazine concentration was 18.56 ppb, but the maximum concentration was a staggering 237.5 ppb, detected in May 2005.

High Levels of Atrazine in Many Drinking Water Systems are Also Cause for Alarm

Our analysis of the EPA's Atrazine Monitoring Program data also reveals disturbingly high levels of atrazine contamination in the drinking water in some public water systems.

- More than 90 percent of the samples taken in 139 water systems had measurable levels of atrazine in both 2003 and 2004.
- Three water systems had running annual averages for atrazine in finished (tap) water[7] that exceeded the 3 ppb drinking water standard: Versailles Water Works in Indiana (4.60 ppb), Mount Olive Water Works in Illinois (3.79 ppb), and Evansville in Illinois (3.20 ppb).
- Fifty-four water systems (39 percent) had a one-time peak atrazine concentration above 3 ppb. The highest peak concentration of atrazine in finished water among all tested public water systems was 39.69 ppb in the Evansville water system in Randolph County, Illinois.

The EPA is Ignoring the Atrazine Problem

Because of the potential adverse effects associated with even short exposures to atrazine, the spikes detected in the watersheds and the public drinking water systems are particularly alarming. Yet, because the EPA focuses on average concentrations of atrazine, it has ignored these peaks.

Monitoring Programs Were Not Designed to Find the Biggest Problems

The EPA's monitoring program for atrazine was poorly designed and is not apt to find the most troubling results, which makes the statistics even more alarming. For example, samples taken before a rainstorm washes pesticides into a watershed will show much lower concentrations of pesticide than samples taken after a rainstorm, which can capture the contaminated field runoff. Similarly, sampling conducted when fields have not yet been treated will result in low to no detections of contamination. Because the monitoring program was not designed to account for the timing of runoff in response to weather events or application, the EPA's watershed monitoring program probably underestimates peak exposures.

Screening Levels Are Too Permissive

The EPA's threshold of concern derived from computer modeling considered the impact of atrazine contamination on plants, but not its toxic effects on aquatic animals that have been shown to occur at lower levels. Therefore, the endocrine-disrupting effects of atrazine on animals were not incorporated into the determination of the level of concern associated with the contamination in the watershed. In addition, the U.S. Fish and Wildlife Service criticized the model for incorrectly predicting no significant adverse effects 8 percent of the time. Although the EPA is considering alternate models, its data analysis is still driven by effects on aquatic plants, effectively ignoring low-dose endocrine-disrupting effects.

The EPA Monitoring Program is Ignoring More Than 1,000 Other Vulnerable Watersheds

The EPA has yet to act to reduce risks in most of the watersheds that it has identified as vulnerable to atrazine contamination. In designing its watershed monitoring program, the EPA and the manufacturer of atrazine, Syngenta, in a secretly negotiated agreement, chose to examine just 40 watersheds for atrazine levels, after determining that atrazine concentrations in these watersheds would be statistically representative of the 1,172 most vulnerable watersheds in the country. Indeed, based on the results of its watershed monitoring program, the EPA itself preliminarily estimated that 101 (9 percent) of the 1,172 watersheds would exceed the (inadequate) level of concern for atrazine contamination and would require risk mitigation measures.[8] To date the EPA has still not ordered mitigation steps in these watersheds.

Atrazine Use Brings Minimal Benefits

Data suggest that atrazine provides, at best, only minimal economic benefits to the farmers who use it. The U.S. Department of Agriculture estimates a ban on atrazine would result in crop losses of only 1.19 percent and decrease corn acreage in production by just 2.35 percent. Italy and Germany (both of which banned atrazine nearly 20 years ago) have not seen any drop in corn productivity or total acreage of land in production for corn since their ban on atrazine was put in place, although this was due in part to the use of other hazardous pesticides. Integrated Pest Management techniques could help farmers eliminate the use of atrazine and control weeds while reducing their use of other dangerous chemicals.

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Recommendations for Protecting Human Health and the Environment

NRDC recommends the following steps be taken to reduce atrazine contamination in U.S. waters and minimize its impacts on human health and the environment:

1. The United States should phase out the use of atrazine.
Given the evidence of atrazine's toxic effects on sensitive wildlife species and its potential risk to human health, the currently high contamination levels in the Midwestern and Southern United States, and the lack of compelling evidence that the herbicide is particularly useful to farmers, NRDC strongly recommends that atrazine be phased out of all uses in the United States, including home gardens and golf courses.

2. Farmers should take interim steps to reduce their atrazine use.
Farmers can take immediate steps to reduce their use of atrazine, including implementing a variety of nonchemical techniques for weed control. These include crop rotation, the use of winter cover crops, alternating rows of different crops, and mechanical weed control methods. Timing fertilizer applications to coincide with periods of greatest nutrient uptake by crops can avoid unnecessary fertilizer use that would fuel weed growth.

3. The EPA should monitor all vulnerable watersheds and require all future monitoring plans to identify worst case scenarios.
The EPA should broaden the monitoring program to assess all watersheds identified as vulnerable. Future monitoring plans should be designed to identify the worst case scenarios occurring in vulnerable watersheds and in public water systems. Proper timing for sampling after big rainstorms and after fields have been treated with atrazine is recommended. This would provide a much more realistic view of the actual severity of the atrazine problem.

4. The EPA should publish monitoring results for each watershed and public water system sampled.
Monitoring results on the watersheds and the public water systems that were sampled under the two different monitoring programs were first made available to NRDC through FOIA requests and litigation. However, people who live downstream of atrazine-treated fields have a right to know about high levels of atrazine contamination in their watersheds or drinking water systems. A publicly available website posting sampling data as it is analyzed and regular reports about spikes of atrazine contamination would be a strong step in the right direction, providing accessible information to the public.

5. The public should use home water filtration systems and demand transparency of information from their water utilities.
NRDC recommends that consumers concerned about atrazine contamination in their water use a simple and economical household water filter, such as one that fits on the tap. Consumers should make sure that the filter they choose is certified by NSF International to meet American National Standards Institute (ANSI) Standard 53 for VOC (volatile organic compounds) reduction and therefore capable of significantly reducing many health-related contaminants, including atrazine and other pesticides. A list of NSF/ANSI 53 certified drinking water filters is available at http://www.nsf.org/certified/dwtu. Consumers should also contact their local water utility and ask what type of treatment they use, whether they are treating for atrazine and other pesticides, and how well atrazine is being removed from their raw water. Providing this information to NRDC will also help us to collect information on how public water systems are treating for contaminants.

Make Our Drinking Water Safer

Visit the NRDC SimpleSteps site at www.simplesteps.org/atrazine for information about how you can take action to make your local public water system safe from contaminants.

[1] Throughout this fact sheet and the full report we refer to atrazine as both an herbicide and a pesticide. Pesticide is the overarching term for describing a substance used to kill an unwanted organism. An herbicide is a type of pesticide used specifically to kill plants.

[2] Gilliom RJ, et al. 2006. The Quality of Our Nation's Waters: Pesticides in the Nation's Streams and Ground Water, 1992–2001. U.S. Geological Survey Circular 1291.

[3] A running annual average is calculated by averaging the data from one date with all the data from the previous 365 days, then averaging the data from the next point and the previous 365 days, and so on.

[4] Hayes TB, et al. 2002. Atrazine-induced hermaphroditism at 0.1 ppb in American leopard frogs (Rana pipiens): laboratory and field evidence. *Environ Health Perspect* 111:568–575.

[5] Colborn T. 2006. A case for revisiting the safety of pesticides: a closer look at neurodevelopment. *Environ Health Perspect* 114(1):10–17. Review.

[6] Colborn T. 2004. Commentary: setting aside tradition when dealing with endocrine disruptors. *ILAR J* 45(4):394–400. Review.

[7] Finished water refers to drinking water that is ready for consumption.

[8] U.S. EPA. 2007. Preliminary Interpretation of the Ecological Significance of Atrazine Stream-Water Concentrations Using a Statistically-Designed Monitoring Program. In Support of an Interim Reregistration Eligibility Decision on Atrazine. Submitted to the FIFRA Scientific Advisory Panel for Review and Comment (November). http://epa.gov/oscpmont/sap/meetings/2007/december/whitepaper_sap.pdf. Accessed August 12, 2008.