

The Syngenta Corporation & Atrazine

The Cost to the Land, People & Democracy



A report by the Land Stewardship Project
and Pesticide Action Network North America
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Acknowledgements

The hard work and courage of many people went into making the report possible, yet some deserve special acknowledgement. Paul Wotzka and Tyrone Hayes stood up to corporate interests and succeeded in making their scientific findings publicly known, despite efforts to obscure and undermine their work. Both have done so at great personal expense, and we appreciate their work and collaboration. We are also grateful to the farmers in this report who shared their time and stories. Their stories offer real world examples of farming without atrazine, and are important to exposing the myth that Syngenta's atrazine is indispensable.

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Introduction

The Syngenta corporation invented the herbicide atrazine¹ and is its primary manufacturer.² The corporation is certainly one of atrazine's most ardent defenders and promoters.³ One of the most commonly detected pesticides in U.S. ground and surface water, many scientists are increasingly concerned about the human health and ecosystem impacts of atrazine. Atrazine is a known "endocrine disruptor" that is linked to reproductive harm and cancers. This report offers a review of the issue, and highlights what farmers in particular can do to end reliance on Syngenta's atrazine.

The Land Stewardship Project & how this report came about

The Land Stewardship Project (LSP) was founded in Minnesota 27 years ago with a mission of fostering an ethic of stewardship for farmland, to promote sustainable agriculture and to develop sustainable communities. During the past two and a half decades, LSP has taken on many of the toughest issues facing rural



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communities and family farmers, including corporate concentration in agribusiness, farm foreclosures in the 1980s, and factory farms. LSP has worked to promote farming systems that are environmentally sound and profitable through policy reform and an "education-to-action" approach that involves farmers and other citizens learning from each other. As a grassroots membership organization, the concerns and passions of our members have directed much of our work.

LSP became involved in the issue of atrazine in 2007 when Paul Wotzka, a hydrologist employed by the state of Minnesota, was fired after a state legislator requested he testify about his research into the high levels of atrazine present in southeast Minnesota waterways. (Wotzka's story and research are detailed in section 3, p. 8.) Wotzka is a long-time LSP member and a strong advocate for stewardship of the land. As a result of his sudden dismissal, he filed a federal whistleblower lawsuit and LSP helped organize a fundraiser

for his legal defense on October 10, 2007. During a presentation at the event, Dr. Tyrone Hayes detailed his research into how very low levels of atrazine emasculated frogs, and how the Syngenta corporation tried to suppress this information (see section 4, pg. 12, for an excerpt of Hayes' 2007 talk).

Over 200 people attended this event, and the feedback from many LSP members who attended was along the lines of, "We are so glad LSP is involved in this issue." Later, LSP mailed a survey on the issue to our members and the response from both farmers and non-farmers was very supportive of LSP continuing to research and organize around this topic. One thing made clear by our survey is that farmers want more information about atrazine, the Syngenta corporation and other alternatives to using this herbicide. This report is a continuation of our learning process. It is especially for farmers, but is written to be accessible to any reader.

Many outside the farming community may wonder why atrazine is still so widely used. There are several reasons for this. For one thing, the herbicide is effective at killing weeds in cornfields and providing ongoing protection against pest plant infestations. In addition, the Syngenta corporation promotes atrazine heavily and assures farmers that it is safe.⁴ Syngenta even promotes atrazine as a valuable part of sustainable agriculture.^{5,6} Many farmers hire custom pesticide applicators and may not know that atrazine is part of the spray mix. Also, many farmers use pre-prepared tank mixes purchased from their co-op and may be unaware that atrazine is a part of the mix. In fact, many *farmers* are surprised to learn that atrazine is still so heavily used.⁷

Many LSP farmer-members use herbicides and pesticides, including atrazine, as part of their farming

operation. If chemicals are used, stewardship of the land demands that they be used judiciously and that only appropriate and safe chemicals be used. However, a persuasive, growing body of science indicates that atrazine may not be safe to use because of its prevalence in our water and its negative impacts on human health and the environment. This report is in part written to help farmers make more informed decisions about atrazine.

This report documents that the federal process and agencies that farmers and the public rely on to pro-

vide unbiased, science-driven information has been corrupted by corporate influence—especially from Syngenta. LSP believes that the Syngenta corporation, through its aggressive marketing and lobbying, should be held primarily responsible for atrazine’s widespread use in the U.S., and for its prevalence in our water. It is important to keep in mind that Syngenta is the primary economic beneficiary of atrazine—not farmers. Indeed, as this report shows, Syngenta maintains profits in part through charging farmers more for its products.

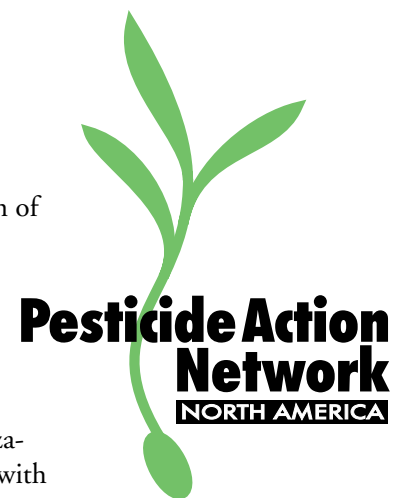
Pesticide Action Network North America’s partnership with LSP on this report

LSP wanted to partner on this work with an organization familiar with the science of pesticides, and one that understands the role of large agribusiness in promoting and profiting from pesticides. Pesticide Action Network North America (PAN) is interested in working with—not blaming—family farmers. PAN knows that the increase of industrial, large-scale farming has led to a handful of giant corporations reaping large profits while farmers often struggle to make ends meet—and the health of farm families, farmworkers and ecosystems suffer. Since the mass introduction of pesticides into agriculture 70 years ago, control over the knowledge and tools needed to grow food has been shifting from farmers to the laboratories and marketing divisions of multinational corporations. PAN wants to see farmers around the world regain control of food production.

PAN is a global network founded 28 years ago in Malaysia to end reliance on highly hazardous pesticides, and to support solutions that protect people and the environment. PAN was created by organizations of farmers, farmworkers, consumers and scientists from around the world, and has grown to an international network of more than 600 groups in some 90 countries. PAN members are concerned about pesticides and the corporate control of agriculture. PAN works for a healthy, fair future. PAN has five regional centers—in Africa, Asia, Europe, Latin America and North America—that coordinate our activities around the world. PAN combines independent, verifiable science and network-based

organizing to yield results. Since PAN’s founding in 1982, the network helped initiate and win ratification of the main international treaties responsible for regulating trade in highly hazardous and persistent pesticides.

PAN partners with organizations that genuinely work with farmers, farmworkers, consumers and scientists toward creating healthy, safe and fair food systems. That’s why we’re so pleased to be partnering with LSP on the production of this report. We know that LSP believes in the power of people when it comes to recreating our food system, and that LSP farmers are a powerful force for change. LSP and PAN share a commitment to healthy, secure and sustainable food and farming systems. And we share the understanding that the Syngenta corporation holds the responsibility for the harms done by atrazine: the contamination of our nation’s water, as well as the increasingly well-understood human health impacts. PAN groups around the world are concerned about Syngenta’s role in reshaping food and agricultural systems, and Syngenta’s practices that have led to some hazardous pesticides being kept on the market far too long. We look forward to working alongside LSP to change that reality.



2 Executive Summary

“Farmers like me are being put on the front line when it comes to the health risks of a chemical like atrazine,” says Paul Sobocinski, a Minnesota farmer. This report summarizes the growing and persuasive body of science that is fueling national concern over Syngenta’s herbicide, atrazine. This report describes how, despite evidence of serious health and ecosystem problems associated with atrazine, the U.S. government has taken minimal action to protect the welfare of the American people, and how Syngenta, atrazine’s creator and ardent promoter, has undermined independent science and the democratic process to keep the pesticide on the market. This report shares concerns from farmers, farmworkers and scientists, and also tells the stories of farmers who have found that atrazine is not an irreplaceable crop protection tool. This report is written for farmers, yet is a resource for all people concerned about the impact of Syngenta’s atrazine on water, people and ecosystems.

Syngenta’s atrazine

Since it first went on the market in the U.S. in 1959, atrazine has become one of the most widely used herbicides in the country. An estimated 76.5 million pounds of atrazine are used in the U.S. each year, with 86% used on corn.^{i,iii} The Syngenta corporation invented atrazineⁱⁱⁱ and is the chemical’s most aggressive defender. The corporation has a 35% market share in corn herbicides, is the global leader in selective herbicides and is number two in non-selective herbicides.^{iv} Atrazine is one reason Syngenta’s net profits grew 75 percent in 2007,^v and another 40 percent in 2008.^{vi}

Atrazine is a common water contaminant

Syngenta’s atrazine has become one of the most commonly detected pesticides in U.S. ground and surface water.^{vii} Between 1998 and 2003, 7 million people were exposed to atrazine in their treated drinking water at levels above state or federal health-based limits.^{viii} The U.S. Geological Survey found that atrazine was present in streams in agricultural areas approximately 80 percent of the time, and in groundwater in agricultural areas about 40 percent of the time.^{ix} In states like Minnesota, Syngenta’s atrazine has been found in a wide variety of areas—from agricultural communities to the pristine lakes of the Boundary Waters Canoe Area Wilderness.^x

Atrazine is a health risk

The widespread presence of Syngenta’s atrazine in the environment poses a risk to humans, wildlife and ecosystems. It is a potent *endocrine disruptor*—a chemical that disrupts hormonal activity of animals and humans at extremely low doses.^{xi} Dr. Tyrone Hayes’ research shows that exposing frogs to as little as 0.1 parts per billion of atrazine causes severe health problems, including inducing a kind of chemical castration.^{xii} Atrazine is linked to breast and prostate cancer, retards mammary development and induces abortion in laboratory rodents.^{xiii}

Science under siege

The Syngenta corporation and its agribusiness allies have attempted to suppress science related to atrazine’s environmental and health problems. Scientists Tyrone Hayes and Paul Wotzka have faced retaliation for speaking publicly about their findings on atrazine. Such bullying tactics have denied the public and policymakers the scientific information they need to make informed decisions on the use of atrazine. Farmers and farmworkers, in particular, are harmed by this suppression of science.

Syngenta undermines democracy and independent science to keep atrazine on the market

Syngenta is a multinational corporation based in Switzerland that is increasingly in control of global agrichemical and seeds markets. Syngenta’s 2008 sales made it the largest pesticide company in the world, controlling almost one-fifth of the global market for agrichemicals.^{xiv} Syngenta has used its deep pockets to undermine scientific integrity, thwart the democratic process and sway the U.S. public’s view of what techniques modern agriculture requires to remain viable. Meanwhile, the same chemical is banned in its home country—and throughout Europe.

Family farmers are innovative stewards and have found ways to grow food without atrazine

There are many viable ways of producing corn without relying on Syngenta’s controversial chemical. Since Germany and Italy banned atrazine in 1991, corn yields and acres of corn harvested in those countries have risen, an indication that atrazine is not as integral to crop production as Syngenta would like the public

to believe.^{xv} According to recent analyses, dropping atrazine would result in yield losses of approximately 0 to 1 percent,^{xvi} much lower than industry estimates. Farmers in states like Minnesota are using innovative production systems to prove that a good corn crop can be raised without this controversial chemical. Increasingly, practical, farmer-oriented information is available for producers seeking alternatives.

Atrazine's legal status is under review

In October 2003, after a long and contentious review, the U.S. EPA approved Syngenta's atrazine for continued use. However, in October 2009, the U.S. EPA officially reopened an examination of the health and environmental risks of atrazine.^{xvii}

A need for swift, decisive action

The federal process and agencies that farmers and the public rely upon have been corrupted by corporate influence. The U.S. EPA's current re-assessment of the pesticide should be a process hallmarked by independent science and transparency. Specifically, during the review process The U.S. EPA should:

- **Ensure 100% transparency.** There should be no closed-door meetings of any kind. Summaries of all interactions between the U.S. EPA and stakeholders should be included in the official record (i.e., the docket) and made publicly available.
- **Studies funded by Syngenta should be discounted in the review process.** Equal involvement of all stakeholders is an important tenet of democracy, however, in the past Syngenta has engaged in several incidents of undue influence on the atrazine registration process. Because of this, any further studies funded by Syngenta that are part of the review should be highly discounted.
- **Make all scientific studies available for public scrutiny.** Critical data should not be hidden from the public or from independent scientific examination by claiming "confidential business information." For the sake of transparency and to ensure farmer confidence in its decisions, the U.S. EPA should only rely on studies that are publicly available.
- **Take swift and clear action to protect farmers and the public if after review the science indicates atrazine is a threat to health and/or the environment.**

Notes

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- ii U.S. Environmental Protection Agency, Large Lakes and Rivers Forecasting Research Branch, "Lake Michigan Mass Balance Study - Atrazine," http://www.epa.gov/med/grosseile_site/LMMBP/atrazine.html (accessed on the internet 12/22/09).
- iii a) Atrazine was developed by a Syngenta legacy company and first used by growers in the U.S. in 1959. Syngenta USA, "Atrazine Celebrates 50 Years of Effective Weed Control," http://www.syngentacropprotection.com/news_releases/news.aspx?id=105657 (accessed December 6, 2009)
b) The herbicide atrazine was introduced in 1958 by J.R. Geigy. Geigy later became part of Novartis. Syngenta was formed in 2000 out of a merger between Novartis and AstraZeneca. Information from: IPSC International Programme on Chemical Safety, Atrazine Health and Safety Guide No. 47, WHO Geneva, 1990. Hicks B, Generic Pesticides—The Products and Markets, Agrow Reports, PJB Publications, 1998.
- iv European Equity Research, *Syngenta* (London: Bear Stearns, February 2008), 9.
- v Sam Cage, *Syngenta profit leaps amid food, biofuel boom*, (Reuters, February 7, 2008) www.reuters.com/article/companyNews/idUSL0711093120080207 (accessed December 11, 2009).
- vi Syngenta Financial Performance Annual Report 2008, http://www.syngenta.com.ph/ar2008/financial_performance.html (December 11, 2009).
- vii U.S. EPA, "Summary of 2003-2004 AMP Results," August 2006. See: http://www.epa.gov/oppsrrd1/reregistration/atrazine/amp_2003_2005_sum.pdf.
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- ix R.J. Gilliom and others, *The Quality of Our Nation's Waters: Pesticides in the Nation's Streams and Ground Water, 1992-2001*, (U.S. Geological Survey Circular 1291, 2006).
- x a) David Shaffer, "Atrazine found in Lakes Far from Farm Sources," *Minneapolis Star Tribune*, September 21, 2008
b) Catherine O'Dell, P.G., Minnesota Pollution Control Agency, *Minnesota's Ground Water Condition: A Statewide View* (Saint Paul, Minnesota, September 2007).
- xi a) Tyrone Hayes et al., "Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses," *Proceedings of the National Academy of Sciences* Vol. 99, No. 8 (April 16, 2002): 5476-5480, www.pnas.org/content/99/8/5476.abstract (accessed November 20, 2009)
b) Tyrone Hayes, *Presentation at Land Stewardship Project event*, (Minneapolis, MN: LSP, October 10, 2007).
- xii Tyrone B. Hayes, Atif Collins, Melissa Lee, Magdalena Mendoza, Nigel Noriega, A. Ali Stuart, and Aaron Vonk, "Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses," *Proceedings of the National Academy of Sciences*, April 16, 2002, Vol. 99, No. 8. 5476-5480.
- xiii a) Jennifer Sass and Paul Brandt-Rauf, "Cancer Incidence Among Triazine Herbicide Manufacturing Workers," *Journal of Occupational and Environmental Medicine*. Vol. 45, No. 4 (April 2003), 343-344
b) M.A. Kettles, et al., "Triazine exposure and breast cancer incidence: An ecologic study of Kentucky counties," *Environmental Health Perspectives*, Vol. 105, No. 11 (1997), 1222-1227
c) R. Munger, et al., "Intrauterine growth retardation in Iowa communities with herbicide-contaminated drinking water supplies," *Environmental Health Perspectives*. Vol. 105, No. 3 (March 1997), 308-314
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c) Agrimarketing (June 2009), 10.
- xv Frank Ackerman, "The Economics of Atrazine," *International Journal of Occupational and Environmental Health* Vol. 13, No. 4 (October/December 2007): 441-449, <http://ase.tufts.edu/gdae/Pubs/rp/EconAtrazine.pdf>.
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- xvii Environmental Protection Agency, *Atrazine Updates: New Atrazine Evaluation* www.epa.gov/opp00001/reregistration/atrazine/atrazine_update.htm, (accessed December 4, 2009).

3 Syngenta's Atrazine in our Water

Atrazine's ability to stick around in the environment after it's applied to fields, combined with its high mobility, make it a serious threat to water quality. In fact, in many farm states atrazine is the most common pesticide contaminant found in surface and groundwater. Research done across the country is providing a picture of how widespread atrazine contamination is. Such research is often controversial, as the story of Minnesota scientist Paul Wotzka illustrates.

The Whitewater Whistleblower: The story of how hydrologist Paul Wotzka's research into atrazine led to his being fired

For over 16 years, Paul Wotzka was a highly-respected hydrologist working for the state of Minnesota, doing cutting-edge research on pesticides, including atrazine, in surface water. In the spring of 2007, he was fired after he asked permission to testify about his research into atrazine before a state legislative committee. After his firing, Wotzka filed a federal whistleblower lawsuit, claiming that his First Amendment right to free speech had been violated. Wotzka's former employer maintains that his firing is a simple case of an employee not following the rules.

But this case is about a lot more than one civil servant who had a difference of opinion with his supervisors. At issue is how publicly-funded science is used to influence policy, the role industry plays in the regulatory system and the public's right to know.

"Scientists tend to look at our shoes too much and say, 'I don't want to enter into the public policy arena,'" says Wotzka. "Well, somebody has to give the straight story."

Atrazine & water

The straight story Wotzka feels he has to tell is this: From 1990 to late 2006, he worked as a hydrologist for the Minnesota Department of Agriculture (MDA) monitoring pesticide levels in surface water. What he found was that one of America's most popular weed killers is frequently finding its way off crop fields and into the water of the middle branch of southeast Minnesota's Whitewater River.

Atrazine has been an inexpensive, effective killer of weeds for 50 years. That's why it was used on around 45 percent of the 7.3 million acres of corn planted in Minnesota in 2005, according to the USDA. In fact, more than 1.6 million pounds of the pesticide were used in the state that year alone.⁸ But the characteristic that makes it an effective weed killer—its stability and



Hydrologist Paul Wotzka on his southeast Minnesota farm

ability to stick around for as much as 100 days in the soil—also makes it a pollution problem.

Once it leaches into groundwater—the water that is beneath the soil in subterranean aquifers—atrazine can remain there for decades. In states like Minnesota, atrazine is by far the most commonly detected pesticide in surface and groundwater.⁹

Wotzka's research over the past several years showed levels as high as 30 parts per billion (ppb) in the Whitewater after storm events. The U.S. Environmental Protection Agency's (EPA) drinking water standard for atrazine is 3 ppb, and research conducted by the University of California's Professor Tyrone Hayes shows that exposing frogs to as little as 0.1 ppb of atrazine causes severe health problems, including inducing a kind of chemical castration.¹⁰

Wotzka has also found that nitrogen, a keystone fertilizer for row crop farming, is showing up in increasing amounts as a pollutant in the Whitewater. Pesticides and nitrogen fertilizer take different paths to waterways—the former tends to run overland, while the latter percolates down through the soil profile.

But Wotzka blames the same culprit for the increased contamination levels of both ag inputs: the growing prevalence of annual row crops that cover the land in the watershed only a few months of the year. Corn and soybeans are replacing pastures, hay ground, wooded acres and other year-round plant systems. Since 1975, in a nine-county region in southeast Minnesota, corn and soybeans have gone from 64 percent of all farmed land to more than 82 percent.¹¹ Combine that with the fact that in recent years more heavy rains are coming in the spring, when crop fields are less covered in vegetation and thus more vulnerable, and it's a recipe for disaster, he says.

Over the years, Wotzka has not been shy about sharing his research results with the public. He has given presentations on his research to farm groups, watershed organizations, physicians, fishing enthusiasts and the general public.

"I'm taking public information and giving it to the public," says Wotzka of these presentations. "I've always viewed that as part of my job: inform the public about how their tax money has been spent."

When talking about agrichemicals in water, Wotzka makes it clear he doesn't blame farmers. He knows they want to do the right thing, but are often forced to use something like atrazine in a vulnerable area because they feel they have no viable alternative for weed control. And many believe they've actually cut atrazine out of their cropping systems, only to find out later it's contained in a tank mix consisting of several chemicals.

"There are now over 90 tank mixes, maybe over 100, containing atrazine. Nobody keeps track of that stuff," says Wotzka.

He lays the blame on government policies that don't inform farmers of such issues, and, perhaps even worse, promote increased plantings of row crops like corn in environmentally sensitive areas.

Between 2000 and 2004, as he watched atrazine levels go up in the Whitewater, the hydrologist became more adamant that the MDA take action.

"In 2004, we saw levels that we hadn't ever seen before," Wotzka recalls. "We were finding higher and higher concentrations, and I wouldn't let [MDA officials] forget about it."

Agriculture Department officials acknowledge that atrazine is in the water, but say it does not exceed health standards because it is not at those high levels for extended periods of time. The MDA sees as a solution the promotion of voluntary best management practices in cropping areas, such as suggesting that farmers don't apply atrazine within a certain distance of wells, and that grassy buffers be used along streams. Wotzka argues that endocrine disruption research shows the health standard is not low enough, and that even those short-term spikes should be of concern. He also feels voluntary best management practices have limited effectiveness, given atrazine's residual nature and ability to move about in the atmosphere. He says he was all but ignored by MDA officials.

Finally in October 2006, Wotzka had had enough. When a hydrologist position at the Minnesota Pollution Control Agency (MPCA) came open, he applied for it and was hired.

In March 2007, Wotzka's research caught the attention of Ken Tschumper, a southeast Minnesota dairy farmer who was then a member of the Minnesota House of Representatives. During the 2007 legislative session, Tschumper and Senator John Marty, with the support of the Land Stewardship Project, spearheaded a group of bills that would tighten regulation on pesticides such as atrazine. Tschumper contacted Wotzka and asked that he testify before the Housing Policy and Finance and Public Health Finance Division committee on March 23 of that year.

The hydrologist responded by sending a copy of a presentation to Tschumper. He also sent a request to testify to his supervisors. A regional MPCA supervisor turned down Wotzka's request to testify at the March 23 hearing, arguing that the research Wotzka was to present to the committee was done while he was an MDA employee. Wotzka feels that the real reason is his testimony would have run counter to MDA's line on atrazine contamination. Indeed, when the committee hearing was held, Dan Stoddard, Assistant Director of the MDA's Pesticide and Fertilizer Management Division, testified that although surface water research showed sharp spikes in atrazine, health standards were not exceeded because those increases were temporary.¹²

A week after the hearing, Wotzka was placed on "investigatory leave." He was told it was for allegedly destroying data while at the MDA and forwarding mail from his MDA address to his MPCA office. On May 8, 2007, Wotzka was fired. When discussing Wotzka's firing, state officials simply say that they do "good science" on pesticides and that the hydrologist's firing is a personnel matter.¹³

Wotzka says his whistleblower lawsuit challenges the state's allegations against him. The hydrologist believes the firing was simply meant to silence him and undermine his public credibility as an expert on pesticide contamination in water. Public criticism of atrazine is not popular in Saint Paul: Tyrone Hayes himself was dis-invited from giving a keynote at an MPCA conference in 2004 after concerns were raised his presentation would offend agribusiness interests.¹⁴

An unfriendly message for public servants

Meanwhile, Wotzka continues to talk about his research and is building a legal case against the state. He has withdrawn his federal whistleblower lawsuit over the technical issue of which agency—the MDA or MPCA—it should be filed against. However, the sci-

entist is still pursuing other litigation against the state government. He says this main goal is to expose that state officials aren't fulfilling their responsibility to protect the environment from agrichemical contamination. Wotzka also thinks it's important to show other public employees that they should feel free to speak out, even when what they say makes powerful interests uncomfortable.

"There are subtle ways the people in power can rein you in," he says. "But in the end, we work for the public."

To listen to a Land Stewardship Project podcast featuring Paul Wotzka describing his research, see www.landstewardshipproject.org/podcast.html?t=3 (episode 43).

Atrazine in the Whitewater

A summary of Paul Wotzka's research on atrazine contamination in southeast Minnesota waterways.

Groundwater

Atrazine and its "metabolites" (the chemicals that result from the breakdown of atrazine over time) are the most commonly detected pesticides in southeast Minnesota groundwater. Atrazine and its breakdown products were detected year-round in three Department of Natural Resources fish hatchery springs. These springs emanate from underground aquifers that are extensively used for drinking water throughout the region.

Atrazine and its breakdown products were detected in almost 100 percent of these samples, according to monitoring done between 2003 and 2004. Concentrations for all six springs averaged 0.21 parts per billion (ppb) during this sampling period. Since atrazine was present in the springs, it can be safely assumed it was also present in the underground aquifers that produce the springs, and that means it is in the region's drinking water.

Streams

Atrazine and its metabolites are detected throughout the year in streams and aquifers. The highest concentrations in streams are seen shortly after atrazine is applied in late spring or early summer. Atrazine is washed off fields by short duration, high-intensity storm events. This storm-generated pulse of water produces a rise in stream levels. Concentrations of 20 to 30 ppb—many times the stream standard of 3.4 ppb—occur during these storm events, which take place early in the growing season. When stream levels recede, atrazine does not disappear from the normal base flow, but drops to levels less than 1 ppb. Even during base flow conditions in winter, atrazine is detected at concentrations of 0.2 ppb.

Rainfall

Atrazine is the most commonly detected herbicide in rainfall. Peak concentrations occur during crop application periods in the late spring and early summer. In 2001, a maximum concentration of 1.65 ppb was recorded for atrazine and its metabolites in rainfall during the first week of June. This value is over half the amount of the drinking water standard of 3 ppb. Atrazine was detected in 76 percent of the rainfall samples collected in 2001 from April through September.¹⁵

Urban storm runoff and lakes

Atrazine has been detected in urban storm runoff and lakes in south Minneapolis, as well as in lakes near the Boundary Waters Canoe Area Wilderness.¹⁶ These detections in areas far from cornfields raise the question: where does it come from? The atmospheric transport and deposition of atrazine (and other pesticides) explains how it can be removed from fields where it is applied and transported hundreds of miles to distant water resources.

Conclusion

In summary, over a period of several years, research showed atrazine levels as high as 30 ppb in the Whitewater after storm events. That's several times higher than the U.S. EPA drinking water standard of 3 ppb. It is also nearly 10 times higher than allowable stream standards for atrazine contamination.

Finally, it is important to remember that atrazine is only one of about half-a-dozen pesticides that commonly occur in storm runoff during the mid-May through mid-July period in southeast Minnesota. Its presence is an indicator that other contaminants are in the water.¹⁷

Are You Drinking Atrazine?

In August 2009, the Natural Resources Defense Council (NRDC) released a report entitled “Poisoning the Well: How the EPA is Ignoring Atrazine Contamination in Surface and Drinking Water in the Central United States.” The report is available online and offers a deeper understanding of the issues.

NRDC analyzed the data from two U.S. EPA surface water and drinking water monitoring programs. The data was collected by the Syngenta corporation as part of a controversial agreement with the U.S. EPA in October 2003 that allowed atrazine to be kept on the U.S. market. (See section 7, p. 34, for more details on the controversy.) The EPA only made the information available to NRDC after court action and repeated Freedom of Information Act requests.

Under the Ecological Watershed Monitoring Program, 1172 watersheds in Mid-western and Southern states were identified as high risk for atrazine, but only 40 were selected for monitoring between 2004 and 2006. Under the Atrazine Monitoring Program, 139 public drinking water supplies were tested for atrazine and its breakdown products. Both untreated and treated water were tested. NRDC did the first comprehensive analysis of this joint data.

Below is a short summary of some of the report’s most critical findings:

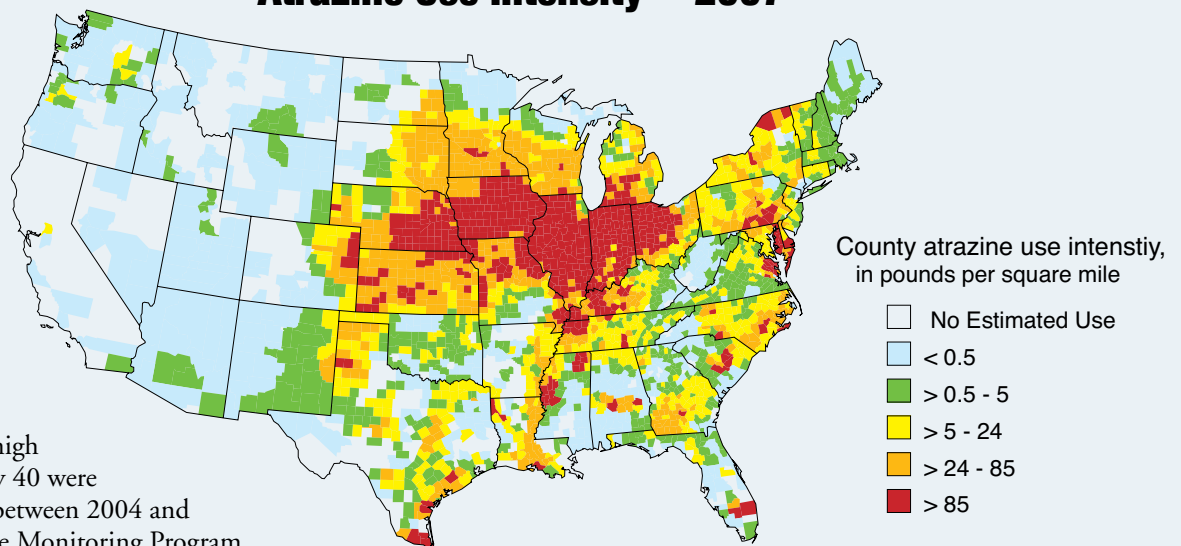
Atrazine in surface water

- All 40 watersheds tested had detectable levels of atrazine.
- Nine of the 40 watersheds monitored had at least one sample showing atrazine levels at 50 parts per billion (ppb) and four watersheds had peak levels exceeding 100 ppb. One watershed in Indiana had an annual average of 18.46 ppb and a peak of 256.5 ppb.
- The watersheds with the 10 highest peak concentrations of atrazine are in Indiana, Missouri and Nebraska.

Atrazine in drinking water

- More than 90 percent of samples taken in 139 water systems had measurable levels of atrazine.
- Three water systems had running annual averages in finished tap water that exceeded the 3 ppb federal standard.
- Fifty-four water systems had a one-time peak of atrazine levels above 3 ppb. The peak level in finished drinking water was 39.69 ppb in the Evansville, Illinois, water system.

Atrazine Use Intensity—2007



Map courtesy of USGS¹⁸

The report points out that the U.S. EPA focuses on average concentrations of atrazine and has ignored these peak levels. As highlighted in section 4, p. 12, of this report, adverse health effects are associated with even short-term exposure to atrazine, so these spikes are alarming.

Overall, the report demonstrates that the U.S. EPA’s monitoring program for atrazine, while poorly designed, has still discovered levels of atrazine in water that are cause for serious concern. (Testing is not done at times when atrazine levels are most likely the highest, for example after a rainstorm or after fields have been treated with atrazine.) There is no process for making the data quickly available to the public and health officials, and there is no effective plan to reduce these unsafe levels.¹⁹

4 The Impact of Syngenta's Atrazine on our Health and Environment

What the Syngenta corporation doesn't want you to know about atrazine

Dr. Tyrone Hayes, a biologist from the University of California who has studied atrazine for years, came to Minneapolis on October 10, 2007, to take part in a legal defense fundraiser for fellow scientist Paul Wotzka's federal whistleblower lawsuit (see "The Whitewater Whistleblower in section 3, p. 8).

Like Wotzka, Dr. Hayes has withstood efforts to suppress his science. In 1998, Dr. Hayes was retained by a company called EcoRisk on behalf of the Syngenta corporation to do research into the effects of atrazine on amphibians. His research found that extremely low doses of atrazine—30 times lower than federal drinking water standards for the chemical—caused feminization of male frogs. Syngenta, however, blocked Dr. Hayes from publishing the data, reminding him that under his contract these findings were confidential. Frustrated at Syngenta's attempts to bury his science, Dr. Hayes ended his relationship with EcoRisk, reproduced the studies on his own and published the results in the scientific literature. EcoRisk then attempted to discredit Dr. Hayes' science by producing its own studies that

supposedly contradicted Hayes' findings.²⁰ (This is covered in further detail in section 7, p. 34.)

Dr. Hayes received his B.A. from Harvard and a PhD in integrative biology from the University of California-Berkeley, where he examined the role of hormones in mediating developmental responses to environmental changes in amphibians. He was tenured at Berkeley at the age of 30, becoming the University's youngest full professor. His work has been highlighted by *National Geographic* magazine and he has published more than 40 papers in many prestigious scientific journals, including *Nature* and *Proceedings of the National Academy of Sciences*.

Dr. Hayes is an accomplished speaker with a gift for making science interesting and accessible. What follows are excerpts of his October 2007 talk in Minnesota.

To listen to Dr. Hayes' full talk, see the Land Stewardship Project's podcast webpage at www.landstewardshipproject.org/podcast.html?t=3 (episode 42).



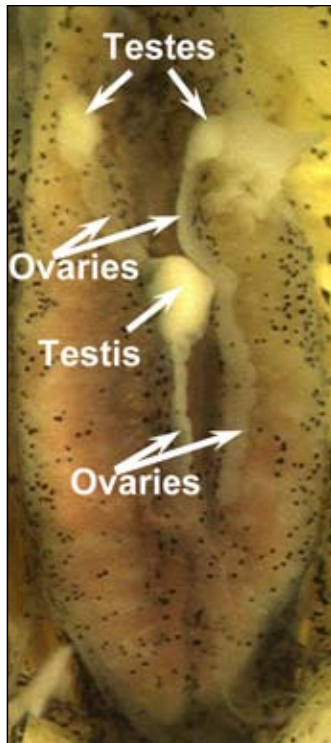
Dr. Hayes speaks to LSP members while state Senator John Marty looks on.

Atrazine: a chemical without a country

Atrazine is an herbicide (weed killer) that's used on corn. It's used in more than 80 countries. But it's not allowed in Europe, or, as the company [Syngenta] likes me to say, it's been denied regulatory approval. And the reason that is significant is that the company that makes it is in Switzerland. So we're using 80 million pounds of something that's not allowed in its home country.

Chemical castration

Testosterone is the male hormone. Frogs are making the same testosterone that we're making. And atrazine turns on the machinery that



Testes of North American leopard frog exposed to atrazine

converts the male hormone into the female hormone, estrogen, or the generator of estrous, resulting in chemical castration, demasculinization and feminization of males that have been exposed to this chemical at fairly low doses.

Animals in the laboratory, such as the North American leopard frog (see image above), grow eggs in their testes—that’s what these big round structures are bulging out of this animal’s testes. Now, I’ve been working not just with Syngenta but also EPA on these issues, and when I show the Environmental Protection Agency these results I say, “Look at what atrazine does,” and they say, “Well, yeah we see that, but we’re not sure if that’s an adverse effect.” Now I don’t know about you, but the thought of a dozen chicken eggs bursting out of *my* testicle brings me a little concern.

Safe levels of atrazine?

The company [Syngenta] wants to convince you that it’s normal so that we can keep using the compound. These problems, these reproductive abnormalities, are produced in frogs at levels of 0.1 parts per billion—that’s one, one thousandth of a grain of salt in a fish aquarium. That’s not a lot. The package of atrazine more or less recommends an application rate that is 290 million times what we’re using in the laboratory.

There is enough atrazine in rainwater to chemically castrate and make hermaphroditic frogs. A half-million pounds of atrazine comes down in the rainwater every year. Perry Jones of the U.S. Geological Survey said he can measure atrazine in the rainwater in Minnesota that was applied in Kansas. It can travel 600 to a thousand miles. And at the same time, the Environmental Protection Agency says 3 parts per billion, 30 times what it takes to chemically castrate a frog, is okay in your drinking water.

Confusing the public

Dr. James Carr [who produced Syngenta funded science for EcoRisk] said in 2002: “We have been unable to reproduce the low concentration effects in the larynx and gonads of the *Xenopus laevis* tadpole that have been reported elsewhere in the scientific literature.”

Comments like that are designed to confuse the public—two doctors can’t agree. It turns out though when he finally published his stuff, he produced the same kinds of effects that we produced. And then I pointed out...that there are 38 studies not funded by Syngenta that show adverse effects of atrazine, and

only nine studies done by the same little group of Syngenta-funded people that showed no problems. He wrote and said, “I don’t think my data contradicts Hayes. My research speaks for itself. It’s not my responsibility how Syngenta chooses to characterize it.”

Ann Lindsay of the U.S. EPA testified before the Minnesota Legislature in 2005 about my research and said the EPA has never seen either results from independent investigative [research] in peer-reviewed scientific journals or the raw data from my additional experiments.

She said she never saw my data. This was in 2005. The U.S. EPA in 2002 wrote to me. They wrote: “Tyrone, although you are not required to provide EPA with any information, you have been very cooperative and have shared both the raw data and standard operating procedures from your research.” That’s the raw data Ann Lindsay said she’d never seen. Additionally, “you’ve spent a considerable amount of time helping the Office of Pesticide Programs to understand the significance of your data and you’ve provided insightful reviews of similar research efforts.” That email was signed by Tom Steeger of the U.S. EPA.

It’s more than frogs

I testified before the Minnesota Legislature in 2005 and I read a quote from Glen Fox, a partner of mine, who says, “In eco-epidemiology (diseases in wildlife) the occurrence of an association in more than one species and species population is very strong evidence for causation.”

So I said look, if we are showing this in multiple species of amphibians, we kind of got something going

on. And I said it's been published that the same things occur in fish, reptiles, birds and mammals. And Ann Lindsay said that no such data existed. I said the fact that atrazine can reduce testosterone and increase estrogen occurs across species and Ann Lindsay told your Legislature the following: "It has been claimed

their wives pregnant, have significantly more atrazine in their urine than men who have no reproductive problems. And I don't know what it means, but the level of atrazine in these men's urine is equivalent to what it takes to chemically castrate a frog. Maybe it's a coincidence.

science with a little bit of passion, that passion is because I know what I want my grandchild's grandchild to say about what role I played in the environment that she or he will be born into. And my code of ethics commands that I want the same thing for everyone's children that I want for mine.

So, when I think about my daughter, and what we're learning in these studies, this is what moves me because it's not about you and me. We've already been exposed. —Tyrone Hayes

that research on frogs shows atrazine causes changes in the production of aromatase, an enzyme involved in the conversion of testosterone to estrogen."

I underline *involved* because if you're an endocrinologist you know aromatase is more than involved; it's the only way you can make estrogen. She went on to say that it has also been claimed that other scientists have shown similar effects in other species. And then she said there is no direct scientific information to assess this hypothesis. So she said I was making it up.

She made this statement to you in 2005. In 2000 it was shown in Europe that atrazine causes a decline in testosterone and a decline in sperm in rats. It's not my work—this is coming out of Europe. Shanna Swan showed in 2003 that sub-fertile men in Missouri who have low sperm counts can't get

There's another rat study that shows testosterone's decrease in the presence of atrazine. But this other study went on to show that these rats with no testosterone are making excess estrogen, just like we've seen in frogs, fish, turtles, alligators. And here is the kicker: this study was done in an EPA laboratory with a Syngenta guy working on it.

What will future generations say?

So, when I think about my daughter, and what we're learning in these studies, this is what moves me because it's not about you and me. We've already been exposed. It's not about our children. They've already been exposed. Data in France shows that once they banned atrazine it was around for 20 years. It's still around in their aquifers. That means if you ban atrazine today, our grandchildren will be exposed.

So, when I come to preach my sermon, when I give you a little bit of

'The farmers we serve.'

In human cell lines it's been shown that if you expose human cancer cells to atrazine, they make aromatase and they make estrogen. Just like we see in fish, frogs, alligators, turtles and rats. And a study in Kentucky, and Syngenta knew about this—very significant—shows that women whose well water is contaminated with atrazine are more likely to develop breast cancer.

It's not my data. People are doing this independently. The prostate cancer increased 8.4 fold in one of Syngenta's factories that makes atrazine. When I testified last fall Syngenta complained I was misrepresenting the facts on atrazine. The Syngentans, they are constantly using terms like, "The farmers we serve"—like they're giving you something.

So what I'm going to do is read to you exactly what's in that Syngenta paper, published in the *Journal*

of *Occupational and Environmental Medicine*, so you know I'm not misrepresenting anything. On page 1052 they wrote: "The increase in all cancers combined seen in the overall study group was concentrated in the company employee group." That's Syngenta. They wrote on page 1052: "The increase of prostate cancer in male subjects was concentrated in male employees." They wrote on page 1053: "The prostate cancer increase was further concentrated in actively working company employees." So if you go to work, you get prostate cancer.

They wrote on page 1052 that "all but one of the cases occurred in men with 10 or more years since hire." So if you are loyal to the company, you get prostate cancer. They wrote on page 1053: "Analysis restricted to company employees also found that the prostate cancer increase was limited to men under 60 years of age." Eighty percent of prostate cancers in this country are men over 65. These guys are increasing prostate cancer 8.4 fold in men who were loyal to the company and worked more than

10 years, and who were active. They showed up to work.

And then they come to you and use words like, "The farmers we serve." We need to ask what exactly are they serving? And then they argue with you, "Oh we have better statistics and we have better screening methods." And you need to ask yourself, "If this is how they serve their employees, then how are they serving the farmers who use their product?"

Playing both sides of the breast cancer problem

Right now, what's become the number one treatment for breast cancer is a chemical called letrozole that blocks aromatase, that knocks out estrogen and it prevents your tumor from growing. If you get breast cancer, this is what they're going to give you. At the same time, another company is exposing 70 percent of all Americans to atrazine, which turns on aromatase, increases estrogen and causes your cancers to grow into

tumors. Novartis Oncology sells letrozole.

Syngenta was the result of a merger of the agri-side of Novartis and AstraZeneca. So the company that's giving you atrazine, which turns on your aromatase, turns around and sells you an aromatase blocker and says it's a thousand times better than any other breast cancer treatment. So you don't have to believe me, just believe this (and any five-year-old will know that both of these can't be true): either atrazine induces aromatase and contributes to breast cancer, the number one cancer in women, or letrozole can't really knock out aromatase and treat your breast cancer.

If you've got breast cancer, and you're buying up their letrozole, how's that supposed to work when 70 percent of all Americans are being exposed to atrazine, which is turning on your aromatase? Call them up and ask them, "How's that supposed to work?" You don't have to believe me, just believe Novartis. And watch out."²¹



A Q & A with TYRONE HAYES

In an interview on November 18, 2009, Hayes talked to the Land Stewardship Project about his current research on atrazine, his reaction to the U.S. EPA's announcement in October 2009 that it was reviewing the herbicide, and Syngenta's attacks on his scientific credibility.

What are you researching now?

TH: In the past two years we have been able to look at the long-term reproductive effects of atrazine. A high profile journal is about to publish our research showing that male frogs are permanently chemically castrated. In about 10 percent of the cases, they actually become females. In a follow-up study we showed that male frogs exposed to atrazine actually show a preference to mate with other males. We have confirmed that atrazine reduces testosterone in male frogs. These are both field and lab studies that this research is based on, and they involve the same low levels of atrazine that showed negative impacts before.

Some of our research on atrazine levels and reproductive abnormalities uses U.S. Geological Survey water samples from across the country. It covers samples from the Mississippi, Missouri and North Platte rivers, for example. States like Minnesota, New York, Iowa, Montana, Wyoming and Utah are covered in this sampling, so it's pretty extensive.

In addition, I have a student that's looking at the effect atrazine has on breast cancer rates. The student is taking actual human cells and tissues and studying them.

Are you focusing only on atrazine?

TH: Actually, we're trying to look at not just the effects of pesticides like atrazine on amphibians, but also look at it in context of other pesticides the frogs are being exposed to, as well as other environmental factors such as the infections and parasites that amphibians are vulnerable to. Research is being done on how other factors such as pesticides may weaken amphibians to the point where they are more vulnerable to parasites. We want to know what role pesticides such as atrazine play in the array of factors that affect the health of amphibians.

What do you think of the Environmental Protection Agency's October announcement that it is opening up atrazine for review again?

TH: I feel that now we have a more scientifically objective system there at EPA, and it's just more indicative of what they should have been doing all along. In terms of the science, I don't know how they cannot do a review. There's more and more evidence that's showing that this is a compound that is damaging biological systems. One study released earlier this year shows a connection between when a baby is conceived, birth defect rates and the time of year when atrazine and nitrates are at their highest level in surface water.

It's also becoming harder for the government to ignore because of all the media attention atrazine is getting. If they do a review and don't utilize the good science out there, it's going to be very hard for them to justify that. It's just getting too much attention right now. We have a better chance now than we ever had of having the science take precedence and leading to some real regulation of atrazine.

Are you concerned that the replacement herbicides for atrazine may be just as bad or worse for the environment and human health?

TH: Yes. I think the best thing about atrazine is that we actually have a lot of information. The information isn't good news for atrazine, but there's a lot of it. For a lot of these compounds, we know very little about their environmental impacts. It cautions us to study the effects of such compounds before they go on the market.

How do you answer critics who say that when you call for the banning of atrazine, you are attacking farmers and threatening their livelihood?

TH: I think what's happened is the polluters are good at raising the emotions of their customers so that farmers go out and say, "You are attacking us. You are threatening our livelihood." Those people who are exposed the most are the ones who are out on the farms. There are a number of farmers who are on the wrong side of the debate because industry put them there. There are farmers out there raising corn without atrazine. They sure are doing it in Europe.

Is the industry fighting so hard to keep atrazine from being regulated because it has been such a keystone herbicide for so long, and banning it would raise a lot of questions about other herbicides out there?

TH: I've always said it's the poster child for our different philosophy about regulation. It's getting harder and harder to ignore the evidence that it's a problem because we know so much about atrazine. We don't know as much about a lot of other pesticides out there, and this controversy over atrazine should draw attention to these other compounds.

What is the status of your academic freedom? Is Syngenta still attacking your credibility?

TH: Yes, that's not going to stop. They still write letters to my dean. I don't expect that to stop. As long as we continue to do science, they are going to keep attacking that science.²²

Syngenta's Atrazine & our Health

Dr. Tyrone Hayes' research raises significant concerns about the implications of exposure to atrazine for humans, wildlife and ecosystems. Below, we summarize additional research related to human health and atrazine. The bottom line: the health impacts of exposure to atrazine can be significant and long lasting. And it should be kept in mind that the negative effects of low-dose exposure to atrazine are particularly troubling in light of a recent trend in agriculture: in many cases less of the herbicide is being used per acre, but a larger number of acres are receiving applications.²³ In other words, more people than ever are potentially being exposed.

In addition, atrazine exposure occurs as one of many other potential hazards. The impacts of exposure to atrazine together with other pesticides may increase their combined toxic effects.²⁴ By failing to consider exposure of atrazine in combination with other pesticides, as happens in U.S. regulatory decisions, the actual health impacts of atrazine may be significantly underestimated.

Atrazine is an endocrine disruptor

Atrazine is a known "endocrine disruptor," meaning it impacts and disturbs the human hormone (or endocrine) system. Exposure to endocrine disruptors at even extremely low doses during critical windows of development of fetuses can have lasting negative impacts for life.²⁵ Babies conceived during the spring, for example, when levels of pesticides including atrazine are highest, are more likely to develop birth defects, including cleft palate, spina bifida and Down syndrome.²⁶ Exposure to atrazine has been shown to disrupt amphibian hormone systems, resulting in the development of female sex organs and eggs in the testes of male frogs.²⁷ Similar "intersex features" within fish populations have been reported by the U.S. Fish and Wildlife Service,²⁸ as well as in numerous studies on mammals and fish.²⁹ Similarly, exposure to atrazine has been linked to decreased sperm count and reduced fertility in humans.³⁰

Health impacts, including increased tadpole mortality³¹ and severe kidney and limb damage,³² have been reported in frogs exposed to multiple pesticides, including atrazine.

Atrazine & cancer

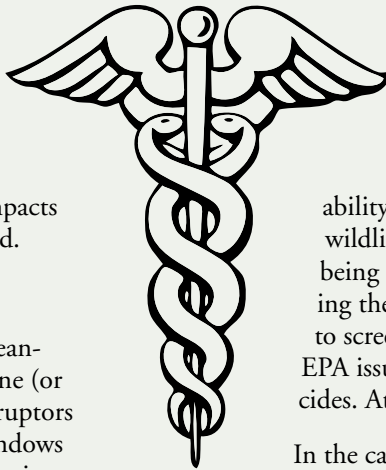
Atrazine exposure has also been associated with increased risk of certain cancers such as non-Hodgkin's lymphoma in humans.³³ The International Agency for Research on Cancer (IARC) reported an increase in mammary gland tumors in female rats exposed to atrazine from early life to adulthood.³⁴ Several scientific studies have found a link between long-term exposure to atrazine and breast cancer. A study of women from all 120 counties in Kentucky showed a statisti-

cally significant increase in breast cancer risk with medium and high levels of atrazine exposure.³⁵ A study from the United Kingdom found a significant association between breast cancer rates and the application of atrazine in rural Leicestershire.³⁶ Other studies using laboratory rats as subjects found exposure to atrazine increased risks of breast and prostate cancers.³⁷

Until now, the U.S. EPA has ignored science on endocrine disruption and cancer during its assessment of the risks of atrazine. The U.S. EPA has said that it will not include evaluation of the hormone-disrupting properties of atrazine until "appropriate testing and/or screening protocols" have been created.³⁸ The U.S. EPA is referring to the much-delayed Endocrine Disruptor Screening Program. In 1996, Congress passed a law requiring the U.S. EPA to screen pesticides and other contaminants for their ability to affect the endocrine systems of humans and wildlife. Stalled 13 years until April 2009, and just being initiated now, scientists are currently developing the battery of tests and protocols that will be used to screen chemicals. On October 29, 2009, the U.S. EPA issued the first test orders for a list of initial pesticides. Atrazine is on the list.³⁹

In the case of cancer, the U.S. EPA ignored the recommendations of its own scientific panel.⁴⁰ The science panel that looked at cancer risks only reviewed data related to prostate cancer, despite the scientists' own frustration with this narrow charge.⁴¹ The scientists stated that it was "misleading" to review prostate cancer data but not data pertaining to other cancer risks.⁴² The U.S. EPA did not consider whether hormonal effects in childhood or adolescence may increase the cancer risk in later years; it also ignored several studies on non-Hodgkin's lymphoma.⁴³ Current U.S. EPA documents say atrazine is "not likely to be carcinogenic to humans,"⁴⁴ although two prominent national breast cancer prevention groups concluded that industry pressure was responsible for this characterization.⁴⁵

New leadership at the U.S. EPA opened a new review of atrazine's safety in October 2009. EPA's review of atrazine's safety will reconsider the issue of cancer. The U.S. EPA promises that, "During the first year of the new evaluation, EPA will consider the potential for atrazine cancer and non-cancer effects, including data generated since 2003 from laboratory animal and human epidemiology studies."⁴⁶ Steve Owens, assistant administrator for EPA's Office of Prevention, Pesticides and Toxic Substances, promised that, "Our examination of atrazine will be based on transparency and sound science, including independent scientific peer review, and will help determine whether a change in EPA's regulatory position on this pesticide is appropriate."⁴⁷



Two Stories of People Concerned about the Human Health Consequences of Exposure to Atrazine

Gloria M. Contreras, Coordinator

Centro Campesino (Farmworker Center) Health Promoter Project

Gloria M. Contreras directs the Health Promoter Program at Centro Campesino, an organization of migrant workers and rural Latino/a residents in southern Minnesota. The Health Promoter Program builds leadership among farmworker and rural Latino/a communities while working to improve health and prevent disease. Mrs. Contreras has been worried about atrazine in Minnesota since she saw disturbing evidence of the hazards of the chemical in late 2004. She subsequently brought testimony to the Minnesota Legislature during discussions of a bill to restrict atrazine uses in Minnesota. The bill was defeated.

Mrs. Contreras worries that farmworker and rural Latino/a communities aren't protected from exposure to atrazine because they're lacking basic, accurate information about atrazine and how people might be exposed. And she doesn't trust the Syngenta corporation to give her community the facts. "I'm concerned about atrazine in the water, and I'm even more concerned because the majority of farmworkers and rural Latino/a residents in our area don't even know that there's an issue—that atrazine is in the water, and that there are potential health concerns related to this pesticide," she says.

Mrs. Contreras is also concerned about the multiple ways that farmworkers are exposed. Although some farmworkers may not apply pesticides as part of their job, they are living in rural areas where pesticides could be in the air, water or dust. In the case of atrazine, per-

haps people use a filter for their drinking water, but Mrs. Contreras says, "Water is used for everything. People cook using the water. People wash their clothes; they wash their face. We don't even know if the filters that people commonly use for their drinking water eliminate atrazine. Water is everywhere." When asked why farmworker communities and rural Latino/a residents are concerned about atrazine and other pesticides, she answers definitively: "The safety and healthy development of our children."

The Health Promoter Program began tackling pesticides early on, offering educational workshops to farmworkers on exposure to pesticides, and working to improve notification of pesticide use, especially near rural housing camps. "This was a very early action of ours, led by farmworkers living in housing camps that are located in the middle of cornfields," she recalls. "Children would be outside playing, clothes would be drying on the line and the applicators would spray pesticides without offering any advance warning to the residents. We talked with the company who both owned the housing camps and directed the spray regime on the surrounding fields. Over time, they agreed to notify farmworker residents before pesticide applications happen, allowing people the opportunity to protect children from being directly exposed. But people still worry about pesticides."

Mrs. Contreras points out that although notification offers the opportunity for people to pro-



tect themselves, it doesn't stop the problem at the source. "Farmworkers come to Minnesota to work in agriculture—they are here to work hard," she says. "It is crucial that we are able to trust that pesticides that are used are not hazardous to human health. We need to do awareness-raising among farmworkers to help prevent exposure to pesticides. But we also need to know that agricultural systems are safe and aren't using dangerous pesticides."

In terms of stopping the problem at the source, Mrs. Contreras thinks that a combination of prevention through awareness-raising, research and policy change is needed. She believes that any changes that happen in the Midwest should also be implemented globally.

She says, "Although we can start with change in the Midwest—the company will most likely turn to some other place to promote the supposed 'safe use' of this dangerous chemical. It's the Midwest's turn right now, but tomorrow Syngenta will go somewhere else."⁴⁸

Janet Gray, PhD

Board Member and Acting Science Advisor, Breast Cancer Fund

Dr. Janet Gray, Director of the Vassar College Environmental Risks and Breast Cancer Project, has serious concerns about atrazine in our water. Dr. Gray is working closely with the Breast Cancer Fund on changing state and federal policy to reduce the number of chemicals in the environment linked to the development of breast cancer. She has been at Vassar College since 1980, first as a National Institute of Mental Health post-doctoral fellow in the Department of Biology and then as a member of the faculty in the Department of Psychology. She is an active participant in the interdepartmental program in Neuroscience and Behavior, and directs the multidisciplinary program in Science, Technology and Society (STS).

“The atrazine story is extremely worrisome because the chemical is so pervasive. It’s scary,” says Dr. Gray.

Atrazine, like many other pesticides and environmental toxicants, is a well-documented endocrine disruptor with complicated ways of exerting its effects. Atrazine increases the activity of an enzyme called aromatase that can, in turn, increase levels of estrogen. According to Dr. Gray, “This is of great concern when it comes to breast cancer because we know that increased exposures to estrogens are one of the major risk factors for increased incidences of breast cancer.”

And the changes that can influence breast cancer development happen after exposures to very low doses of the chemical. That’s been part of the problem with understanding atrazine. Scientific wisdom held for many years that the “dose makes the poison,” and chemicals weren’t tested at low levels. Dr. Gray explains: “A lot of early studies were done using whopping doses. The story with endocrine disruption is that low doses are actually of the biggest concern. Often, low doses exert much worse effects and more profound long-term health

consequences than higher doses. Several studies have looked at atrazine or mixtures of atrazine metabolites—at much lower levels than those considered to be safe by the U.S. EPA—and have found profound effects on mammary gland development.”

Dr. Gray’s primary laboratory research focused on neural and peripheral metabolic mechanisms by which estrogens and mixed antiestrogens, especially tamoxifen, affect eating, body weight regulation and metabolic activity. As the use of tamoxifen became more pervasive as an adjuvant treatment for breast cancer, her work focused on the mechanisms by which tamoxifen affects neural (especially hypothalamic) cellular activity.

In the past few years, Dr. Gray has been increasingly interested in learning and teaching about the intersection of environmental and women’s health issues, focusing on environmental risks and breast cancer. She has turned her research and writing focus towards engaging in the public conversation on these complex issues. The Vassar College Environmental Risks and Breast Cancer Project is a team effort that has led to the production of a bilingual, interactive, user-friendly CD and website (<http://erbc.vassar.edu/erbc/>). She is also the principle author of the Breast Cancer Fund’s “State of the Evidence: The Connection Between Breast Cancer and the Environment” (2008).

Dr. Gray concedes that human epidemiological studies are extremely difficult to do, especially given the prevalence of atrazine in U.S. water and the pervasiveness of our exposure to atrazine. “With the inherent problems in doing human epidemiological research, going to the animal data is very important,” Dr. Gray says. “There, the data is devastating. There are increasing mammary tumors, breast tumors, earlier development



of tumors, alteration of proliferation rates in existing tumors.”

According to Dr. Gray, during the industrial decades from WWII to the end of 2000, there has been a steady and profound increase in rates of breast cancer—pre-menopausal and post-menopausal—in the United States. During the past two years, researchers have found lower levels of breast cancer among post-menopausal white women, in particular, most likely due to a dramatic decrease in the use of post-menopausal hormone replacement therapy. That hopeful (if extremely limited) data raises the possibility that breast cancer rates could be reduced if we decrease the number of estrogen-increasing agents in the environment. Dr. Gray points out that, “The dramatic increase [of breast cancer] through 2000 can’t be attributed only to mammography and increased detection, although that’s part of it. There is evidence that many of the chemicals that we have been bathed in are related to breast cancer development. It’s not too big of a leap to think that these environmental factors are a part of the reason that we’ve seen an increase in breast cancer. We’re hopeful that if we could lower levels of endocrine disruptors and other chemicals, we’d decrease levels of breast cancer and a host of other cancers and disorders, including developmental problems.”⁴⁹

5 Background on the Syngenta Corporation

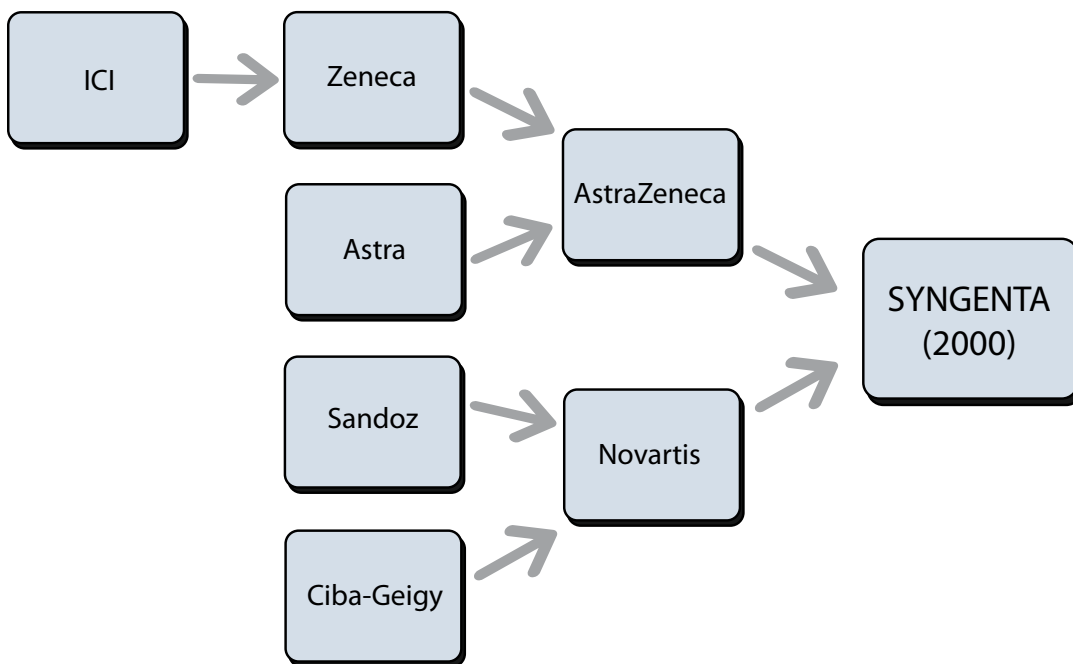
The world's largest agrichemical company

Syngenta is a Switzerland-based transnational company that specializes in pesticides and seeds. Valued at \$25 billion, Syngenta is the world's largest corporation that focuses solely on agribusiness. As 2008 came to a close, and the world tumbled into a financial meltdown, the Syngenta corporation celebrated another year of impressive expansion, growing 25%.⁵⁰ Syngenta now boasts more than 24,000 employees in over 90 countries.⁵¹ In fact, in 2008 the pesticide industry as a whole enjoyed the highest rate of sales growth since 1976.⁵²

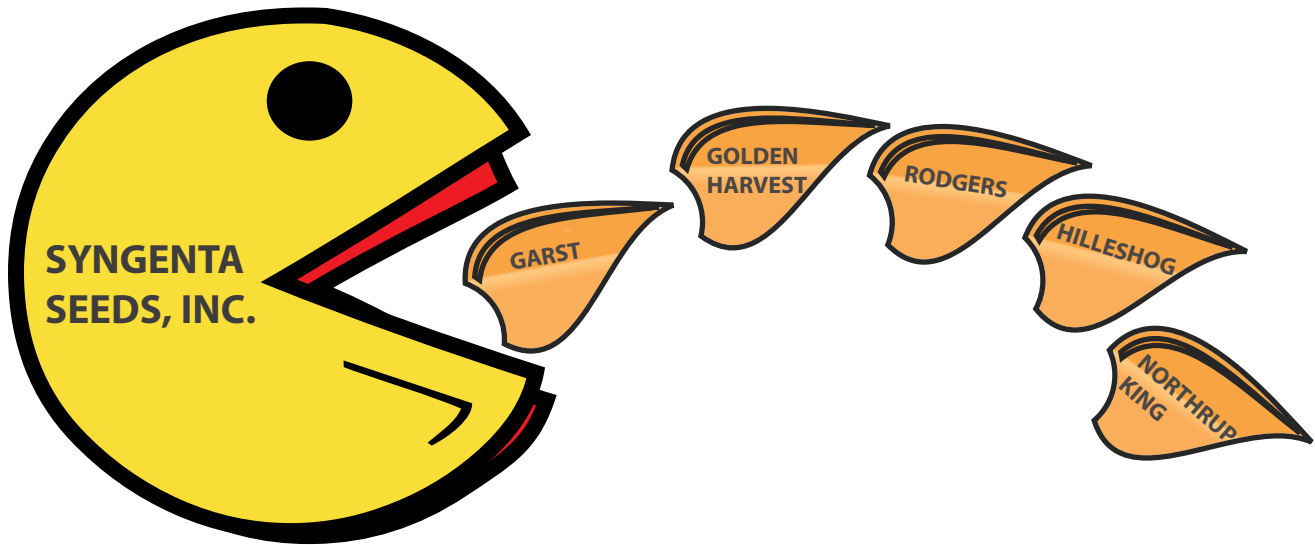
While product-specific sales data are not available to the public, we do know that U.S. corn farmers are one of Syngenta's target markets for both pesticides and seeds. A significant percentage of U.S. corn acreage is planted with Syngenta's proprietary Bt corn,⁵³ and atrazine is the second-most widely used herbicide in the country. Over the past five years, while farmers struggled to achieve a sustainable family

income, the handful of corporations that control pesticides, fertilizers and grain markets saw a hefty return.⁵⁴

Over the past nine years, Syngenta has bought multiple seed companies and laid plans for an expanded future in the Midwest. In September 2009, Syngenta opened its seed division global headquarters, a 116,000-square-foot building in a Minneapolis suburb.⁵⁵ Syngenta's intentions are clear: secure and expand a market among American corn farmers. The U.S. market is especially important since its home country, Switzerland, along with the entire collection of countries in the European Union, won't allow sales of several of its controversial pesticides (including atrazine), and many won't open their doors to its genetically modified seeds. Syngenta is also aggressively promoting its pesticides and proprietary seed technologies in Africa, Asia and Latin America.



A history of corporate mergers that have spawned Syngenta



Syngenta bolstered its business in seeds through aggressive acquisitions. *Information from: Hoovers Syngenta Seeds, Inc. Profile*

Syngenta: a brief history

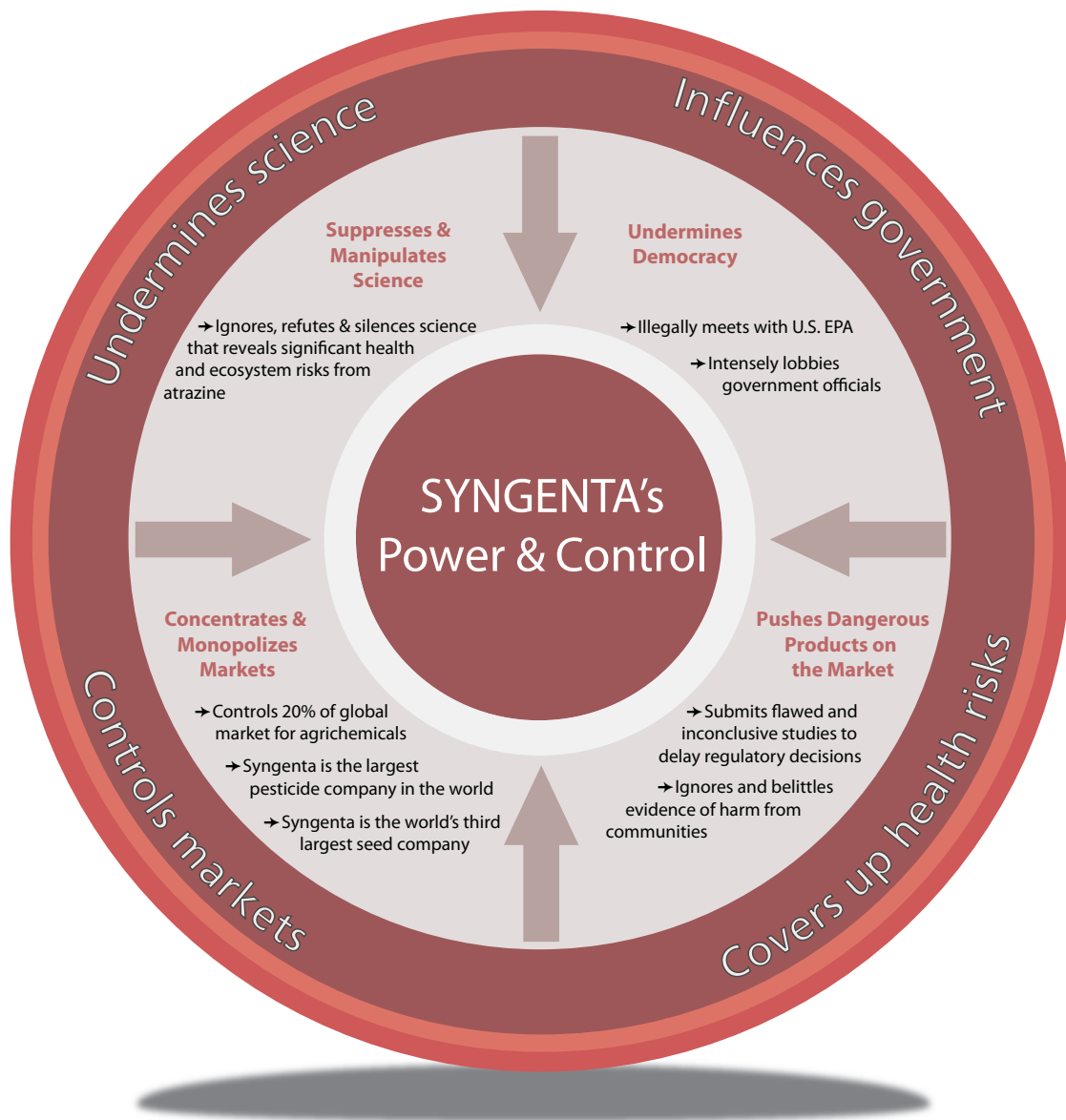
The Syngenta corporation was created to consolidate and control seed and pesticides markets around the world. Its consolidation efforts have been fierce: Syngenta was formed in November 2000 by the merger of Novartis Agribusiness (Switzerland) and Zeneca Agrochemicals (United Kingdom). Novartis, in turn, was formed in 1996 by the merger of Ciba-Geigy and Sandoz; at the time, it was the largest corporate merger in history. Zeneca was formed after a split from Imperial Chemical Industries (ICI) in 1993.⁵⁶

Evidence shows that the companies that merged to form Syngenta are collectively responsible for years of illegal chemical dumping, chemical spills and explosions, and testing pesticides on people. A few historical examples:

- Syngenta's family history includes the production of several well-known pesticides that have since been banned due to health and environmental harm. The roster includes DDT, developed as an insecticide at Geigy in 1939. DDT was banned in the U.S. in 1972, and recent studies link DDT exposure to reproductive deformities in boys, lower fertility, breast cancer and low birth weights in humans.⁵⁷



Actual ad for DDT, invented by Geigy, now part of Syngenta



Syngenta's mechanisms for controlling government decisions about their products

- In 1991, Ciba-Geigy was forced to buy back 100,000 gallons of DDT that the company illegally sold to Tanzania. Their action also violated the company's own internal policies.⁵⁸
- Both AstraZeneca and Novartis worked on developing technologies that would enforce farmer dependence on them as suppliers of proprietary seed. Their most famous endeavors include the "Terminator" seed technology—seeds that are genetically engineered to grow plants that produce infertile seed and thus can't be saved for future planting.⁵⁹ Terminator is just one example of a

range of techniques known as Genetic Use Restriction Technologies (GURTS). After public outcry at this attempt to undermine farmer rights, both AstraZeneca and Novartis made public promises that they would not commercialize the Terminator patents they owned. However, several investigations show that research and development around Terminator seeds have continued since those promises were made.⁶⁰ When Syngenta was created in 2000, the company inherited the largest interest in GURTS of all the global proprietary seed companies. Out of a total of 60 GURTS patents identified at that time, Syngenta owned 25, or 42%.⁶¹

- For over 20 years, a Ciba-Geigy production plant in Toms River, New Jersey, dumped 4 million gallons a day of carcinogenic/teratogenic chemical waste into the Atlantic Ocean, 2500 feet offshore from a popular beach. In 1992, Ciba agreed to stop the dumping and to pay \$61.35 million in fines and cleanup costs for illegal dumping of toxic waste on or near the site.⁶²
- In 1975, an affiliate of Ciba-Geigy sprayed 40 children and adult volunteers with the insecticide monocrotophos (a nerve poison) to measure the amount of chemical uptake after spraying.⁶³ In 1976, Ciba-Geigy paid six Egyptian boys to stand in a field and be sprayed with the insecticide and miticide Galecron (chlordimeform), which was already at the time a suspected carcinogen. The chemical was banned in 1988.⁶⁴

- John Atkin, Chief Operating Officer, was with Novartis from 1997–2000 and with Sandoz from 1993–1997.
- Mark Peacock, head of Global Operations, comes from Zeneca.⁶⁶

A rapid rise to the top

Since creation of the newly branded, consolidated company in 2000, Syngenta has risen to the top of the agrichemical sector. Syngenta's 2008 sales made it the largest pesticide company in the world. Syngenta is also the third largest seed company in the world, right behind Monsanto and DuPont. Together, the top 10 pesticide companies control 89% of the global pesticide market, making it one of the most concentrated industries worldwide.⁶⁷

Democracy relies upon public engagement, transparency and accountability of our leaders to their constituents. Syngenta has intentionally undermined democratic processes as the corporation seeks continued control of markets.

- The 1986 Rhine River industrial accident has been described as one of the world's most serious chemical disasters. During a fire at a Sandoz chemical plant near Basel, Switzerland, up to 30 tons of at least 35 different chemicals (pesticides, dyes and heavy metals) washed into the Rhine. The spill devastated the river's ecosystem, killing more than 500,000 fish and eliminating several species. The river was considered "biologically dead" for 300 kilometers downstream. Sandoz moved all production to Brazil by 1989 after another near-spill on the Rhine.⁶⁵

Who's in charge now?

Syngenta's current management includes many prominent personalities from its parent companies.

- John Ramsay, the Chief Financial Officer, was with Zeneca Agrochemicals from 1994–1999, and Imperial Chemical Industries from 1987–1993.

Undermining effective governance and democracy

Democracy relies upon public engagement, transparency and accountability of our leaders to their constituents. Syngenta has intentionally undermined democratic processes as the corporation seeks continued control of markets. (For more on this issue see section 7, p. 34).

Intense lobbying of governmental officials is just one way corporations influence our democracy—and Syngenta is no exception. According to the Center for Responsive Politics, Syngenta spent \$705,000 on lobbying in 2009. This pales in comparison to other years. For example, in 2006 Syngenta corporation spent \$4.36 million on lobbying. Since 2000, annual totals tend to hover around the \$1 million mark.⁶⁸

Syngenta's efforts to influence government decision-making don't end with lobbying, though. A

sampling of even more overt attempts to undermine democracy include:

- Syngenta held approximately 50 private meetings with the U.S. EPA during the Agency's review of atrazine in 2003. At least some of these meetings were illegal. Despite laws that require EPA advisory committees to be objective and transparent, during its review of atrazine the Agency used two advisory bodies made up only of representatives from EPA and Syngenta.⁶⁹
- Syngenta has been accused of insider deals with Malaysia in the reversal of the government decision to ban the controversial herbicide paraquat, another pesticide manufactured by Syngenta.⁷⁰ Paraquat is responsible for a very large number of farmworker poisonings around the world.⁷¹
- CropLife, the trade association and lobbying group for the agrichemical industry, including Syngenta, pushed for an amendment to the 2008 Farm Bill that would have prevented conservation money from going to state programs that help farmers transition from atrazine to alternative weed-control methods. The amendment eventually failed.⁷²
- Syngenta illegally planted GMO crops within an environmental protection zone around the internationally-acclaimed Iguacu National Park, a UNESCO World Heritage Site. Supported by a farmers' organization, the Brazilian Institute for the Environment and Renewable Natural Resources fined Syngenta US\$500,000. Although Syngenta appealed, the Federal Court in Cascavel ruled that Syngenta had violated Brazilian law and upheld the fine. The Brazilian state of Paraná in November 2006 issued a decree to expropriate Syngenta's site due to their illegal activities, and planned to install a center for agroecology and family farmers. Syngenta fought back, and in January 2008, the plans for the agroecology center were annulled.⁷³

Concentrating markets: gaining control of the seed & pesticides industries

It is key to remember that the agrichemical industry is one of the most concentrated in the world. Not only do the top 10 firms control 89% of the market, the top six—Monsanto, Syngenta, Bayer, DuPont, BASF and Dow, names familiar to farmers—account for 75% of the industry. These corpo-

rations create a formidable structure of control over agricultural pesticides. The Syngenta corporation alone controls almost one-fifth of the global market for agrichemicals.⁷⁴

The same companies have emerged as giants in the seed industry, and Syngenta has shown plenty of interest in increasing its dominance in the controversial arena of genetically modified organisms (GMOs).

Despite widespread adoption in the U.S., many farmers have concerns about GMOs, especially because of the near-monopolistic control that seed giants have. This control makes farmers increasingly dependent on a handful of corporations for expensive seeds each year. Farmers are also concerned about the development of pesticide-resistant weeds as a result of widespread use of GMOs and associated products.⁷⁵ A May 2009 study showed that insect resistant corn increased yields by 5 percent, while costs went up \$1 to \$4 per acre, as the technology fee was higher than the reduced insecticide costs of \$6 per acre.⁷⁶

Since the middle of this decade, Syngenta has bolstered its business in seeds through more than a dozen acquisitions. Syngenta spent in the neighborhood of \$1 billion building up its seed business, which now includes 200 product lines and more than 6,000 varieties.⁷⁷ In 2004, Syngenta bought a 90% stake in the Golden Harvest group (a consortium of five Midwestern seed companies) and 90% of Advanta.⁷⁸ Syngenta bought Goldsmith Seeds in 2008, paying some \$74 million in cash.⁷⁹ Syngenta also bought SPS Argentina, giving Syngenta an increased presence in the soybean market in Argentina.⁸⁰ In 2009, Syngenta bought Monsanto's hybrid sunflower seeds business for \$160 million in cash. Later in 2009, it acquired two U.S. lettuce-seed companies, Synergene Seed & Technology and Pybas Vegetable Seed Company.⁸¹

Keeping products on the market long after health & environmental damage is clear

It's important to understand something about the pesticide business, and about the U.S. system that purports to regulate this industry. The pesticide industry is one of the most consolidated sectors in the world, and invests significant resources into lobbying and engaging the U.S. regulatory system. While assessing the risks of pesticides, the U.S. EPA asks the corporations to submit their own science

Does Syngenta Corporation Have the Best Interests of Farmers in Mind?

Syngenta corporation attempts to present itself as the friend of family farmers and to make the case that criticism of atrazine is a criticism of farmers. Here are two insights that call such claims into question:

Hiding behind farmers

Dawn Forsythe, the former chief lobbyist for Sandoz Inc. (now Syngenta), revealed in a recent interview how pesticide companies rely on manipulating farmers to extend the regulatory life of pesticides. Forsythe was interviewed by the Huffington Post for a 2009 investigative piece on atrazine and Syngenta. She recounts events from 1996 and a meeting with other agrichemical lobbyists.

“Atrazine was of course on the top of our radar because you would find atrazine in all of the water resources. Lobbyists from Monsanto, from Ciba, from Dow, we got together monthly. In order to protect the life of atrazine we had to figure out how to keep this stuff from going in the water. *Or so I thought that was our mission.*

“First thing they talked about is that we have to get these farmers mad. We’ve got to get these farmers writing letters. We’ve got to get these farmers calling EPA. The farmers are the

best lobbyists for the pesticide industry. That was the turning point of my becoming disenchanted. I’m sorry I couldn’t go out and make farmers mad about something that they were drinking.”³⁵

Not willing to pursue a strategy that avoids responsibility and jeopardizes the health of farmers, Forsythe left her position with Sandoz, Inc., at the end of 1996.

Achieving profits through charging farmers higher prices for seed and pesticides

John Ramsay, Chief Financial Officer of the Syngenta corporation, reported in the company’s 2009 Half Year Analysis: “(Sales) Volumes were lower in Crop Protection and Seeds, but this was more than offset by price increases. Pricing increased sales by \$596 million, or 8%.”³⁶

Here are the numbers:

- Seeds: \$1.7 billion in sales, up 7%. Volume of sales was down 4%; prices were increased 11%.
- Crop protection: \$5 billion in sales, up 1%. Volume decreased by 6%; prices were increased 7%.

when they evaluate their products for safety, and the Agency is limited by its own lack of resources to do independent and transparent science. Since pesticide products that are being considered for market are proprietary, the science used by the companies isn’t always subject to peer-review or public scrutiny.

When a pesticide company wants to keep its product on the market longer, it can game the system by submitting flawed and inconclusive studies. The U.S. EPA then dutifully pores over the research, finds it wanting, and asks for something more definitive. Atrazine and other pesticides are on the market for years, even decades, after problems are discovered, while our regulatory system moves along at a glacial pace.

Our regulatory system moves along at a glacial pace. Syngenta, in the case of atrazine, has used closed-door tactics and undue influence to extend the process even further.⁸²

As other parts of this report (see section 4, p. 12) highlight, atrazine’s connections to serious environmental and health problems is well-documented. Yet atrazine stays on the market in America.

The serious consequences of Syngenta’s actions

Deep pockets can have quite an influence—on government decisions as well as on the way we think about food, farming and our future. Syngenta, the main manufacturer of atrazine, has used its deep pockets to undermine scientific integrity, thwart the democratic process and sway the U.S. public to continue use of a chemical that contaminates our water, threatens our health and stays around as a hazard for decades. All the while the same chemical is banned in its home country—and throughout Europe.

6 Caring for the Land

Five stories of farmers who have moved beyond atrazine

Since it came onto the market half-century ago, atrazine has become one of the most widely used corn herbicides in North America. Its relatively low cost and ability to kill broadleaf weeds and grasses without harming corn plants have made it popular with Midwestern farmers for decades.⁸³

Atrazine's creator and main producer, Syngenta, claims there are no viable alternatives to their best-selling herbicide and has estimated that the chemical provides farmers an economic advantage of \$35 per acre.⁸⁴ Various studies have estimated that banning atrazine nationwide would result in as much as a 6 percent yield loss for corn farmers.⁸⁵

But in fact there are many viable ways to produce corn without relying on the controversial chemical. That has been proven in European countries such as Germany and Italy, which both banned atrazine

in 1991 (a European Union ban went into effect in 2005 and a handful of extensions for limited use expired in 2007). Since the ban, corn yields and acres of corn harvested in Germany and Italy have risen, not dropped, an indication that atrazine use was not as integral to crop production as its manufacturer would like the public to believe.⁸⁶

According to recent analyses, the experience in Europe and the introduction of new alternative herbicides in recent years show that dropping atrazine would result in yield losses of more like 0 to 1 percent.⁸⁷

Here are the stories of five Minnesota farmers who have found there is life without atrazine. Their reasons for not using the herbicide vary, but they all agree on one thing: it is not the irreplaceable production tool its manufacturer makes it out to be.

Paul Sobocinski

A southwestern Minnesota farmer learns about the dangers of atrazine and decides not to use it

Southwest Minnesota farmer Paul Sobocinski started using atrazine in 1987, and from the beginning liked its ability to control grass and broadleaf weeds for a relatively low cost. In particular, Sobocinski liked the chemical's residual quality—it could be applied after the corn was planted and would hang around in the soil long enough to kill weeds well into the growing season.

“It was fairly effective,” recalls Sobocinski.

Then one day before the 2007 growing season, Sobocinski was in Saint Paul, sitting in on a legislative hearing. There he heard biologist Tyrone Hayes talk about his research, which showed that low levels of atrazine caused major health problems in frogs (see section 4, p. 12). Sobocinski, who is an organizer for the Land Stewardship Project, was also aware of efforts within the state government to keep hydrologist Paul Wotzka from testifying at the Capitol about his atrazine research. Wotzka was eventually fired (see section 3, p. 8).



“Tyrone’s research got me to thinking about how farmers like me are being put on the front line when it comes to the health risks of a chemical like atrazine,” says Sobocinski. “It made it clearer than ever to me that farmers needed more information on the chemicals they were handling, and here the state fires a researcher who was trying to provide that information. It was like a cover-up.”

So that spring Sobocinski directed the co-op that custom applies his chemicals to take atrazine out of the tank mix. Unfortunately, the farmer learned later that year that in fact atrazine had been included in that tank mix. This is a common problem in the Corn Belt. Because of the complications and risks associated with applying chemicals, a growing number of farmers are hiring professional applicators to do their spraying. The trouble is, having a custom applicator do the job makes it harder to control what is included in the spray tank once it makes it to the field.

“There was not an intention on the part of the co-op manager to deceive me,” says Sobocinski, adding that he has since made sure there is no atrazine in his yearly tank mix. “I learned you need to communicate with the applicator and get the message across.”

Making sure farmers have as much information as possible on what chemicals they are using, as well as the effects of those chemicals, is important to Sobocinski.

“We’re the closest to this and so are the most susceptible to any negative effects. But unfortunately we don’t have very good answers about the effects of atrazine or the other chemicals we might use to replace it,” he says. “There’s not a question in my mind there needs to be more research.”

The farmer says there not only needs to be more research on the impacts of chemicals like atrazine, but also alternative weed control methods. Diverse rotations and mechanical weed control—both methods Sobocinski uses—can help control plant pests with little or no herbicides. But when the soil is heavy and holds moisture during spring planting, as Sobocinski’s does, it can be difficult to control weeds without chemical help.

“Are there alternatives to chemicals? You just can’t go cold turkey overnight,” he says.

Unfortunately, just as the risks of herbicides are coming to light and farmers like Sobocinski are seeking alternatives, budgets for state and federal programs that would help crop producers research and adopt alternative cropping methods are being cut. For example, during the 2009 session of the Minnesota Legislature, budgets for two key sustainable and organic agriculture programs at the Minnesota Department of Agriculture were cut up to 90 percent.⁸⁸

“How ironic that these cuts come at a time when we farmers need this information the most,” says Sobocinski.⁸⁹



Greg Erickson

A southeastern Minnesota farmer finds atrazine in his well and takes action

Several years ago, Greg and Jeanne Erickson had their well on their southeast Minnesota dairy and crop farm tested for contaminants. The results weren’t good: the nitrate readings were quite high and there were trace amounts of pesticides such as atrazine in the water. Greg, who at the time used atrazine to raise corn on the farm, eventually decided to spend \$23,000 to drill a 550-foot well—200 feet deeper than the existing borehole. Tapping into a deeper aquifer put the family’s mind at ease—somewhat.

“Problem solved. I drilled a new well and now I can keep using chemicals,” recalls Greg on a recent

fall morning while taking a break from chopping corn. “But problem not solved—because my neighbor across the road has a 280-foot well and he’s still drinking my chemicals. I decided it wasn’t acceptable.”

So in 2000 the Erickson family started weaning their farm off of chemicals entirely. This was no easy task: Greg bought the farm from his father in 1978 and for several years relied on intensive conventional methods.

“Churn it and burn it is what I did,” Greg admits.

But for several years the Ericksons had a sense that conventional crop production methods were not sustainable in their part of Minnesota, with its highly erodible, rolling landscape above-ground, and porous contaminant-prone geological formations (called karst) below. In fact, soon after Greg started farming the land, a four-inch rain fell on a hillside of row crops he had planted. There were no strips of alfalfa hay or other deep-rooted plants on the hillside to soak up and slow the water flow. As a result, a horrific amount of the Ericksons' topsoil ended up in a neighbor's pond.

"There may have been 30 tons of soil that went into that pond," recalls Greg. "In the first year I lost

quality while keeping it in place. They were original members of the Land Stewardship Project's Stewardship Farming Program back in the 1980s. This initiative brought together stewardship-minded farm families to learn innovative conservation techniques from each other.

The family eventually brought dairy cows back to the farm. Having the bovines on the operation means they have an economical justification for raising cattle forages such as alfalfa and grass—perennials that build soil while naturally breaking up pest cycles. Their complete conversion of the land and the dairy herd to certified organic was just the latest decision that fit with the family's desire to be sustainable economically and environmentally.

"I went organic for two reasons: economics and it's the right thing to do," Greg says.

Today Greg farms with one of his four grown children. They milk 110 cows and farm 450 acres of owned and rented ground. The Ericksons' chemical-free production system relies heavily on good rotations to build the soil and naturally break up weed cycles. A typical rotation may consist of corn one year, followed by oats or another small grain the next, and then two years of hay. They use a rotary hoe to kill emerging weeds five to seven days after the corn is planted. The farmers will then follow that up with two rounds of cultivation once the corn is four to five inches tall.

The Ericksons have been certified organic for seven years now, and Greg says they are still learning. Wet springs can play real havoc with an organic weed control system, since they give the plant pests a jump on the corn. There are other, non-agronomic barriers as well. For example, federal commodity programs punish farmers for diversifying their cropping systems, often forcing them to focus on raising just one or two row crops such as corn and soybeans. Such a narrow rotation is inherently more reliant on chemicals.



more soil than dad had lost in 25 years. I had gullies in my fields. My first reaction was, 'Boy, that was a bad rain. It wasn't my fault.' But then this awareness dawned on me of, 'Who are you to squander this resource?'"

Since that catastrophic event, the Ericksons have been very mindful of ways to improve their soil's

But producing organically certified milk means the Ericksons are eligible for price premiums. That means they are receiving an economic incentive to put up with the extra trouble of raising the chemical-free corn and other crops they feed to their cows. In addition, the Ericksons are considering signing up for the Conservation Stewardship Program, a new federal initiative that provides financial rewards for farming methods that produce positive environmental results.

But as he loads two of his granddaughters (he has eight grandchildren living within a few hundred yards of the home farm) into the pickup truck for a trip to the field to check on this year's corn crop, Greg makes it clear that his desire to protect the land, his family and his neighbors trumps any economic considerations when it comes to figuring out which crop production tools to use.

"I'm here to protect this land," says Greg.⁹⁰

Mike Phillips

A south-central Minnesota farmer applies his own herbicides and raises corn without atrazine

Mike Phillips raises corn and soybeans on 240 acres in southern Minnesota using a no-till system, which reduces soil erosion and cuts fuel usage dramatically. But because he can't rely on tillage to control weeds, Phillips says having a good herbicide is important to the success of his system.

For about a dozen years he used atrazine on his corn. He would spray it after the corn had emerged, killing weeds on contact as well as gaining a residual effect which kept weeds from germinating later in the growing season.

"For a low cost, you really got some results with it," says Phillips. "It was a very effective herbicide and you didn't seem to get too many resistant weeds."

But about five years ago, he dropped atrazine from his weed-control arsenal. The farmer, who is certified by the state to apply his own chemicals, didn't like handling the pesticide because its consistency made it difficult to clean tanks and spray booms properly. Cleaning pesticide application equipment can be a messy and dangerous chore.

Since dropping atrazine, Phillips has switched to mesotrione, which is marketed under the brand name "Callisto" and is manufactured by Syngenta. Callisto is a post-emergent herbicide, meaning it is applied after weeds appear. He says it provides just as good of weed control as atrazine without fouling up his spraying equipment. He uses a lot less of the new herbicide—about two ounces per acre, as opposed to one to one and a half pounds of atrazine per acre.

"It's very similar to atrazine and a residual so once it rains it keeps weeds from germinating," says Phillips,

adding that having a residual herbicide is important in a no-till system where mechanical weed control is not an option.

Because Phillips does his own spraying, he can tailor application amounts according to how much weed pressure certain parts of his farm are facing. "You don't always need the full rates," he says. Phillips also makes sure he doesn't spray on windy days.

He says the major disadvantage to mesotrione is the cost: \$5 to \$8 per acre; he could kill weeds with atrazine for around \$1 to \$2 per acre. But the farmer doesn't miss the hassle of handling atrazine. "I didn't like working with it," says Phillips.⁹¹



Loretta and Martin Jaus

A west-central Minnesota farm family utilizes an innovative tool for herbicide-free weed control

The Jaus farm may be certified organic, but that doesn't mean the family always takes a kinder, gentler approach to weed infestations in their cornfields.

"You can go in and fry everything," says Loretta, who farms some 400 acres with her husband Martin in west-central Minnesota's Sibley County. "It's pretty intimidating at first."

The Jauses "fry everything" with an innovative tool called a "flame weeder"—basically a set of propane gas nozzles mounted on the frame of an eight-row,



rear-mounted cultivator. This technology, which was first used in cotton fields in the southern U.S., takes advantage of corn's ability to withstand a certain amount of abuse when it comes to a high-temperature, short-duration singeing.

Flame weeding is just one of the strategies the Jauses use to control weeds without herbicides like atrazine. Their farm has a long history of utilizing as few chemicals as possible. In the mid-1960s, Martin's father, Roman, started using atrazine on the farm. He noticed almost immediately that when he fed atrazine-treated corn to his milk cows, they experienced an unusually high abortion rate.

"Even though there was no official connection made, in his mind the abortions and the atrazine were related," says Loretta. A connection was also made that in general pesticides were not worth the risk they posed to animal and human health.

Over the years mechanical cultivation and diverse crop rotations began to replace chemicals as tools for keeping weeds in check. Agrichemicals were used only sparingly on the farm by the time Martin and Loretta took over the operation in 1980.

"The transition to chemical-free started with Marty's dad even before we got to the farm," Loretta recalls.

By 1990, the Jaus farm's crop acres and dairy herd were certified organic. Mechanical cultivation and soil-building crop rotations that include alfalfa and small grains like oats and barley continue to play key roles in controlling weeds. In addition, they plant corn two to three weeks later than what's normal for the region. During that delay, the first flush of weeds comes along, making it easier to control them and giving corn a jump-start once it's planted.

"There is a pretty dramatic difference in weed pressure as those plantings stretch out later," says Loretta.

In the mid-1990s Loretta and Martin added a flame cultivator to their weed control arsenal. They run the cultivator through the field when corn is around eight inches tall. The tractor is driven at a pace that exposes weeds to a 2,000-degree flame for around a tenth of a second. That's all it takes to heat up the liquid inside of a typical weed to the point where it bursts the cell walls.

"To test whether the flame weeder worked, you can pinch the weed's stem and if your finger leaves a wet imprint, that shows the cell wall is burst," says Loretta.

The flames may hit the corn plants as well, but because maize's "growth area" is wrapped in a whirl of leaves, it can recover from the singeing. The corn may look dead after a pass with the flame cultivator, but it recovers within a few days.

Depending on weed pressure, the Jauses may run the flame cultivator through the field a second time,

when the corn plants are as tall as two or more feet; they've even used the flamer when corn was as much as four feet tall. The flames often kill the weeds outright, but even if they just set them back, it provides the corn a chance to out-compete the weeds.

The learning curve for running the equipment can be steep at first. Early on, the Jauses got some bad advice on the best timing for using the equipment. They also found their flame jets weren't adjusted at the right angle for their purposes. But through trial and error the farmers figured out at what stages during the growing season the flame cultivator can be used, as well as how to adjust the jets to produce the most effective results.

And an increasing number of crop farmers are utilizing the equipment, which means more practical,

on-the-farm information is becoming available on how to use it under varying agronomic conditions. The Jauses strongly urge anyone considering taking up flame weeding to attend on-farm field days that showcase the tool, and to talk to farmers utilizing this strategy. "It's just one more tool you can use," says Martin.

Martin and Loretta have found flame weeding to work on most broadleaf weeds under varying conditions. Although giant ragweed is still a problem on the farm, the farmers feel most years they can keep a tight enough rein on weeds to produce a good corn crop.

"There have been times when our fields were cleaner than the neighbor's field that had been sprayed," says Loretta.⁹²

Duane Hager

A farmer in the upper reaches of the Mississippi River whose attention to the soil means pesticides aren't necessary

It all starts and ends with the soil, says southeast Minnesota crop and livestock farmer Duane Hager. In his quarter-century of farming just three miles from the Mississippi River, Hager has never used atrazine or any other herbicide. Yet his corn yields are competitive with his neighbors'. In fact, the soft-spoken farmer is a bit of a legend among farmers in the region who are trying to figure out how to raise row crops without chemical weed control.

Hager and his wife Susie milk 40 cows and raise 30 beef brood cows. They farm 200 acres of corn, soybeans, alfalfa hay and small grains such as wheat, oats and barley. Hager is not certified organic, but he says he's never been tempted to utilize herbicides to control weeds.

"When you don't use chemicals you don't have the cost," Hager said recently after the evening milking. "Also, I feel if you can maintain the health of the soil you shouldn't need the crutch of chemicals."

Hager is working constantly to build his soil using diverse rotations and natural mineral amendments. He doesn't see his soil as simply a plant stand for the corn and other crops, but as a living environment



that affects everything from what weeds are present to how the finished product influences the health of his livestock.

Soil tests are important to Hager, and he's learned over the years that such tests can show not only that fields differ from each other, but also soil characteristics can vary within the same field. For example, he's recently been having a problem with jimson weed. ("It's nasty, real nasty," he says.) It tends to cluster on only certain parts of his fields, although Hager knows the seed bank for that pest plant is probably spread throughout his farm.

"We tested the soil last week where jimson weed really likes to grow, and then tested where it's not a problem at all," says Hager. "I'm going to compare those soil samples to see what minerals are different. I've read it could be a calcium deficiency that jimson thrives on. I guess jimson doesn't like calcium."

Hager monitors his soil's health in less scientific ways as well. He knows it's healthy and not compacted when it's crumbly and implements pull easily during fieldwork. He also looks for signs of life.

"I watch what's going on in this soil pretty hard. When I check the planter, I can always see earthworms," says Hager. "Once I walked no more than six feet into my neighbor's field and I couldn't

find any earthworms. It was amazing I could walk that short a distance and it made that much of a difference."

Of course, even the healthiest soil produces weeds. Hager controls weeds during the growing season by, among other things, waiting until around May 20 to plant his corn—a full month after many of his neighbors. This means the soil is warmer and the corn plants get a jump on the weeds, providing a healthy canopy that can shade out the plant pests. He runs a rotary hoe across the corn four to seven days after planting. Then he will cultivate the first time typically 10 days after that first run with the rotary hoe; he does a second cultivation six to eight days after that.

"I'll throw dirt that first cultivation and it will cover a lot of weeds," he says. "And then with that second cultivation the weeds didn't respond fast enough and you throw more dirt on them and finish them off."

Hager feels he can farm the way he does without herbicides because of his relatively small scale. It allows him to manage each field individually and to adjust his methods accordingly.

"I'm always tweaking things and learning," he says. "When I have a weed problem, my first question is, 'What's wrong with the soil?'"⁹³

Brand Names of Herbicides Containing Atrazine

Syngenta corporation sells atrazine under the AAtrex® brand name. Syngenta and other companies include atrazine as a critical component of a number of pre-mix herbicide products including:^{99, 100}

Acetochlor Plus

Atrazine

Altra-5

Axiom AT DF

Ballistic

Banvel K +Atrazine

Basis Gold™

Bicep II MAGNUM®

Bicep Lite II MAGNUM®

Brawl II ATZ™

Breakfree™ ATZ

Breakfree™ ATZ Lite

Bromox + Atrazine

Bromoxynil + Atrazine

BROX®-AT

Brozine®

BUCTRIL® + Atrazine

Bullet®

Cadence® ATZ

Cadence® Lite ATZ

Charger Max™ ATZ

Charger Max™ ATZ Lite

Confidence Xtra

Confidence Xtra 5.6L

Dicamba + Atrazine

Dicambazine

Dicambazine®

Establish ATZ™

Establish Lite™

Expert®

Field Master®

FullTime®

G-Max Lite™

Guardsman Max®

Harness® Xtra

Harness® Xtra 5.6L

Infantry 4L

Infantry 90DF

Keystone®

Keystone® LA

Laddok™ S-12

Lariat®

LeadOff®

Lexar®

Liberty ATZ

Medall II AT

Metolachlor AT

OverTime ATZ

OverTime ATZ Lite

Parallel™ Plus

Propel™ ATZ

Propel™ ATZ Lite

Rifle Plus™

Shotgun®

Simazat™ 4L

Simazat™ 90DF

Sortie ATZ

Sortie ATZ lite

Stalwart® Xtra

Steadfast®ATZ

Sterling Plus®

Tremor AT

Tremor AT Lite

Triangle™

Trizmet™ II

Suggestions for Reducing or Eliminating Atrazine Use

The problems associated with atrazine have sent farmers and agronomists in search of ways to keep the herbicide from becoming a water pollutant. The majority of atrazine that leaves crop fields is lost via water run-off, particularly after heavy rains. The remainder of lost atrazine is caused by soil erosion. Here are a few ways to reduce atrazine applications and keep it in place once applied:

- Do not apply atrazine when heavy precipitation is in the forecast.
- Do not apply atrazine within 50 feet of any well or sinkhole. Mix atrazine and fill and rinse your sprayer at least 50 feet from any well, sinkhole, stream, river, lake, reservoir or pond.
- Do not apply atrazine within 200 feet of a lake, reservoir or pond.
- Plant a 66-foot buffer of grass or other similar vegetation along streams or rivers.
- Incorporate atrazine into the soil using mechanical tillage equipment.
- Utilize no-till, mulch-till, ridge-till or other high-residue farming methods to reduce soil erosion, and thus atrazine runoff. However, be aware that no-till is not effective at reducing atrazine losses on tight, poorly drained soils or soils with a restrictive layer that limits water infiltration.⁹⁴

Reducing herbicide & pesticide applications

There are numerous ways to reduce atrazine applications while maintaining corn yields:

- Use integrated pest management (IPM) to scout for weeds. This makes it possible to match spraying to weed infestations, rather than applying chemicals to an entire field indiscriminately. In many fields, weeds are clustered, with as much as 70 to 90 percent of land having

very few weeds. It is possible to map these infested areas at harvest time.

- Use less than the label recommends. Keep in mind that in years past, the recommendation was that farmers use four pounds of atrazine per acre. One to one and a half pounds per acre is now the typical recommended rate. However, studies have shown that by scouting weed infestations and using targeted spraying, even less atrazine can effectively control plant pests.
- Applying atrazine after corn has emerged, rather than before, can reduce runoff by as much as half.
- Applying atrazine in a narrow band in crop rows can reduce the amount of herbicide needed.
- Rotate crops. Rotating corn with soybeans, for example, can reduce atrazine use by at least half. Adding a third crop such as oats or other small grains can reduce reliance on the herbicide even more.⁹⁵

Dropping herbicides

Certified organic crop farmers have been proving for years that weed control is possible without chemicals. That doesn't mean you have to be completely organic to be atrazine-free. However, certain organic cropping strategies can help remove herbicides like atrazine from conventional farm fields. Here are a few proven strategies:

- Rotary hoes, cultivators, flame weeders and other mechanical weed control methods. These can be effective tools, particularly on land that is not highly erosive.
- Long crop rotations that consist of soybeans, forages and small grains. These rotations can break up weed cycles.
- Cover crops. Farmers have found that planting crops that have low market value after harvest of the main crop in the fall or even in the

spring before planting can suppress weeds, as well as reduce erosion and enrich the soil. For example, a number of farmers in the upper Midwest are planting winter rye in the fall. This cover crop grows well in early spring, and suppresses weeds by competing for sunlight, nutrients, moisture and space. In addition, crops like rye contain alleopathic compounds, which naturally interfere with weed growth. Cover crops can be particularly useful for controlling cool-season perennials.⁹⁶

- Chemical-free no-till. The Rodale Institute in Pennsylvania has developed a corn production system that utilizes a cover crop of hairy vetch or rye and a specially designed roller. The roller knocks down the cover crop and corn is planted into the natural mulch. Weed suppression has been so effective that trials show this system can out-yield corn systems reliant on herbicides for weed control. The University of Minnesota's Southwest Research and Outreach Center in Lamberton is experimenting with this system.⁹⁷

What you can do

- If you have your agrichemicals applied by a contract sprayer, check with them to see what alternatives to atrazine they have available, as well as what can be done to reduce application rates.
- Check out the Minnesota *Greenbook* (www.mda.state.mn.us/protecting/sustainable/greenbook.aspx) for examples of farmers who are utilizing various alternative methods to eliminate or reduce applications of herbicides like atrazine.
- The University of Minnesota's Organic Ecology initiative (<http://organicecology.umn.edu>; 507-454-8310) has details on alternative weed control research being conducted in various parts of the state.

7 Democracy & Syngenta's Atrazine

Government regulation must make a priority to, in the words of the preamble to the U.S. Constitution, “promote the general welfare”—i.e., the wellbeing of the public. This regulation should be transparent and guided by independent and accurate science. This is essential to the health of our democracy.

When a pesticide is produced and promoted after peer-reviewed, transparent and independent science has shown that it causes widespread health concerns and damage to the environment, the general welfare has been harmed. It's particularly troubling when the general welfare is harmed for the profit of a particular company. Unfortunately, the regulation of atrazine by the U.S. Environmental Protection Agency is a story of private profit trumping the general welfare of the American people.

Regulation of Syngenta's atrazine by the U.S. Environmental Protection Agency

In 1988, Congress updated the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). The updated law required the U.S. EPA to speed up its review of older pesticides, and if science warranted, to set new rules to protect the public health and environment. Atrazine, as one of the oldest and the most commonly used pesticides in the nation, was a prime candidate for review. The U.S. EPA failed to meet its 1997 deadline for atrazine and in August 1999, the Natural Resources Defense Council (NRDC), along with the United Farm Workers of America, the AFL-CIO and others, filed a lawsuit because of their own concerns about the environmental and human health consequences of widespread atrazine use. In a consent decree, the U.S. EPA was given until October 31, 2003, to meet the deadline.¹⁰¹

In 1998, Novartis Agribusiness, not wanting to rely on publicly funded science, began funding its own research. (Novartis merged with AstraZeneca in 2000 to form Syngenta.) Novartis hired a private firm—EcoRisk of Ferndale, Washington—to conduct the research. As part of its work, EcoRisk contracted with Dr. Tyrone Hayes at the University of

California-Berkeley to research the effect of atrazine on frogs. Hayes was an ideal researcher, with a biology degree from Harvard and a doctorate in amphibian development from the University of California.

Dr. Hayes' research concluded that male tadpoles exposed to atrazine grew to be frogs that were “demasculinized.” They had smaller voice boxes, greatly reduced testosterone levels and many grew up as hermaphrodites. Particularly alarming was that the effects appeared with doses of atrazine as low as 0.1 parts per billion (ppb). That is the equivalent of a single drop of atrazine in 200,000 gallons of water. Dr. Hayes was told by EcoRisk to repeat his experiment. When this produced the same results, Dr. Hayes was reminded by Syngenta that according to his contract he could not publish the results of his findings.¹⁰²

Dr. Hayes ended his contract with EcoRisk and reproduced the study on his own, eventually publishing the results in the journal *Nature*,¹⁰³ and the *Proceedings of the National Academy of Science*.¹⁰⁴ Once the findings were made public in these prestigious journals, the U.S. EPA could not ignore them. However, EcoRisk went on to produce numerous studies that contradicted Hayes' findings. Ultimately, the U.S. EPA's Scientific Advisory Panel would conclude that all the EcoRisk studies were scientifically and methodologically flawed.¹⁰⁵ By muddying the waters with poorly designed and sloppy studies, the Syngenta corporation bought time. (For more on Hayes' research, see section 4, p. 12).

Syngenta's efforts did not stop at creating questionable science. The *Washington Post*, in an August 16, 2004, front-page article by reporter Rick Weiss, detailed how the company and its allies worked to exclude consideration of the problems Dr. Hayes' study had identified.¹⁰⁶

A law written by an industry lobbyist and passed in 2000 as part of a 712-page appropriations bill provided the tool to accomplish this. The law, referred to as the “Data Quality Act” and implemented under the George W. Bush Administration, directed

the Office of Management and Budget (OMB) to ensure all information disseminated by the Federal Government is reliable.

The OMB's Office of Information and Regulatory Affairs was in charge of implementing the law and was headed by a strong critic of regulation with a history of favoring industry when evaluating the costs-to-benefits ratio of regulation. The OMB established rules that allowed industry to challenge science they believed to be unreliable. This opened another avenue for industry to undermine Dr. Hayes' research—which is what it did.¹⁰⁷

A chemical industry lobbyist challenged Dr. Hayes' research on two counts. First he claimed it was not

had to turn over thousands of documents that show U.S. EPA officials held approximately 50 private meetings with officials of the Syngenta corporation. In addition, the U.S. EPA established advisory committees composed solely of representatives from the Syngenta corporation. The U.S. EPA then relied on the findings of these committees to determine how atrazine should be regulated.¹⁰⁹

Democracy suffered

When we understand effective regulation as a critical function of our democracy, as essential to promoting the general welfare, then the story of the U.S. EPA's kowtowing to the Syngenta corporation is troubling. Shoddy science was produced to further private

When a pesticide is produced and promoted after peer-reviewed, transparent and independent science has shown that it causes widespread health concerns and damage to the environment, the general welfare has been harmed.

reproducible, since Syngenta-funded science had come to a different conclusion. Second, he argued for tossing out Dr. Hayes' science since there was no gold standard test established by the U.S. EPA to determine whether atrazine was a hormone disruptor in frogs. Ultimately, the U.S. EPA ruled that hormone disruption couldn't be considered a "legitimate regulatory endpoint at this time" because there was no officially accepted test for measuring endocrine disruption. Shortly after that, in October 2003 the U.S. EPA ruled that atrazine would be re-registered with no meaningful changes in regulation.¹⁰⁸

The Natural Resources Defense Council, based on the strength of the science, was advocating for more stringent regulation of atrazine. During the review process, NRDC learned that the U.S. EPA held a series of closed-door meetings with the Syngenta corporation. When the U.S. EPA failed to respond to a Freedom of Information Act request, NRDC was forced to pursue court action to learn about the extent of these meetings. As a result, the U.S. EPA

profit over the public good. A process that should have been transparent—meaning open and understandable to the public—was anything but that. And a law written by corporate interests was used to suppress science and cloud the regulatory process.

The European Union & atrazine

The European Union (EU) reviewed atrazine at the same time as the U.S. EPA, and used much of the same science in conducting that review. In October 2003—the same month the U.S. EPA decided to effectively take no action—the EU moved to ban atrazine, effective in 2004, with some uses continuing through 2007. Dr. Hayes' work and other research showing atrazine to be an endocrine disrupter undoubtedly played a role in the decision. However, the deciding factor cited by the EU was that atrazine exceeds the allowable limits of 0.1 ppb in groundwater in many areas, and with continued use will likely exceed that in other areas. It is interesting that the European Union's process was

lengthy, provided the opportunity for input from all parties including the Syngenta corporation, environmental interests and farm organizations, and was relatively uncontroversial.¹¹⁰ The EU has adopted as a principle that only a handful of pesticides should be allowed to exceed 0.1 ppb in drinking water.¹¹¹ Since a considerable number of households get drinking water from private wells, groundwater is in such cases considered drinking water. No such criteria exist in the United States.

Wisconsin & Syngenta's atrazine

Wisconsin is one of few states that have significant regulation of atrazine beyond federal standards. In 1983, the state adopted a groundwater protection law that directed the Wisconsin Department of Agriculture, Trade and Consumer Protection (WDATCP) to address emerging pesticide pollution problems. In 1991, WDATCP created state rules related to atrazine. Initially the state adopted an approach of having “atrazine management areas,” where atrazine could be used but at rates lower than allowed nationally, as well as “atrazine prohibition areas” where use of atrazine was banned outright. In 1992, the approach was simplified and the atrazine management area category was eliminated. There are now either areas where atrazine is banned or areas where atrazine is allowed. An atrazine prohibition area is triggered when a groundwater test shows levels of the herbicide exceed 3 ppb.¹¹²

In 1993, based on human health concerns related not just to atrazine, but also to the combination of atrazine and its breakdown products, Wisconsin officials decided to measure atrazine levels in water in terms of the sum of atrazine and three of its metabolites (metabolites are the breakdown products atrazine decomposes into). The chlorinated metabolites are of special concern because of their suspected impact on human health. This more accurate way of measuring atrazine levels has resulted in increased acreage in the atrazine prohibition areas.¹¹³

To date that state has prohibited atrazine use on 1.2 million acres of land. Wisconsin regulators take the law seriously and in 2008 fined a farmer \$14,000 for violating the restriction.¹¹⁴

Comprehensive research has yet to be done on whether this approach will keep atrazine at safe levels in Wisconsin surface and groundwater. It does seem to demonstrate that restrictions on atrazine have little to do with corn production or yields. Wisconsin is one of the top 10 corn-producing states in the nation. In 1990, before this regulatory framework on atrazine was implemented, 3,700,000 acres of corn were planted in Wisconsin. In 2008, it was 3,800,000 acres. Plantings reached a high of 4,050,000 acres in 2007. In addition, Wisconsin corn yields in general have gone up over that period of time.¹¹⁵

A chance to get it right

In October 2009, Lisa Jackson, the new Administrator of the U.S. EPA appointed by President Obama, reopened a review of atrazine. Steve Owens, Assistant Administrator for EPA's Office of Prevention, Pesticides and Toxic Substances, said about the decision: “One of Administrator Jackson's top priorities is to improve the way EPA manages and assesses the risk of chemicals, including pesticides, and as part of that effort, we are taking a hard look at the decision made by the previous administration on atrazine. Our examination of atrazine will be based on transparency and sound science, including independent scientific peer review, and will help determine whether a change in EPA's regulatory position on this pesticide is appropriate.”

Based on this evaluation, the U.S. EPA will decide whether to revise its current atrazine risk assessment and whether new restrictions are necessary to protect health and the environment.¹¹⁶

It is important that the U.S. EPA's review is followed with diligent and effective action.

8 Conclusions & Recommendations

This report points to the need for action from both the U.S. government and the Syngenta corporation. Based on the evidence presented in this report, the building blocks of effective regulation—regulation that protects and promotes the public welfare and the health of the American people—has been jeopardized. We base our recommendations on the information in this report and the following principles:

- The interests of individual corporations should not trump the welfare of the American people.
- Independent, transparent science is fundamental to effective regulation of inherently hazardous products such as pesticides.
- Government should take swift action when the health of its people or natural resources is at risk.
- Farmers are innovative and are not dependent on any one herbicide for stewardship, profitability or yields.

The U.S. EPA's responsibility

The U.S. EPA is currently reexamining the safety of atrazine and has formally opened a new review. To ensure the integrity of the process and rebuild farmer and public confidence in the agency's efforts, we believe that the U.S. EPA should adopt these recommendations:

- The process should be 100% transparent. There should be no closed-door meetings of any kind, especially with industry representatives, and summaries of all interactions between the U.S. EPA and stakeholders on this topic should be included in the official record (i.e., the docket) and made publically available.
- Studies funded by Syngenta should be discounted in the review process of atrazine. The studies it has submitted in the past have been deeply flawed and have hampered good decision making.
- All scientific studies supporting the continued registration of atrazine should be made available for public scrutiny. Studies that are not made publicly available should be removed from consideration. Industry should not be permitted to hide critical data from independent scientific examination by claiming "confidential business information." For the sake of transparency and to ensure farmer and farmworker

confidence in its decisions, the U.S. EPA should only rely on studies that are publicly available.

- If after review the science indicates atrazine is a threat to human health or the environment, the U.S. EPA should take swift and clear action to protect farmers and the public.

Farm groups from around the country have joined with the Land Stewardship Project and Pesticide Action Network North America in supporting these recommendations. The letter on the following pages, signed by over a dozen farm and rural organizations, was sent to the U.S. EPA on January 5, 2010.

The Syngenta corporation's responsibility

The Syngenta corporation makes this statement on its website as part of its position on corporate responsibility: "The confidence of Syngenta's stakeholders is critical to the continuing success of our business. We can only maintain their trust if we act—and are seen to act—in accordance with the highest standards of ethics and integrity." To live up to the standards it has set for itself, we believe that at a minimum the Syngenta corporation should do the following:

- No matter what course of action the U.S. EPA takes, Syngenta must be honest with farmers and the public about the potential health and environmental risks of atrazine. Given the scientific evidence cited in this report, to promote atrazine as completely safe is not responsible and not "in accordance with the highest standards of ethics and integrity."
- When submitting science for consideration by the U.S. EPA, USDA or other governmental agencies as part of future product review processes, Syngenta should make all data publicly available. In addition, we encourage peer review by other scientists. Withholding data calls into question the integrity of Syngenta's science.
- Because of its past record of producing faulty science on atrazine, Syngenta should recuse itself from the current review of atrazine.

The Land Stewardship Project and Pesticide Action Network North America will be vigilant in determining whether the Syngenta corporation is working to live up to its claim to act "in accordance with the highest standards of ethics and integrity."

January 5, 2010

Lisa P. Jackson, Administrator
Steve Owens, Assistant Administrator
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue NW
Washington, DC 20460

Dear Administrator Jackson and Assistant Administrator Owens:

We write you as organizations representing family farmers, farmworkers and people concerned about scientific integrity in the regulatory process. We have strong concerns about the safety of the herbicide atrazine and how Syngenta, its primary manufacturer and promoter in the United States, has continued to promote its use to farmers as completely safe. We are also concerned about Syngenta's manipulation of the regulatory process.

Many farmers who are members of the undersigned organizations use herbicides and pesticides as part of their farming operation. Many farmworkers work on farms where these chemicals are applied. They rely on the U.S. EPA when registering pesticides to use a transparent process that is guided by science and places protection of human health and the environment above corporate profits. Farmers, farmworkers and their families can be among the first harmed when unsafe pesticides are approved by your agency.

We do not believe that the Syngenta corporation can legitimately claim to represent the interests of farmers. As the world's largest agrichemical company and one of the largest seed suppliers, Syngenta has pursued a strategy of achieving profits that often relies on raising prices to farmers and vertical integration. Their track record is one of prioritizing their bottom line rather than the wellbeing of family farmers.

Atrazine is one of the most commonly detected pesticides in U.S. ground and surface water. A monitoring program conducted by the U.S. EPA in 10 states between 2003 and 2005 found that 94 of 136 public water systems tested had atrazine concentrations above the federal drinking water standard of three parts per billion in their untreated water for at least one 90-day period.¹ Such widespread contamination indicates a problem with the chemical, not the way it is applied. Further, it is worrisome that a large and growing body of science is showing atrazine is linked to birth defects, breast cancer, prostate cancer and other human health concerns.²

The past record of Syngenta on the issue of atrazine is very disturbing. Some of the events that we find most egregious include:

- In 2003, while atrazine was being reviewed by the U.S. EPA, Syngenta participated in approximately 50 closed door meetings with U.S. EPA regulators. These meetings were not publicly announced, and documents about the meet-

ings were only made public by the agency after the Natural Resources Defense Council filed a lawsuit.³

- Syngenta attempted to prevent publication of science conducted by Dr. Tyrone Hayes that showed atrazine at very low levels feminized frogs and acted as an endocrine disruptor.⁴
- Syngenta-funded studies submitted in 2003 to the U.S. EPA's Scientific Advisory Panel were found to be inaccurate and flawed.⁵ Publically-funded science should be given primary consideration.
- Male workers at a Syngenta factory in Louisiana where atrazine is manufactured experience significantly increased rates of getting prostate cancer⁶

We are extremely encouraged that the U.S. EPA, under your direction, is reexamining the safety of atrazine and has officially opened a new review. To ensure the integrity of the process and rebuild farmer confidence in the agency's efforts, we make the following requests:

- The process should be 100% transparent. There should be no closed-door meetings of any kind, especially with industry representatives, and summaries of all interactions between the U.S. EPA and stakeholders on this topic should be included in the official record (i.e., the docket) and made publicly available.
- Studies funded by Syngenta should be discounted in the review process. The studies they have submitted in the past have been deeply flawed and have hampered good decision-making. Publically-funded and peer-reviewed science should be given primary consideration.
- All scientific studies supporting the continued registration of atrazine should be made available for public scrutiny or be removed from consideration. Syngenta and other atrazine registrants should not be permitted to hide critical data from independent scientific examination by claiming "confidential business information." For the sake of transparency and to ensure farmer and farm-worker confidence in its decisions, the U.S. EPA should only rely on studies that are publicly available.
- If after review the science indicates atrazine is a threat to human health or the environment, the U.S. EPA should take swift and clear action to protect farmers and the public.

Our health—and more importantly the health of our children and their children—will bear the consequences of your decision. Thank you for your consideration of our views.

Sincerely,

Land Stewardship Project
Pesticide Action Network North America

This letter was signed by other farm groups. For a complete list, go to www.landstewardshipproject.org.

Notes on page 43.

Endnotes

- 1 a) Atrazine was developed by a Syngenta legacy company and first registered for use in the U.S. in 1959.
b) Syngenta USA, "Atrazine Celebrates 50 Years of Effective Weed Control," http://www.syngentacropprotection.com/news_releases/news.aspx?id=105657 (accessed Dec 6 2009).
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- 4 Syngenta USA, "Atrazine: Celebrating 50 Years," http://www.syngentacropprotection.com/prodrender/Atrazine/index.aspx?nav=atrazine_main (accessed December 7, 2009).
- 5 Kate Galbraith, "Agribusiness Chief Slams Organics," *New York Times Green Inc. Blog* posted on November 25, 2009, <http://green-inc.blogs.nytimes.com/2009/11/25/agribusiness-chief-slams-organics/> (accessed December 3, 2009).
- 6 Syngenta USA, "Less Soil Erosion Through Conservation Tillage," http://www.syngentacropprotection.com/prodrender/Atrazine/index.aspx?nav=atrazine_benefits_soil_erosion (accessed December 5, 2009).
- 7 Land Stewardship Project, Farmer interviews and public meeting feedback, 2007-2008.
- 8 Minnesota Department of Agriculture, *2005 Nutrient and Pesticide Management Assessment of Producers in the Middle Branch and South Branch Watersheds of the Whitewater River* (St. Paul, MN: MN Department of Agriculture, 2008).
- 9 U.S. Department of Interior and U.S. Geological Survey, *The Quality of Our Nation's Waters: Pesticides in the Nation's Streams and Ground Water, 1992-2001*, by Robert J. Gilliam et al., (Washington, DC: U.S.G.S. Circular 1291, 2006), <http://pubs.usgs.gov/circ/2005/1291/> (accessed December 4, 2009).
- 10 Tyrone Hayes et al., "Hermaphroditic, demasculinized frogs after exposure to the herbicide atrazine at low ecologically relevant doses," *Proceedings of the National Academy of Sciences* Vol. 99, No. 8 (April 16, 2002): 5476-5480, www.pnas.org/content/99/8/5476.abstract (accessed November 20, 2009).
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