Atrazine
50 years of proven performance

For more information, visit:
www.atrazine.com

syngenta

GS 409.82007 SCP 560-00247-A

Atrazine

50 years of proven performance

"I'm close to 80 percent no-till, which protects soil types that are highly erodible. I use cover crops to save moisture and incorporate more organic matter into my soil. Atrazine helps maintain this system, because the residual control helps burn down cover crops and keep them from regenerating until the corn crop can get established. It is a critical tool for crop protection today. It works, it's cost-effective and it's safe if used properly."

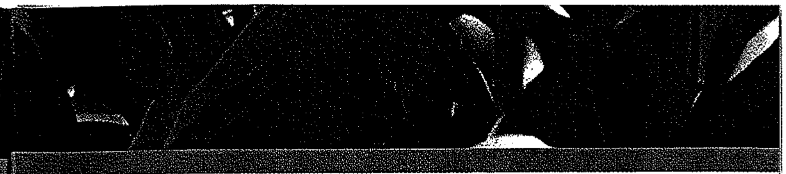
—Carl Shaffer, Mifflinville, Pa.

"Atrazine is an economical option that helps us control problem weeds like velvetleaf, vines and morningglory. We get more residual control for the cost, and that protects our yields. We also use atrazine to provide a different mode of action for weed control. We don't want to develop weed resistance."

—Mat Muirheid, Oakley, Ill.

"When I first started raising corn, atrazine was very beneficial. It eliminated at least one pass of tillage. Today it still helps us control weeds like cocklebur and henbit, which suck up moisture, while allowing us to till as little as possible to get the job done."

—William Albert, Hutto, Texas



Tested veteran in weed control

Atrazine has long been a favorite of corn, sorghum and sugar cane farmers because it's effective in controlling a broad range of yield-robbing weeds, is safe to the crop and fits a variety of farming systems. Its ability to increase yields is critical as demand for food and alternative fuel increases.

- Atrazine can be applied to crops before, during or after planting — or even after the crop emerges — and provides residual weed control throughout the growing season.
- Atrazine is a popular option in conservation tillage programs that reduce or eliminate plowing and tillage — methods traditionally used to control weeds. Conservation tillage systems — used on almost 44 million acres of corn in the U.S. — can benefit the environment by reducing soil erosion by as much as 90 percent.
- Atrazine is most often used at low rates in tank mixes or pre-mixes with other products to enhance their performance. More than 45 pre-mix products on the market today contain atrazine.
- Used in combination or rotation with other chemistries, atrazine helps delay and manage weed resistance to those products.

Delivering value to the farmer & beyond

Farmers simply can't raise profitable crops without controlling grass and broadleaf weeds that compete for moisture, sunlight and nutrients. That's why they rely on atrazine to control weeds on well over half of all U.S. corn acreage, about two-thirds of sorghum acreage and as much as 90 percent of U.S. sugar cane. For these growers, farming without atrazine would present significant economic consequences.

- Farming without atrazine would have a financial impact on U.S. corn, sorghum and sugar cane farmers in excess of $2 billion annually, as estimated by the U.S. Environmental Protection Agency (EPA).
- By using atrazine over alternative herbicides, corn farmers can save as much as $28 per acre in reduced herbicide costs and increased yields, according to EPA.
- In sugar cane, EPA estimates a 10 to 40 percent crop loss, plus higher costs for alternative herbicides without atrazine. The estimated impact: as much as $343 million.

"Atrazine is a reliable, consistent product that saves me about $4.50 per acre. It has no crop safety issues and helps keep fields clean. The extra residual can control some of those last weeds that emerge before canopy, and eliminating weeds this year gives you cleaner fields next year. Atrazine allows us to use less herbicide."

—Doug Albin, Clarkfield, Minn.

"Atrazine is critical to maintaining my bottom line. The price of sugar hasn't gone up for decades, but input costs have, so we need to keep our weed control costs down, and atrazine is our most cost-effective option. If you don't control morningglory vines, you can hardly harvest and they pull sugar cane down. You lose productivity and as much as 50 percent of your yield."

—Marty Graham, Morganza, La.

"Atrazine helps other herbicides work better, and it provides more residual weed control and another mode of action for weeds that can cost 2 to 10 percent of corn yields. The low rates we use today are environmentally safe, and because it has been around for years, I know how to handle it correctly. It's a vital part of what makes my operation work successfully."

—Dan DeRycke, Victor, Iowa

"Atrazine has a great history. University studies have proven that its toxicity to people and animals is very, very low. Of course, we must use it prudently, but atrazine has a long track record of success and safety. Plus, it has excellent crop safety, which protects yield."

—Greg Stone, Garden City, Kan.

"We need to rotate herbicides to help control weeds, especially glyphosate-tolerant weeds that have evolved from using too much glyphosate with crops like Roundup Ready® soybeans and corn, and atrazine is one option we use. If used correctly, within EPA guidelines, atrazine can be a very safe option for weed control."

—Eric Weeks, Brownell, Kan.

Safety in the science

With its popularity and long tenure, atrazine is considered the most studied herbicide ever used in agriculture. And its safety continues to stand up to the most stringent regulatory standards — in this country and around the world.

- Farmers have used atrazine safely for 50 years.
- In June 2006, EPA re-registered atrazine and concluded that the triazine herbicides pose "no harm that would result to the general U.S. population, infants, children or other major identifiable subgroups of consumers."
- World-renowned institutions including the World Health Organization, the National Cancer Institute and EPA all have studied atrazine and found no health concerns.
- Atrazine is used in more than 60 countries around the world. No country has ever discontinued the use of atrazine based on health concerns — including the European Union.
- The latest, cutting-edge research shows that atrazine has no adverse effect on frogs and continues to meet the rigorous environmental standards placed on the use of agricultural chemicals.

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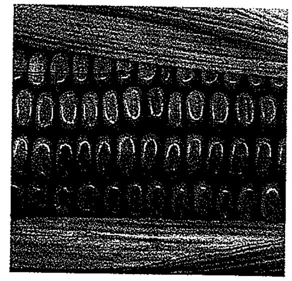
Effective.

Affordable.

No one cares more about the safety of atrazine than those of us who use it in our fields and have seen it boost yields and profits over the last 50 years. After all, we raise our families on our farms and in our local communities. We drink the local water. We swim and fish in local lakes, rivers and ponds. We look forward to passing our way of life on to our children and grandchildren. No one cares more than we do about keeping our environment healthy and our foods safe and abundant.



One of the tools we use, the herbicide atrazine, has been the subject of a lot of claims by people whose knowledge about the way agriculture works is questionable, at best. Unfortunately, the Environmental Protection Agency (EPA) is allowing activist claims to drive the re-evaluation of atrazine outside normal regulatory procedures. These claims have no place in influencing how or when a proven tool that has been deemed safe to use should come under fire again.

The unplanned reviews of atrazine currently underway by the EPA are unprecedented, and in our view, unnecessary. Two lawsuits, one in federal court and another in Illinois state court, are being led by lawyers who have a history of pursuing class action cases and dollars. In allowing the activists' claims and lawyers' rhetoric to open up the review again, the EPA appears to be setting up a different scheme for atrazine that is not supported by our current science-based process. But, just as important, if this happens to atrazine — a herbicide that was re-registered after an exhaustive 12-year review, with thousands of studies to back up its safety — what will that mean for all the other crop protection tools in the market? Where would it stop?

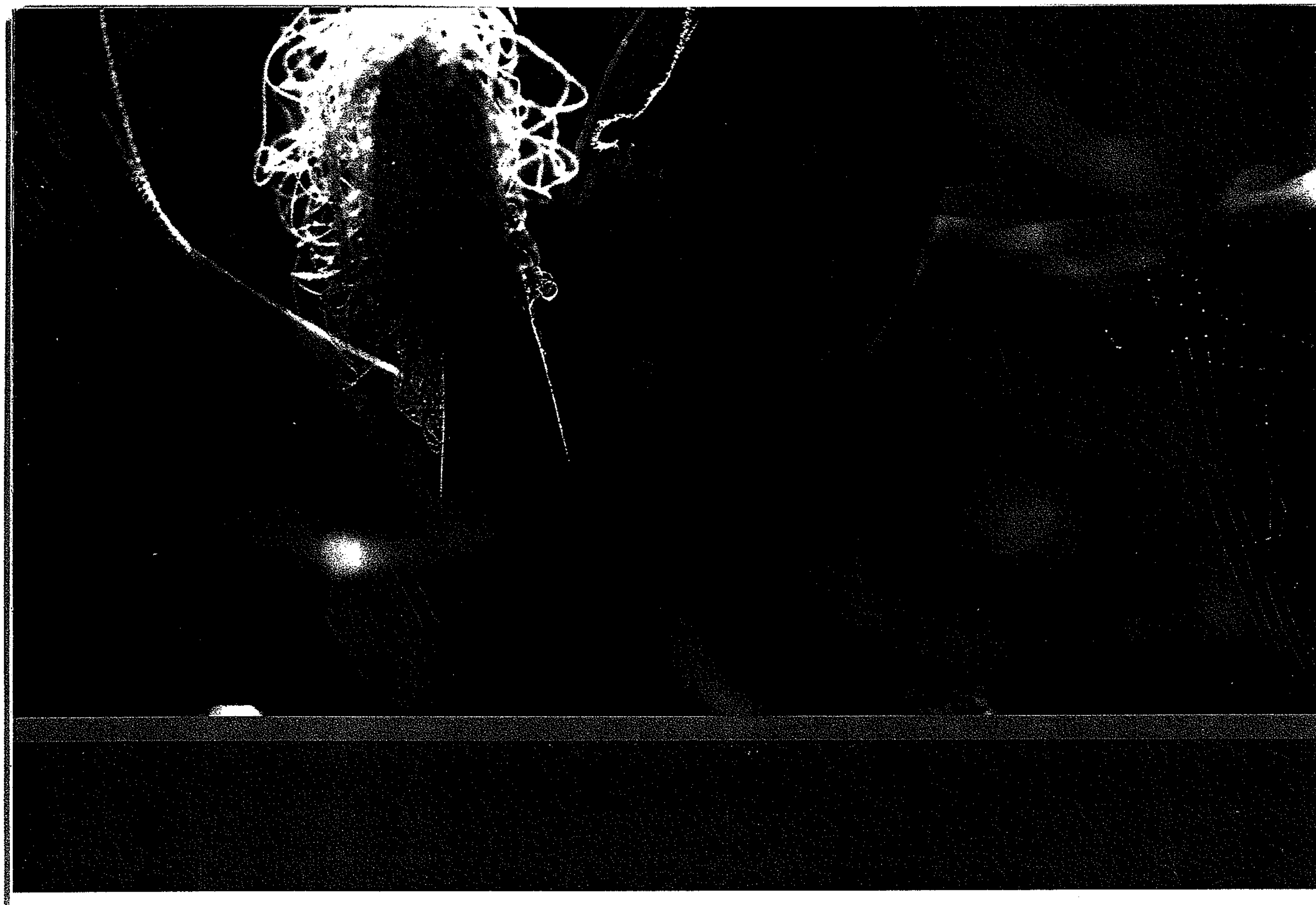
Atrazine is the most studied herbicide in the world, with more than 6,000 studies on record. We rely on years of credible, scientific research to back up the facts. There is little doubt that the robust data and very conservative safety factors regarding its continued use ensure confidence in the safety of atrazine for farms, regulators and consumers. As growers and retailers we are the primary handlers of this product. Our kids and our grandkids are a part of our farms, our land and our lives. We need safe tools in our toolbox and atrazine is one of the safest.

Our group, the Triazine Network, is made up of farmers and farming groups who raise crops that have safely fed livestock and people for years. We urge you to join us in support of the preservation of atrazine and push the EPA to get back to business and follow established regulatory guidelines. The weight of evidence through 50 years of use and more than 6,000 studies should be the guide in regulating this important tool.

Sign up at **www.AgSense.org** to receive up-to-date alerts about atrazine and the review process.

With our united voice we can be heard,

Jere White
Chairman, Triazine Network



"There isn't an affordable substitute for atrazine with as broad a spectrum in weed control. Growing corn without atrazine would cost yield and require more herbicides. It would be kind of like brushing your teeth without toothpaste — it's a key to keeping our fields clean."

Lamar Ratliff
Corn grower, Greenfield, Ohio

"Atrazine has been used for so many years that over time it's proven to be a critical part of corn production."

Regan Wear
Agronomy Sales Manager, Shipman Elevator, Shipman, Ill.

Atrazine: Vital Industry Tool

Applied on

> Well **over half of all U.S. corn** acres

> **Two-thirds of U.S. sorghum** acres

> As much as **90% of U.S. sugar cane**

Fights weed resistance

> As a tankmix partner, atrazine adds **another herbicide mode of action** to improve effectiveness

> **Enhances the performance** of many other herbicides, minimizing selection pressure for herbicide-resistant weeds

Saves the soil

> When using atrazine products, U.S. farmers are turning more to conservation tillage and no-till systems to help protect valuable topsoil

> In 2008, **64 percent*** of the atrazine used in corn **allowed for no-till or conservation farming**

> Conservation tillage can **reduce soil erosion** by as much as 90%**

*Source: GfK Kynetec
**Source: Conservation Tillage Information Center

Proven safety

> Most studied crop protection product on the market with **more than 6,000 studies** on record

> **Positive safety reviews** around the world by EPA, Australia, Canada, UK and the World Health Organization

Increases productivity

> Average of **5.7 bushels more per acre***

> Farming without atrazine would cost growers as much as **$28 per acre**** in alternative herbicides and reduced yields

> Loss of atrazine would cost U.S. growers more than **$2 billion****

*Source: NCWSS, 2008
** Source: EPA estimates

Impact on jobs

> The loss of atrazine would **wipe out 21,000 to 48,000 jobs*** related to corn production

> Additional losses in sugar cane and sorghum industries

> In 2009 terms, the loss of atrazine would increase unemployment in the agricultural sector alone **by as much as 2.6 percent***

*Source: Professor D. Coursey, University of Chicago, 2010

Atrazine: Critical for Farmers

After 50 years on the market, chances are you're using or have used atrazine. It is a critical component in at least 59 products on the market today. Often atrazine is used at low rates in tank mixes or pre-mixes with other products to enhance performance.

Syngenta Crop Protection sells atrazine under the AAtrex® brand name and includes atrazine in a number of other herbicides brands. Several other companies sell their own brands of atrazine as well including:

AAtrex® 4L
AAtrex Nine-O®
Atra-5™
Atrazine 4L
Atrazine 90 DF
Atrazine 90 WDG
Ballistic™
Banvel-k® + Atrazine
Basis Gold®
Bicep II Magnum®
Bicep Lite II Magnum®
Brawl II ATZ™
Breakfree® ATZ
Breakfree ATZ Lite
Buctril® + Atrazine
Bullet®
Callisto® Xtra
Charger Max® ATZ
Charger Max ATZ Lite
Cinch® ATZ
Cinch ATZ Lite
Commit® ATZ
Commit ATZ Lite
Confidence® Xtra
Confidence Xtra 5.6L
Degree Xtra®
Establish ATZ™
Establish Lite™
Expert®
Field Master®
FulTime®
G-Max Lite™
Guardsman Max®
Harness® Xtra
Harness Xtra 5.6L
Keystone®
Keystone LA
Lariat®
Lexar®
Lumax®
Marksman®
OverTime™ ATZ
OverTime ATZ Lite
Parallel™ Plus
Propel™ ATZ
Propel ATZ Lite
Ready Master® ATZ
Simazat™ 4L
Simazat 90DF
Sortie™ ATZ
Sortie ATZ Lite
Stalwart® Xtra
Steadfast® ATZ
Triangle®
Trizmet™ II
Volley® ATZ
Volley ATZ Lite
Watchman™
Watchman Lite™

Sources: National Pesticide Information Retrieval System, CDMS.net, product labels as of June 2010.

Go to AgSense.org today to support atrazine for tomorrow.

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Important: Always read and follow label instructions before buying or using Syngenta products. The instructions contain important conditions of sale, including limitations of warranty and remedy.

All products listed are Restricted Use Pesticides.

GS 400.82007

SCP 560-00250-A (6/10)

Testimony by:

Laura Olah, Executive Director
Citizens for Safe Water Around Badger (CSWAB)
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Prepared for:

Assembly
PUBLIC HEARING
Committee on Agriculture
Thursday, February 10, 2011
417 North (GAR Hall)
State Capital, Madison, Wisconsin:
10:00 a.m.

Concerning:

Clearinghouse Rule 10-110
Relating to pesticide product restrictions.

Good morning. Thank you for the opportunity to address the committee on this important environmental health issue.

I am here today as a rural resident of Sauk County and a representative of Citizens for Safe Water Around Badger. I attended the public hearing in my community and we submitted formal comments that were co-signed by 12 other organizations including Physicians for Social Responsibility Wisconsin, Midwest Environmental Advocates, and the John Muir Chapter of the Sierra Club.

I recognize that all of us here today share a concern about the presence of atrazine in our groundwater and drinking water. I also know that there has been and will continue to be significant debate and discussion about the toxicity of atrazine and whether or not it is a possible human carcinogen, but I think it's fair to say that it's something that you and I would rather not have in our water – especially the water that we give to our kids or, for some of us, our grandkids.

As adults, we all feel and share a responsibility to make sure that the next generation has a safe and healthy environment. But my emphasis on children is more than just being a responsible grownup – the special concern for children is based in science. Children and babies before they are born, are much more vulnerable to harm from exposure to environmental toxins. Children are more susceptible (than adults) because children eat more food, drink more water, and breathe more air in proportion to their body size. Their bodies are still developing and their behavior – like picking up and eating food that has fallen in the dirt – puts them at a higher risk for exposure.

According to the federal health agency ATSDR, atrazine may affect pregnant women by causing their babies to grow more slowly than normal. Birth defects and liver, kidney, and heart damage have been seen in animals exposed to high levels of atrazine. In pregnant animals, exposure to atrazine causes a decrease in fetal growth and birth defects. Exposure to high levels of atrazine during pregnancy caused reduced survival of fetuses; it is unclear whether or at what level of exposure this might occur in humans.

Unfortunately, the state's current approach to mitigating these health risk to infants and children consistently remands action only **after** an exposure to unsafe levels of atrazine in residential well water has occurred. For pregnant mothers and infants, even a short term exposure to high levels of atrazine at a critical time in prenatal and early childhood development, is a concern and places these women and children at risk.

The question is not the degree of risk but whether or not we have the capacity and ability to PREVENT these exposures and the associated risk to those most vulnerable.

We cannot escape the fact that even with adherence to recommended use rates, our groundwater and our drinking water wells are being contaminated. Families are being unknowingly exposed – often for months and even years. What other industry gets to break the rules again and again and again?

There are a lot of environmental exposures that we can't protect our children from. This isn't one of them.

For these reasons, I encourage you to support for the proposed expansion of atrazine restrictions in Sauk and Columbia counties. I also urge you to consider a statewide ban or other significant action to prevent further exposures and continued contamination of our state's groundwater resources.

Thank you.

Attached:

November 4, 2010 Public Comment on Proposed Expansion of Atrazine Restrictions co-signed by:

Laura Olah, Executive Director, Citizens for Safe Water Around Badger
Pam Kleiss, Executive Director, Physicians for Social Responsibility Wisconsin
Kimberlee Wright, Executive Director, Midwest Environmental Advocates
J. Gilbert Sanchez, Executive Director, Tribal Environmental Watch Alliance
Al Gedicks, Executive Secretary, Wisconsin Resources Protection Council
Hiroshi Kanno, President, Concerned Citizens of Newport
Judy Miner, Wisconsin Network for Peace and Justice
John E. Peck, Executive Director, Family Farm Defenders
Edie Ehlert, Coordinator, Crawford Stewardship Project
Don Timmerman and Roberta Thurstin Timmerman, Milwaukee, Wisconsin
Marcia Halligan, Kickapoo Peace Circle
Karen Etter Hale, Executive Secretary, Madison Audubon Society
Amie Mink, Board Member, Healthy Lawn Team
Eric Uram, Chair, John Muir Chapter of the Sierra Club *(added November 6)*

NOTATION: Please allow for sufficient public notice of hearings in the future. The one-day notice effectively prohibited many people who are directly affected by this issue from participating. They would have liked to have an opportunity to testify before the committee.

Rick Graham
Department of Agriculture, Trade and Consumer Protection
P.O. Box 8911
Madison, WI 53708-8911
Telephone 608.244 .4502
Email: rick.graham@wi.gov

SENT BY ELECTRONIC MAIL

RE: Public Comment on Proposed Expansion of Atrazine Restrictions

November 4, 2010

Dear Mr. Graham:

We are writing to express our strong support for the proposed expansion of atrazine restrictions in Sauk and Columbia counties. At the same time, while we are very supportive of the proposed actions, we believe that a statewide ban or other significant action is necessary to prevent further exposures and continued contamination of groundwater.

The current approach consistently remands action only after an exposure to unsafe levels of atrazine in residential well water has occurred. We are particularly concerned that this approach may not be protective of pregnant mothers and infants as even short term exposure to high levels of atrazine at a critical time in prenatal and early childhood development may cause significant harm.

According to the federal health agency ATSDR, atrazine may affect pregnant women by causing their babies to grow more slowly than normal. Birth defects and liver, kidney, and heart damage have been seen in animals exposed to high levels of atrazine. In pregnant animals, exposure to atrazine causes a decrease in fetal growth and birth defects. Exposure to high levels of atrazine during pregnancy caused reduced survival of fetuses. It is unclear whether or at what level of exposure this might occur in humans.

Atrazine is a selective herbicide for controlling grasses and broadleaf weeds and is estimated to be the most heavily used herbicide in the United States. Atrazine may be washed from sprayed fields or spill sites into streams and rivers and may migrate into wells used for drinking and bathing.

The use of atrazine, or any farm chemicals containing it, has already been banned in more than 1.2 million acres in Wisconsin. The Wisconsin Department of Agriculture, Trade, and

Consumer Protection (DATCP) has proposed expansion of atrazine restrictions for 1,430 acres in Sauk County near Prairie du Sac and 8,140 acres in the Columbia County towns of Marcellon and Wyocena.

The existing and proposed bans are in themselves evidence that atrazine represents a persistent and growing threat to public health and the environment. Moreover, continued monitoring, testing, and administration of areas outside these ban districts place an undue financial burden on public taxpayers in response to an identifiable non-public source of contamination. In addition to exposure and other hardships, affected families lose measurable property value if their well water is no longer potable.

Pursuant to state groundwater law, DATCP must regulate pesticide use as necessary to ***prevent*** groundwater contamination and restore groundwater quality. Current law prohibits the use of atrazine but only when contamination of groundwater has attained or exceeded state groundwater enforcement standards which contradicts the State's responsibility to protect public health, quality of life, and groundwater as a resource for safe and healthful drinking water. It is time for a new approach which ***prevents*** exposures to those most vulnerable to harm -- our children.

Thank you for the opportunity to comment.

Sincerely,

Laura Olah, Executive Director, Citizens for Safe Water Around Badger
Pam Kleiss, Executive Director, Physicians for Social Responsibility Wisconsin
Kimberlee Wright, Executive Director, Midwest Environmental Advocates
J. Gilbert Sanchez, Executive Director, Tribal Environmental Watch Alliance
Al Gedicks, Executive Secretary, Wisconsin Resources Protection Council
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Marcia Halligan, Kickapoo Peace Circle
Karen Etter Hale, Executive Secretary, Madison Audubon Society
Amie Mink, Board Member, Healthy Lawn Team
Eric Uram, Chair, John Muir Chapter of the Sierra Club *(added November 6)*

CC: State Senator Mark Miller
Dr. Henry A. Anderson, Wisconsin Division of Public Health

Department of Agriculture, Trade and Consumer Protection Testimony

Assembly Agriculture Committee
Relating to ATCP 30 (Pesticide Product Restrictions)
February 10, 2011

Chairman Nerison and Committee members, thank you for giving me the opportunity to provide testimony on ATCP 30 Pesticide Product Restrictions. My name is Lori Bowman and I am the Director of the Agrichemical Management Bureau, representing Secretary Brancel and the Department of Agriculture, Trade and Consumer Protection (DATCP). The Agrichemical Management Bureau is responsible for enforcing state and federal pesticide laws, including those relating to pesticide use. My comments are intended for information only.

Let me start by providing you with a brief summary of our groundwater protection program and atrazine regulations. DATCP's authority to regulate atrazine contamination in groundwater began in 1985 with the passage of chapter 160, Wisconsin Statutes, commonly referred to as the Groundwater Law. This law directs our department to take specific actions when a pesticide compound exceeds a groundwater enforcement standard. In the early 1990's, DNR established a groundwater enforcement standard of 3 parts per billion for atrazine plus its three breakdown products. Based on the widespread occurrence of atrazine in private wells and the fact that many of these wells had levels of atrazine above the enforcement standard, DATCP developed ATCP 30 to minimize further contamination.

ATCP 30 was developed with assistance of our former Atrazine Technical Advisory Committee which was made up of thirteen members who represent all interested parties. With input from this committee, DATCP developed a rule that uses a scientific approach to minimize groundwater impacts from atrazine use. Specifically, the rule limits the application rates for atrazine on a statewide basis and also establishes prohibition areas where atrazine use has already caused groundwater contamination above the enforcement standard.

The process of creating an atrazine prohibition area begins when the level of total atrazine in a private well exceeds the 3 parts per billion enforcement standard. The well is then resampled by DATCP to confirm the initial result. If the confirmatory sample is also above 3 parts per billion, we conduct an extensive investigation to determine the source of the atrazine in the well. As part of this investigation, well owners and nearby corn growers are interviewed about atrazine use and handling practices in the area. The investigation documents if atrazine was used in the area and attempts to identify other possible sources, such as spills or mishandling, that could be impacting the well. Samples are also collected from other nearby wells in an effort to determine the extent of the contamination.

If the investigation shows that the groundwater contamination is mainly due to legal use of atrazine in an area, a prohibition area is proposed. If the groundwater contamination is believed to be mainly from point sources such as a spill, a prohibition area is not proposed but actions to clean up the point source are taken. In the case of an isolated well exceeding the ES, a single well prohibition area is proposed. Based on a recommendation from the Wisconsin Geological and Natural History Survey, we include all land in a four square mile area (2,560 acres) around the impacted well in the prohibition area. If a cluster of wells exceeds the enforcement standard, a multiple well prohibition area is proposed.

Each year DATCP initiates the ATCP 30 rule making process in case a private well is found to be impacted by atrazine, but we only proceed through the entire rule making process if a well is found to exceed the enforcement standard. In the last five years we have expanded two prohibition areas and are now proposing one additional expansion and one new prohibition area.

Currently ATCP 30 contains 101 prohibition areas covering approximately 1.2 million of acres of land in the state.

The rule outlines a process for repealing existing atrazine prohibition areas. This process includes three conditions that were developed in consultation with the Atrazine Technical Advisory Committee.

The first repeal condition is that the atrazine level in the well that exceeded the enforcement standard declines to one half the level of the enforcement standard. As expected, this condition has been met in many of the prohibition areas where atrazine use has been discontinued.

Repeal condition two evaluates atrazine concentration of atrazine in other wells in the prohibition area and is only considered if conditions one and three are met.

The third condition of the repeal process is to scientifically determine that renewed use of atrazine in a prohibition area will not cause a renewed violation of the enforcement standard. To evaluate condition three, DATCP and the technical advisory committee designed the "Atrazine Reuse Study." DATCP conducted the study with the cooperation of agricultural producers at various locations in existing prohibition areas from 1998 to 2005 to assess the potential impact of atrazine reuse. The results of this study showed that renewed use of atrazine on test fields in prohibition areas caused concentrations in monitoring wells to exceed the enforcement standard. Following a review of the study, the Atrazine Technical Advisory Committee concluded in its March 2006 meeting by an 8-2 vote that condition three of the repeal process had not been met. The results of the reuse study were also presented to the DATCP Board and they supported the department's conclusion that the study did not support repealing any prohibition areas at that time. Any interested person can present information to the department to support the repeal of a prohibition area, but to date no information has been presented.

To summarize the current rule revision before you, the two prohibition areas are based on well and investigative results indicating that the use of atrazine has contaminated four drinking water wells in Sauk and Columbia Counties at levels above the enforcement standard. Both of these areas are immediately adjacent to existing prohibition areas.

Thank you for the opportunity to provide these comments.

ATRAZINE

EPA (Federal) rule	Surrounding States	Wisconsin Rule
2.5 Lb total for Pre and Post **2 Lb** for any single application HEL land with less than 30% cover 1.6 Lb per application but 2.5 Lb total allowed per year	SAME AS FEDERAL (MN has a **voluntary** BMP rate of .8 Lb per acre on sandy soils)	**1.5 Lb** per acre on med. and fine textured soils on first year corn **1 LB** per acre on sandy soils or on corn on corn
MCL (maximum contaminant level) of **3 ppb** for parent only	SAME AS FEDERAL.	**3 PPB** is the **enforcement standard** and it is for atrazine **and breakdown products**
(EPA has a new DWLOC [Drinking Water Level Of Comparison] that includes breakdown products, but it is set at **36 ppb.**)		
NO PROHIBITION AREAS	**NO PROHIBITION AREAS**	**102 PROHBITION AREAS**

Wisconsin Groundwater Quality

GRICULTURAL CHEMICALS IN WISCONSIN GROUNDWATE

April 2008

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ARM Pub 180.qxd 04/08

AGRICULTURAL CHEMICALS IN WISCONSIN GROUNDWATER

FINAL REPORT
MARCH 2008

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A Cooperative Project of the:

Wisconsin Department of Agriculture, Trade and Consumer Protection
Rod Nilsestuen, Secretary

United States Department of Agriculture,
National Agricultural Statistics Service
Wisconsin Field Office
Robert J. Battaglia, Director

Department of Health and Family Services
Bureau of Environmental and Occupational Health
Charles Warzecha, Director

This report is the result of a cooperative effort between three units of Wisconsin government. The Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) was responsible for overall project management and laboratory analysis. The Bureau of Environmental & Occupational Health of the Wisconsin Department of Health and Family Services provided funding and supplemental water testing kits and will analyze information on water use by rural households. The Wisconsin Field Office of the National Agricultural Statistics Service developed survey procedures, collected water use data, and summarized lab results.

DATCP administers many water quality and agricultural chemical programs that are designed to protect Wisconsin's groundwater. This survey provides factual information on the chemical compounds found in water used by Wisconsin residents with private wells.

Special thanks to the residents who participated in the survey and the enumerators who collected the water samples and administered the questionnaires.

Rod Nilsestuen   Robert J. Battaglia   Charles Warzecha

ABSTRACT

Between January 2007 and June 2007, three hundred and ninety-eight private drinking water wells were sampled as part of a statewide survey of agricultural chemicals in Wisconsin groundwater. The purpose of the survey was to obtain a current picture of agricultural chemicals in groundwater and to compare the levels in the 2007 survey with levels found in earlier surveys conducted in 1994, 1996 and 2001. Wells were selected using a stratified random sampling procedure and were used to represent Wisconsin groundwater accessible by private wells. Samples were analyzed for 32 compounds including herbicides, herbicide metabolites, one insecticide, and nitrate-nitrogen.

Based on statistical analysis of the sample results, it was estimated that the proportion of wells in Wisconsin that contained a detectable level of a pesticide or pesticide metabolite was 33.5%. Areas of the state with a higher intensity of agriculture generally had higher frequencies of detections of pesticides and nitrate-nitrogen. The two most commonly detected pesticide compounds were the herbicide metabolites alachlor ESA and metolachlor ESA which each had a proportion estimate of 21.6 %.

The statewide estimate of the proportion of wells that contained atrazine total chlorinated residues (TCR) was 11.7%. The estimate of the proportion of wells that exceeded the 3 µg/l enforcement standard for TCR was 0.4%. Estimates of the mean detect concentrations for pesticides were generally less than 1.0 µg/l. The estimate of the proportion of wells that exceeded the 10 mg/l enforcement standard for nitrate-nitrogen was 9.0%.

Time trend analysis was performed to determine whether the proportion estimates for atrazine, TCR, nitrate-nitrogen, alachlor ESA and metolachlor ESA in private wells had changed between the 2001 survey and the 2007 survey. The results of this analysis did not show any statistically significant changes for these compounds over this time period.

Introduction

The Wisconsin Department of Agriculture, Trade and Consumer Protection conducted the Atrazine Rule Evaluation Survey in 1994 (Phase 1) and 1996 (Phase 2) (LeMasters and Baldock, 1997). These two surveys were an important part of the Department's evaluation of its regulations on the use of the herbicide atrazine. In 2000-2001, a third statewide survey was conducted to provide an update on agricultural chemicals in groundwater and to compare findings with the earlier surveys (Wisconsin Department of Agriculture, Trade and Consumer Protection, 2002).

The 2007 survey was a joint project between the Wisconsin Department of Agriculture, Trade and Consumer Protection, the National Agricultural Statistics Service (NASS) and the Department of Health and Family Services (DHFS). The specific objectives of the 2007 survey were 1) to establish the frequencies of detection and concentrations for agricultural chemicals (pesticides and nitrate-nitrogen) in rural drinking water wells in Wisconsin and 2) to determine if there have been measurable changes in pesticide compounds and nitrate-nitrogen levels in Wisconsin groundwater over time.

Each well sample was analyzed for 32 compounds including 17 pesticide parent compounds, 14 pesticide metabolites and nitrate-nitrogen. This is an expanded list compared to the 17 analytes included in the previous surveys. Of the 17 pesticide parent compounds, 16 are herbicides and one (chlorpyrifos) is an insecticide. These are the active ingredients in many commonly-used agricultural pesticide products in Wisconsin. All the metabolites are herbicide metabolites. These are related chemical compounds that are formed when the parent herbicide compounds break down in the soil and groundwater. Health standards have been established for 11 of the parent compounds and four of the metabolites.

The purpose of this report is to provide the results of the 2007 survey and to compare these results to earlier surveys. All four surveys were designed to allow for statistical comparisons.

Materials and Methods

Survey Design

The desired target population for the 1994, 1996, 2001, and 2007 surveys was Wisconsin groundwater. However, obtaining a representative sample of all Wisconsin groundwater is not easy due to its large three-dimensional extent across the state. In order to sample groundwater in an efficient manner, existing private drinking water wells were used. The actual target population for the four surveys can be best described as groundwater accessible by private wells.

Each survey used a 50 percent sample rotation scheme in which approximately half of the wells in the 1996, 2001, and 2007 surveys had been part of the previous survey and approximately half were newly selected. Wells that were tested for the first time in the 2001 survey were tested again in the 2007 survey. Wells that had been in both the 1996 and 2001 surveys were rotated out of the 2007 survey and a sample of new wells was selected. This rotation allowed for the potential to identify new areas of agricultural chemical detections within the state and for the use of statistical tests that can detect changes in pesticide levels over time.

The 2007 survey, along with the previous three surveys, used a stratified, random sampling procedure to allocate (select) samples throughout the state. The sample allocation procedure used in 2007 for the newly-selected wells utilized NASS land use strata, which are based on how intensively land in Wisconsin is cultivated for agricultural production. Each NASS stratum includes land areas falling into a specific range of intensity of cultivation. The land within each stratum is divided into "area segments" that are typically one square mile in size.

Since no comprehensive list of private wells exists, samples were allocated by randomly selecting a predetermined number of area segments within each agricultural stratum. Strata for entirely urban, non-agricultural, and water-covered areas were excluded from sampling. Since area segment boundaries are typically roads, office staff chose a starting corner in each segment and the groundwater samplers were instructed to travel clockwise within the segment until they found a well owner willing to participate in the survey. In a few sparsely-populated segments, the samplers had to contact a well owner in an adjoining segment in order to collect a sample.

All previous surveys also used a stratified, random sampling procedure to allocate samples, but the strata in these earlier surveys were the nine NASS Agricultural Statistics Districts, which are groups of adjoining counties. The number of samples collected in each of the nine districts was based on the number of acres in farms in each district. Samples were allocated by selecting a random sample list of civil sections in each district (excluding those covered by water or publicly owned). In each civil section, a random 10-acre parcel was selected and the well nearest its center was identified to represent the groundwater of the civil section.

The 2007 stratification method offered several benefits over the previously used method. First, samples were allocated proportional to agricultural intensity throughout the state. Second, the new method allowed for comparisons of water quality to agricultural intensity in addition to location within the state.

In order to compare the frequencies of detections of agricultural chemicals over time, GIS software was used to restratify the results of the 2001 survey into the NASS strata. This re-stratification allowed the 2001 survey data to be appropriately weighted so that the 2001 data could be compared to the 2007 data.

Sample Collection and Analysis

For the 2007 well water survey, 398 samples were collected from private drinking wells throughout Wisconsin. Figure 1 shows the location of the NASS strata (land use categories) used in the 2007 survey, the wells sampled in 2007, and the boundaries of the nine NASS Agricultural Statistics Districts, which were the strata in the previous three statewide surveys.

One hundred eighty-eight water samples were collected from wells that were first tested in the 2001 survey. Water samples were only obtained from wells that had not had any structural changes since the last survey. This was to ensure that water samples were collected from the same location in the aquifer as the previous survey in order to make comparisons valid.

Two hundred ten water samples were taken from newly-selected wells that replaced those rotated out of the 2001 survey. Once a new well was selected, the samplers interviewed the owner to obtain well information and inspected the plumbing system to determine if there was a water treatment device. Samples were only collected if untreated raw water could be obtained. If a groundwater sampler was not able to get an untreated sample from a well, another well was selected using the process described above.

Samples were collected through a cold water supply after running the water for approximately five minutes. Four one-liter amber glass bottles with Teflon-lined caps were filled at each site and promptly placed in an insulated box with ice. Sample collection records were completed and bottles were sealed to maintain sample integrity through delivery to the DATCP laboratory.

Each water sample was analyzed for the following compounds at the DATCP laboratory:

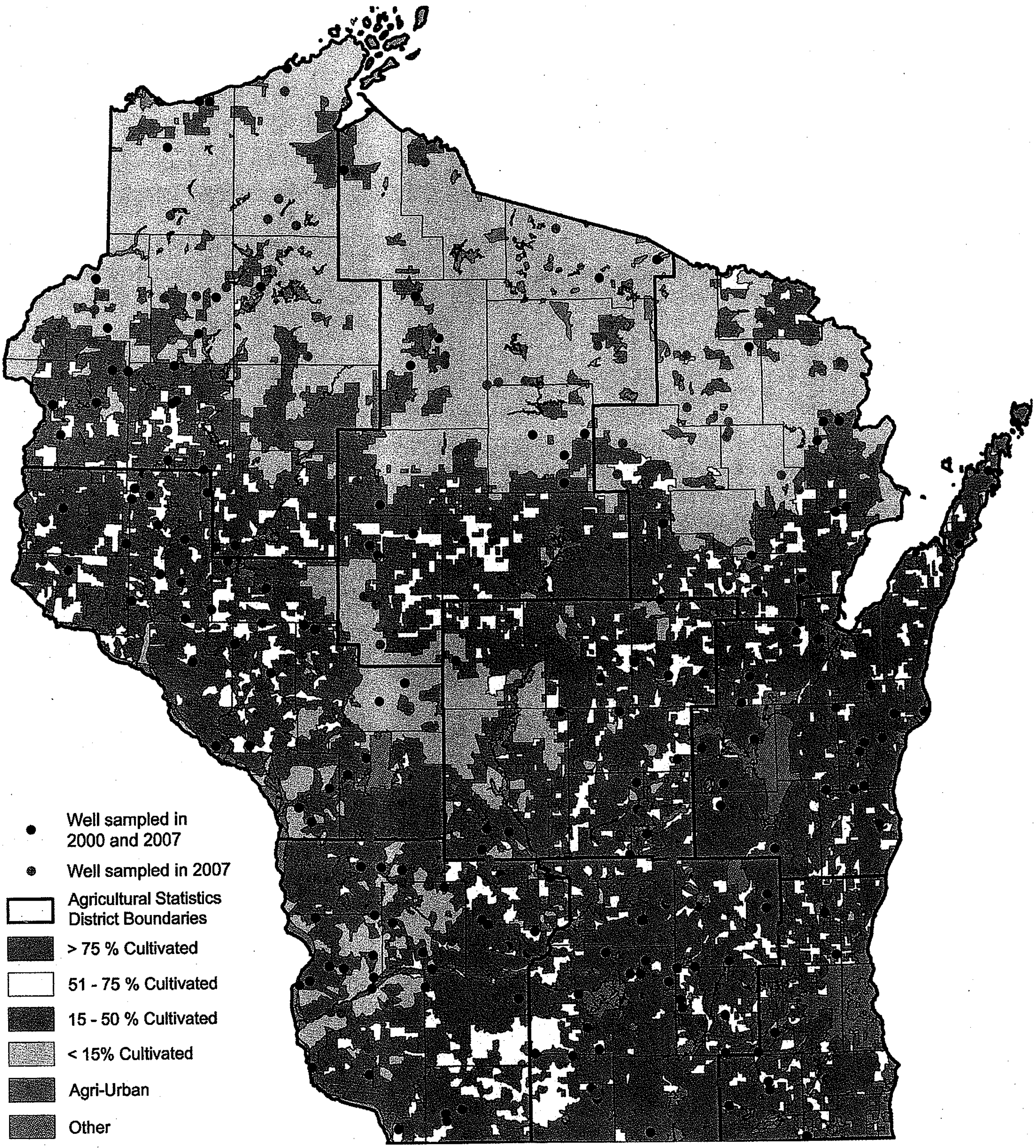
- Atrazine and its metabolites deethyl atrazine, deisopropyl atrazine and diamino atrazine (the sum of these four compounds is referred to as total chlorinated residues of atrazine or TCR)
- Alachlor, metolachlor and acetochlor and their ESA and OA metabolites
- Cyanazine
- Metribuzin
- Simazine
- Nitrate-nitrogen
- Glyphosate* and its AMPA metabolite*
- Mesotrione/mesotrione MNBA* and mesotrione AMBA*
- Dimethenamid* and its ESA* and OA* metabolites
- Prometone*
- EPTC*
- Pendimethalin*
- Chlorpyrifos*
- Bentazon*
- Clopyralid*
- 2,4-D*
- Dicamba*

* new analytes in 2007 not included in previous surveys (15 total)

For each analyte a limit of detection (LOD) and a limit of quantitation (LOQ) were established. Results below the LOD were considered to be non-detects. Results above the LOQ were quantified and presented as numerical values. Results between the LOD and LOQ were considered to be detects but were not quantified or presented as numerical values.

FIGURE 1

SAMPLING LOCATIONS AND LAND USE CATEGORIES FOR THE 2007 SURVEY.



Results of the 2007 Survey

Pesticide and Nitrate-Nitrogen Detections

Table 1 shows the results of the 2007 survey. One hundred fifty-eight of the 398 samples contained a detectable concentration of one or more pesticides or pesticide metabolites. The most commonly detected herbicide compounds were alachlor ESA (100 detects), metolachlor ESA (106 detects), and atrazine total chlorinated residues or TCR (55 detects). Figures 2-4 show the geographic distribution of the results for these three parameters.

Two of the 55 samples that contained detectable residues of TCR exceeded the Wisconsin groundwater enforcement standard of 3 micrograms per liter (µg/l) (parts per billion). No samples exceeded the alachlor ESA enforcement standard of 20 ug/l. A standard has not been established for metolachlor ESA.

Nitrate-nitrogen was detected in 234 of the 398 samples at concentrations ranging from 0.52 milligrams per liter (mg/l) (parts per million) to 81.1 mg/l. Forty-seven of the samples exceeded the nitrate-nitrogen enforcement standard of 10 mg/l. Figure 5 is a map showing the geographic distribution of the nitrate-nitrogen results.

TABLE 1

RESULTS OF THE 2007 SURVEY.

Compound	Number of detects	Limit of detection* (µg/l)	Limit of quantitation* (µg/l)	Groundwater enforcement standard (µg/l)	Groundwater samples over standard	Concentration range** (µg/l)
atrazine	22	0.046	0.15			0.15 - 1.04
deethyl atrazine	40	0.058	0.3			0.31 - 2.08
deisopropyl atrazine	9	0.07	0.3			0.33 - 0.51
diamino atrazine	28	0.12	0.5			0.53 - 1.39
TCR	55	#	#	3	2	0.16 - 3.66
alachlor	1	0.082	0.3	2		0.36
alachlor ESA	100	0.044	0.14	20		0.14 - 8.35
alachlor OA	13	0.034	0.11			0.15 - 1.33
metolachlor	0	0.067	0.25	15		
metolachlor ESA	106	0.045	0.14			0.14 - 6.54
metolachlor OA	18	0.057	0.18			0.30 - 1.37
acetochlor	0	0.03	0.1			
acetochlor ESA	16	0.064	0.2			0.23 - 2.32
acetochlor OA	3	0.038	0.12			4.36
metribuzin	0	0.03	0.1	250		
simazine	0	0.038	0.15	4		
mesotrione and MNBA	0	0.016	0.052	3		
mesotrione AMBA	0	0.018	0.06			
glyphosate	0	0.65	2.2			
glyphosate AMPA	0	0.022	0.072			
bentazon	2	0.057	0.18	300		0.18
chlorpyrifos	0	0.054	0.2			
clopyralid	1	0.4	1.3			
cyanazine	0	0.18	0.6	1		
dicamba	0	0.12	0.41	300		
dimethenamid	0	0.022	0.1			
dimethenamid ESA	1	0.057	0.19			0.205
dimethenamid OA	0	0.05	0.17			
EPTC	0	0.22	0.75	250		
pendimethalin	0	0.039	0.15			
prometone	0	0.027	0.1	90		
2,4-D	2	0.13	0.43	70		4.95
nitrate-nitrogen***	234	0.5	0.5	10	47	0.52 - 81.1

* LODs and LOQs are empirically derived statistical parameters. The LODs and LOQs noted are the lowest derived value for each target compound. Due to nominal differences in instrument sensitivity and sample size, a small number of samples have LOD and LOQ values slightly above those noted.

** quantifiable concentration

TCR is the sum of four analytes and does not have a LOD or LOQ

*** nitrate-nitrogen values are in mg/l

FIGURE 2

ALACHLOR ESA AND ALACHLOR OA RESULTS FROM THE 2007 SURVEY.

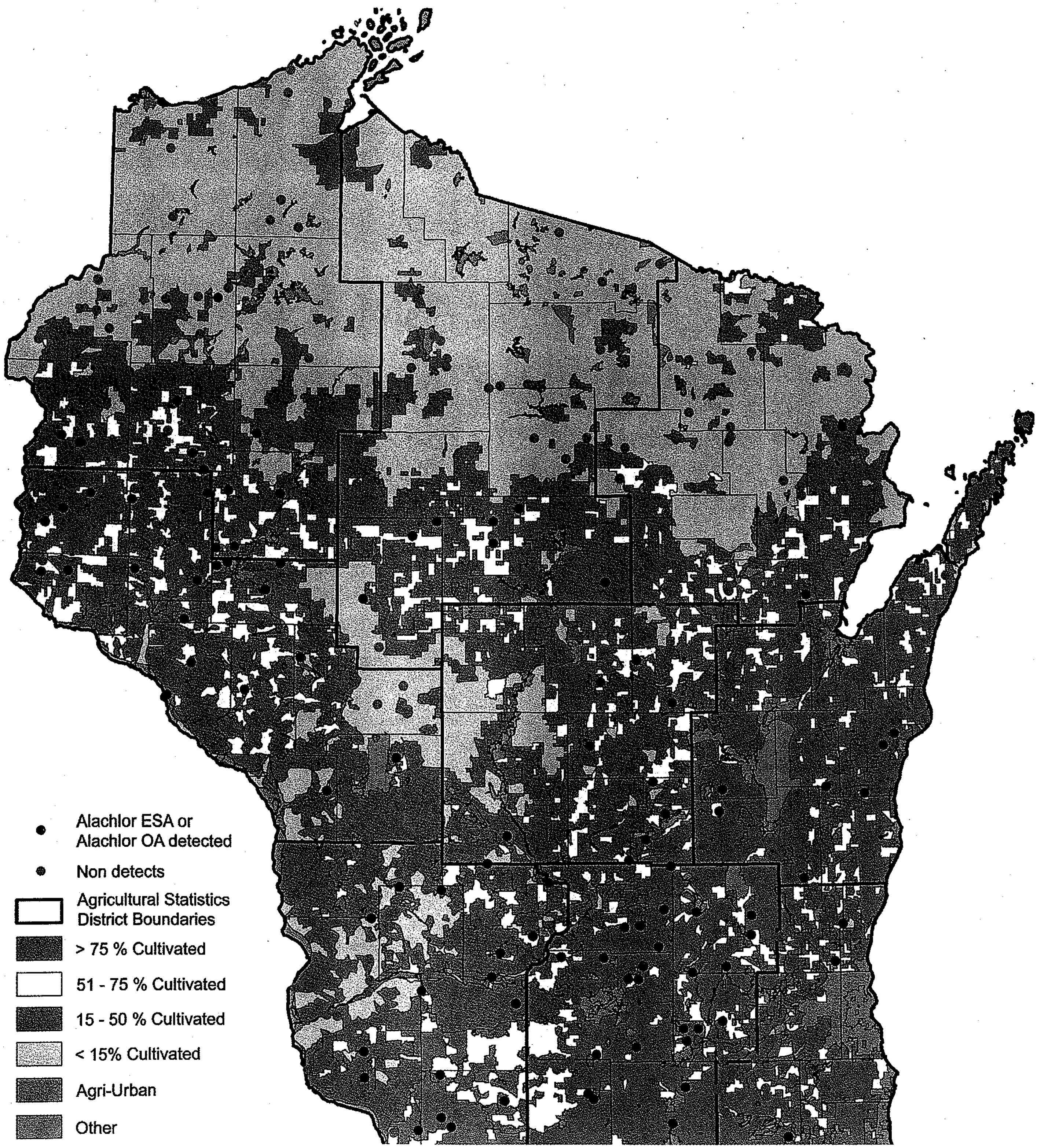


FIGURE 3

METOLACHLOR ESA AND METOLACHLOR OA RESULTS FROM THE 2007 SURVEY.

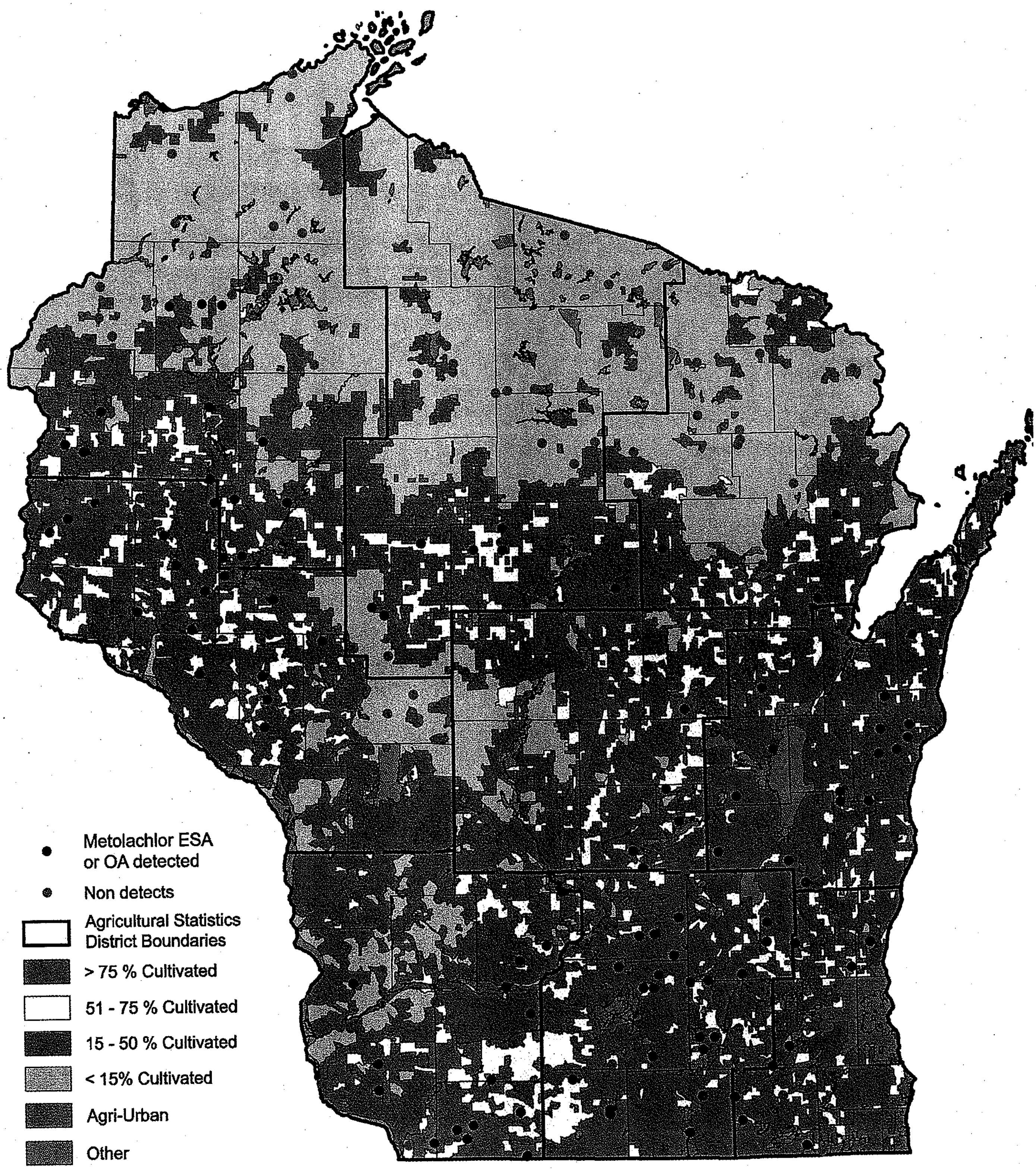


FIGURE 4

ATRAZINE TCR RESULTS FROM THE 2007 SURVEY.

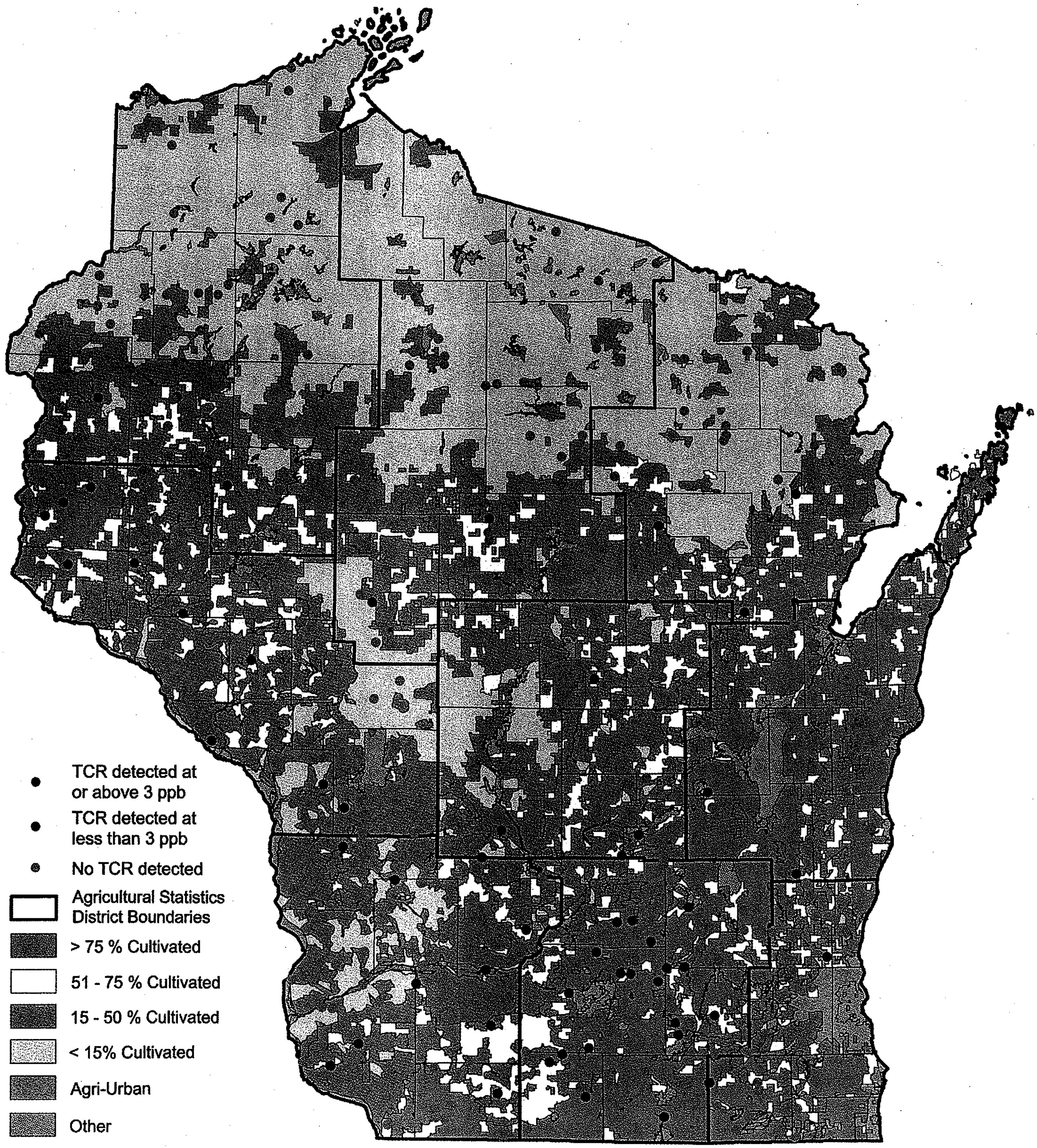
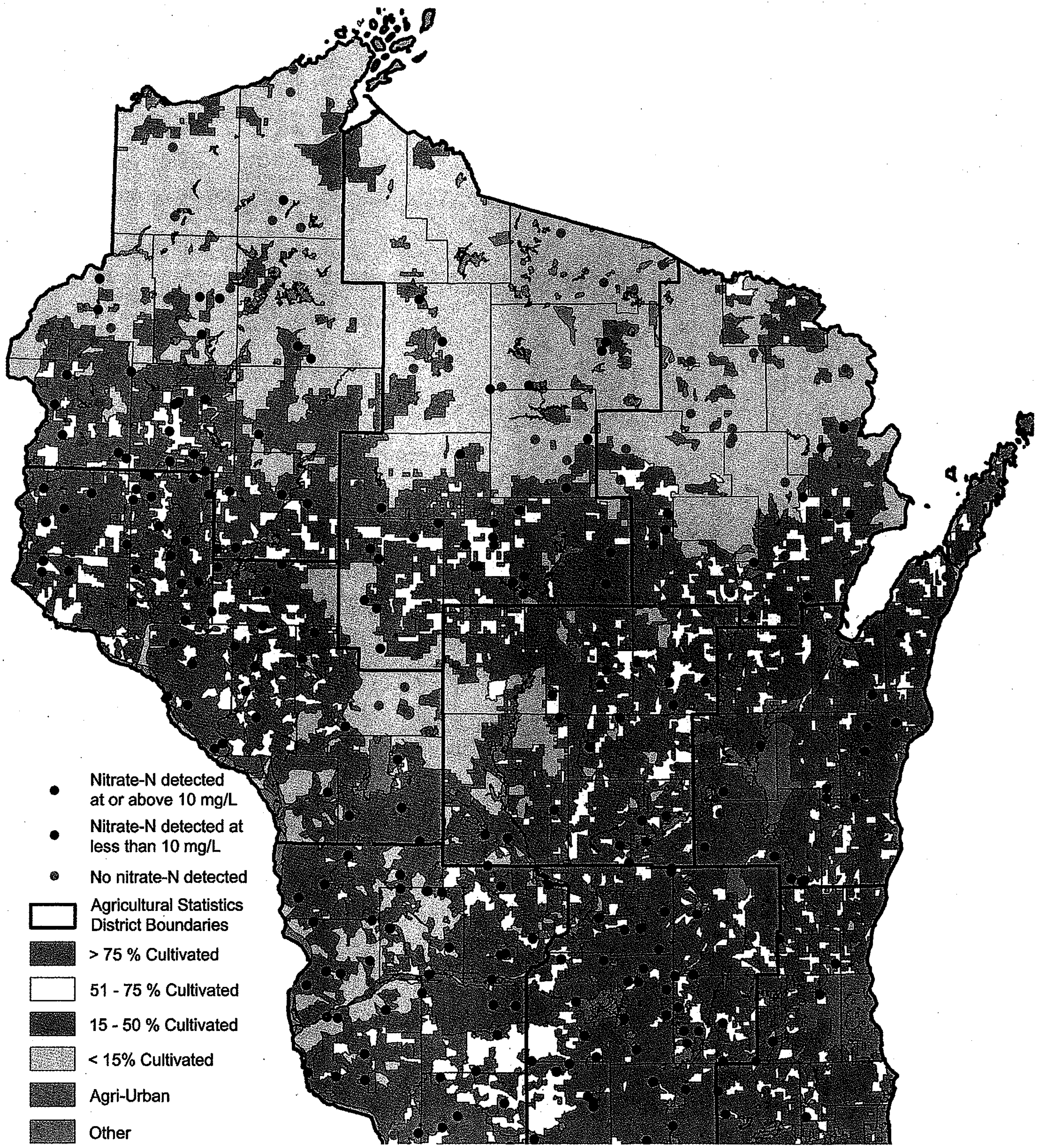


FIGURE 5

NITRATE-NITROGEN RESULTS FROM THE 2007 SURVEY.



Detection Frequencies in the Strata

Table 2a shows the number of detects and Table 2b shows the percentage of detects in the NASS strata for the most commonly detected compounds in the 2007 survey. Table 2c shows the number of detects in the NASS Agricultural Statistics Districts which were the strata for the three previous statewide surveys. In each table, the number of samples per stratum varies because of the stratified sampling design.

Table 2A

Number of Detects* by NASS Strata and Parameter in the 2007 Survey.

NASS Strata	Strata Description	Number of Samples	Number of Detects					
			Atrazine	TCR	Alachlor ESA	Metolachlor ESA	Nitrate-N	Nitrate-N>10 mg/l
11	>75% Cultivated	134	7	23	48	62	84	28
12	51-75% Cultivated	50	1	10	14	11	30	5
20	15-50% Cultivated	150	11	19	30	27	91	13
40	<15% Cultivated	59	3	3	7	6	28	1
31	Agri-Urban	5	0	0	1	0	1	0
Total		**398**	**22**	**55**	**100**	**106**	**234**	**47**

* quantifiable and non-quantifiable detects

Table 2B

Percentage of Detects* by NASS Strata** and Parameter in the 2007 Survey.

NASS Strata	Strata Description	Number of Samples	Percentage of Detects					
			Atrazine	TCR	Alachlor ESA	Metolachlor ESA	Nitrate-N	Nitrate-N>10 mg/l
11	>75% Cultivated	134	5.2	17	36	46	63	21
12	51-75% Cultivated	50	2.0	20	28	22	60	10
20	15-50% Cultivated	150	7.3	13	20	18	61	8.6
40	<15% Cultivated	59	5.1	5.1	12	10	47	1.7

* quantifiable and non-quantifiable detects
** the percentages for the Agri-Urban stratum are not included because of the small number of samples

TABLE 2C

NUMBER OF DETECTS*
BY NASS AGRICULTURAL STATISTICS DISTRICT AND PARAMETER IN THE 2007 SURVEY.

NASS District	Number of Samples	Number of Detects					
		Atrazine	TCR	Alachlor ESA	Metolachlor ESA	Nitrate-N	Nitrate-N >10 mg/l
NW	50	1	3	11	13	27	0
NC	46	2	2	7	7	29	6
NE	32	0	3	2	3	11	1
WC	61	7	10	20	16	46	7
CE	33	3	5	10	6	19	7
EC	48	0	2	7	16	15	6
SW	55	5	9	15	15	40	3
SC	50	4	19	25	23	40	16
SE	23	0	2	3	7	7	1
Total	**398**	**22**	**55**	**100**	**106**	**234**	**47**

* quantifiable and non-quantifiable detects

Table 2b shows that in 2007 there was generally a pattern of higher frequencies of detections in strata with higher percentages of cultivated land. Alachlor ESA and metolachlor ESA, for example, were detected in 36% and 46% of the wells, respectively, in stratum 11 which has greater than 75% cultivated land. Only 12% and 10% of wells in stratum 40 (less than 15% cultivated land) contained these two compounds. Twenty-one percent of wells in stratum 11 exceeded the 10 mg/l health standard for nitrate-nitrogen, whereas 1.7% of the wells exceeded this standard in strata 40. Table 2c shows that, as in the 2001 survey, the South Central NASS Agricultural Statistics District (Columbia, Dodge, Dane, Jefferson, Green, and Rock Counties) had the highest number of detects for most compounds.

Statewide Statistical Estimates of the Proportion of Detections

Using the results from each stratum and the methods described by Cochran (1977) and Thomson (1992), statewide estimates of the proportions of detections were calculated for eleven parameters. These estimates apply to rural Wisconsin groundwater accessible by private wells. Table 3 shows these estimates and their 95% confidence intervals. (The proportion estimates in Table 3 include the non-quantifiable detects between the LOD and LOQ.) Similar to the 2001 survey, alachlor ESA and metolachlor ESA had the highest proportion estimates for pesticide compounds. The estimate of the proportion of wells that exceeded the 10 mg/l health standard for nitrate-nitrogen is 9.0%

Table 3

Statewide Estimates of the Proportion of Detections and 95% Confidence Intervals for Eleven Parameters in the 2007 Survey.

Parameter	Statewide number of detects*	Statewide estimate of the proportion of detects (%)	95% Confidence Interval (%)
any pesticide or metabolite	158	33.5	28.6 - 38.3
TCR	55	11.7	8.5 - 14.8
TCR>3.0 µg/l	2	0.4	**
atrazine	22	5.4	2.9 - 8.0
alachlor ESA***	100	21.6	17.2 - 26.0
alachlor OA	13	2.4	1.0 - 3.9
acetochlor ESA	16	3.1	1.4 - 4.8
metolachlor ESA	106	21.6	17.7 - 25.6
metolachlor OA	18	3.6	1.8 - 5.4
nitrate-nitrogen	234	56.0	50.3 - 61.5
nitrate-nitrogen>10 mg/l	47	9.0	6.5 - 11.6

* quantifiable and non-quantifiable detects
** not enough data points to calculate a confidence interval
*** there were no detections of alachlor ESA over the 20 µg/l groundwater enforcement standard

Concentrations

We also estimated average concentrations for nine parameters. These estimates are based on detectable levels of these parameters. Non-quantifiable detects (detects between the LOD and LOQ) were assigned a value of LOQ/square root of 2 (Helsel, 2005). If wells without detections had been included, the statewide average concentration estimates would be different. Table 4 shows these estimates and their 95% confidence intervals. The estimates of mean detect concentrations for pesticides ranged from 0.20 µg/l for metolachlor OA to 1.00 µg/l for alachlor ESA.

Table 4

Estimates of the Mean Concentration of Detects and 95% Confidence Intervals for Nine Parameters in the 2007 Survey.

Parameter	Statewide number of detects	Statewide estimate of the mean detect concentration (µg/l)	95% confidence interval (µg/l)	Enforcement Standard (µg/l)
TCR	55	0.67	0.12 -1.21	3
atrazine	22	0.22	0.13 - 0.32	
alachlor ESA	100	1.00	0.53 - 1.48	20
alachlor OA	13	0.30	0.00 - 0.87	
acetochlor ESA	16	0.74	0.55 - 0.93	
acetochlor OA	3	0.57	0.00 - 10.45	
metolachlor ESA	106	0.47	0.29 - 0.65	
metolachlor OA	18	0.20	0.00 - 0.50	
nitrate-nitrogen*	234	5.64	4.83 - 6.46	10

*nitrate-nitrogen values are in mg/l

Results for the Expanded List of Analytes in 2007

Fifteen additional analytes were included in 2007 compared to previous surveys. These additional analytes (see Materials and Methods section) were included in 2007 because of increased use of the parent compounds in Wisconsin, new information suggesting potential leaching potential, or improved laboratory capability to analyze for these compounds.

Of these 15 analytes, only four were detected in the 398 wells included in the 2007 survey. Table 5 shows the results for these four compounds. Based on the small number and low concentrations of detects and the considerable increase in laboratory costs, it is unlikely that these 15 compounds will routinely be included in future surveys.

Table 5

Results for the Expanded List of Analytes in the 2007 Survey.

Compound	Number of Detects	Concentrations (μg/l)
2,4-D	2	non-quantifiable, 4.95
bentazon	2	non-quantifiable, 0.18
clopyralid	1	non-quantifiable
dimethanamid ESA	1	0.205

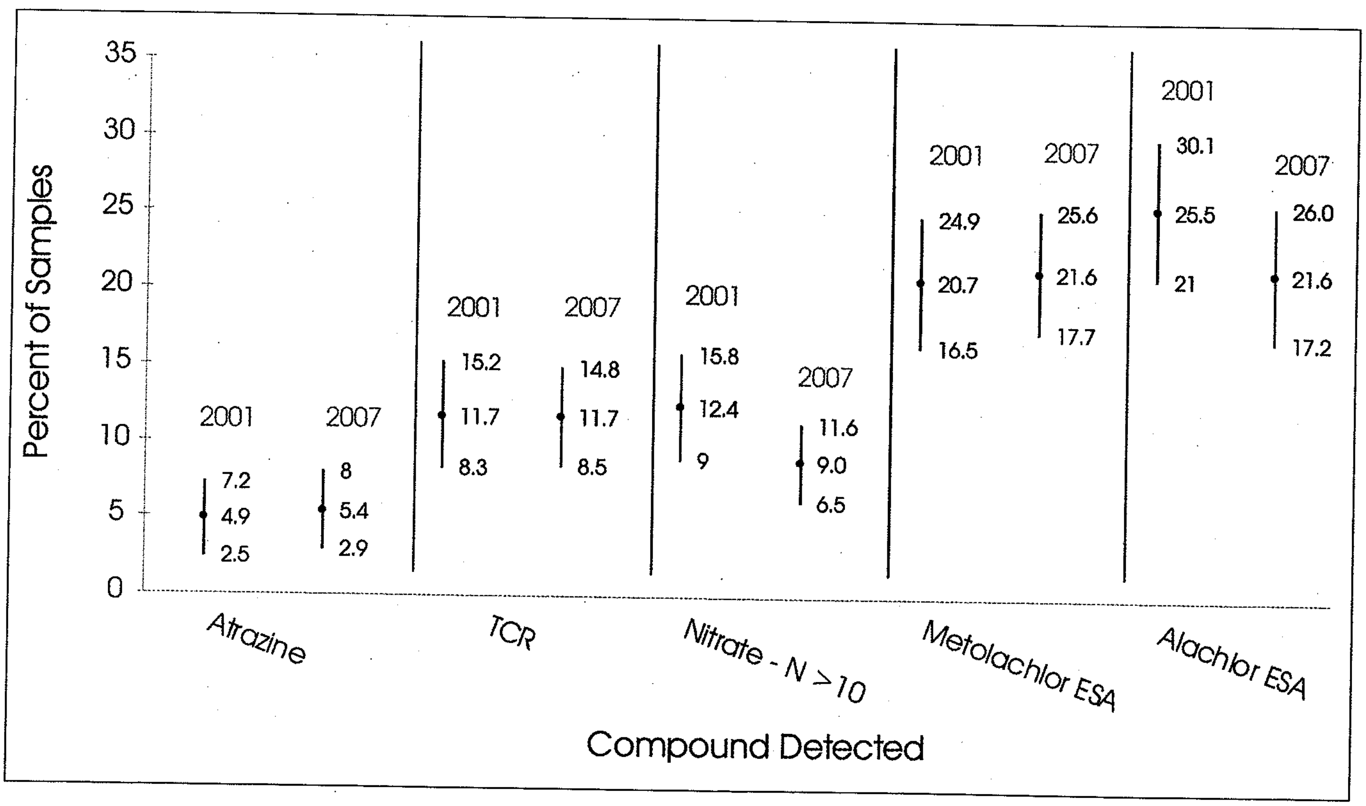
Comparing Results between Surveys

The estimates of the proportion of detects and the respective 95% confidence intervals for atrazine, TCR, and nitrate-nitrogen over 10 mg/l, metolachlor ESA, and alachlor ESA were compared to see if there were any statistically significant changes between 2001 and 2007. The results from 2001 and 2007 were chosen to allow for time trend analysis for alachlor ESA and metolachlor ESA (comparable lab methods for these compounds did not exist in 1994 and 1996).

Figure 6 shows that there were no statistically significant changes (all confidence intervals overlap) for the proportion of wells containing these five parameters. Previous analysis showed that the proportion of wells with a detection of parent atrazine had a statistically significant decline between 1994 and 2001 (WDATCP, 2002).

Figure 6

Comparison of proportion estimates and 95% Confidence Intervals for 2001 and 2007.



Relationship between Well Characteristics and Frequencies of Detection for Selected Compounds

As part of the 2007 survey, each participating household was asked to provide information about their well and various aspects of their use of the water supplied by the well on a questionnaire developed by DHFS and NASS. The purpose of the information generated by these questions was to estimate the potential exposure of well users to agricultural chemicals in well water. The findings from these questions will be presented in a separate report by DHFS.

As part of the questionnaire, DATCP included two questions on well age and well depth.

For well age, each respondent was asked if the well was under six years old, six to 20 years old, or over 20 years old. For well depth, respondents were asked if the well was less than 50 feet deep, 50-150 feet deep, or over 150 feet deep. This information was used to evaluate the relationships between well characteristics (age and depth) and detection frequencies for selected agricultural chemicals. Not all respondents were able to provide the age and depth of their well and those who did generally answered based on their memory.

Table 6a shows the percentage of detections by well age. The majority of wells in the survey fell in the greater than 20 year old range. Noticeable trends are higher percentages of detections of alachlor ESA and nitrate-nitrogen with increasing well age. The older wells also had a higher percentage of nitrate-nitrogen over the 10 mg/l health standard.

Table 6b shows the percentage of detections by well depth. The majority of wells in the survey were in the 50-150 feet depth range. The shallower wells had a higher percentage of detections of nitrate-nitrogen and a higher percentage of wells with nitrate-nitrogen over the 10 mg/l health standard.

Table 6A

Percentage of Detection for Selected Compounds, by Well Age.

Well Age	Number of Samples*	Percentage of Detects					
		Atrazine	TCR	Alachlor ESA	Metolachlor ESA	Nitrate-N	Nitrate-N>10 mg/l
<6	31	6	16	19	29	42	6
6-20	87	7	17	20	21	48	9
>20	222	5	11	28	28	64	11

* 340 respondents knew the age of their well

Table 6B

Percentage of Detection for Selected Compounds, by Well Depth.

Well Depth	Number of Samples*	Percentage of Detects					
		Atrazine	TCR	Alachlor ESA	Metolachlor ESA	Nitrate-N	Nitrate-N>10 mg/l
<50	42	10	17	24	26	71	24
50-150	149	3	11	30	31	64	8
>150	89	8	24	22	17	44	7

* 280 respondents knew the depth of their well

Summary

- The statewide estimates of the proportion of wells containing atrazine, atrazine TCR, nitrate-nitrogen over 10 mg/l, metolachlor ESA and alachlor ESA did not show statistically-significant changes between 2001 and 2007.
- The estimate for the proportion of wells that exceeded the 10 mg/l enforcement standard for nitrate-nitrogen was 9.0%.
- The statewide estimate of the proportion of wells that contained a detectable level of a pesticide or pesticide metabolite was 33.5%.
- Alachlor ESA and metolachlor ESA were the most commonly detected herbicide compounds with identical proportion estimates of 21.6%.
- The statewide estimate of the proportion of wells that contained atrazine TCR was 11.7%.
- The estimate for the proportion of wells that exceeded the 3 ug/l enforcement standard for atrazine TCR was 0.4%.

LITERATURE CITED

Cochran, William G. 1977. Sampling Techniques. 3rd ed. John Wiley and Sons, Inc. New York 428 p.

Helsel, D., 2005. Non detects and Data Analysis: Statistics for Censored Environmental Data. John Wiley, New York.

LeMasters, Gary and Jon Baldock. 1997. A Survey of Atrazine in Wisconsin Groundwater. Wisconsin Department of Agriculture, Trade and Consumer Protection-Agricultural Resource Management Division publication 26a. Madison, Wisconsin.

Thomson, Steven K. 1992. Sampling. John Wiley and Sons, Inc. New York 343 p.

Wisconsin Department of Agriculture, Trade and Consumer Protection. 2002. Groundwater Quality: Agricultural Chemicals in Wisconsin Groundwater. Agricultural Resource Management publication 98.