

# Atrazine Summary Information

## Classification and Sites of Application in Minnesota

Atrazine is classified by the U.S. Environmental Protection Agency as a Restricted Use Pesticide. This means that anyone selling or using a pesticide product containing atrazine is required by law to be licensed (commercial or non-commercial applicators) or certified (private applicators). Licensure and certification are obtained through applicator training programs administered by the Minnesota Department of Agriculture. Almost all atrazine used in Minnesota is for the production of field corn.

Atrazine was first registered in the U.S. in 1958. In Minnesota, the MDA registers pesticides based primarily on EPA registration. Since the mid 1980s atrazine has been identified by the MDA, EPA and others as a common contaminant in groundwater. Since 1990 the registrant and EPA have changed label restrictions on the use of atrazine several times, including lowering the approved rates of use. Pesticides, including atrazine, have been hypothesized by some researchers as a possible source of deformities in frogs. Other potential sources of deformities in frogs have also been hypothesized.

## Sales & Use

The graph in Attachment A shows total corn herbicide use in Minnesota, along with atrazine use and sales for currently available reporting years.

Atrazine use rates in Minnesota can be compared to Agricultural Statistics Service data collected for other states in the region, as the graph in Attachment A illustrates.

The vast majority of atrazine used in Minnesota is used in combination with other herbicides in various mixtures. Pre-packaged mixtures of two or more herbicides are often called “pre-mixes.” Unique mixtures can also be created by custom blending pure atrazine with other herbicides to create “tank mixes.” Pre-mixes and tank mixes allow for a broad spectrum of weed control, since many individual herbicide active ingredients may not control all weeds.

	Effective Atrazine Rate on coarse-textured soils		
	any coarse-textured soil	Soils with <3% organic matter	Soils with >3% organic matter
	(lb a.i./A)	(lb a.i./A)	(lb a.i./A)
<b>The top 7 products sold (brand - registrant) in Minnesota that contain atrazine, in order of high to low sales in 2002:</b>			
HARNESS XTRA HERBICIDE - Monsanto pre-mix	<b>0.765</b>	na	na
HARNESS XTRA 5.6L HERBICIDE - Monsanto pre-mix	na	<b>0.875</b>	<b>1.06</b>
DEGREE XTRA HERBICIDE - Monsanto pre-mix	<b>0.97</b>	na	na
FIELDMASTER HERBICIDE - Monsanto pre-mix	<b>1.3</b>	na	na
AGRISOLUTIONS ATRAZINE 90DF - Sipcam	<b>varies</b>		
MARKSMAN HERBICIDE - BASF pre-mix	<b>0.52</b>	na	na
AGRISOLUTIONS ATRAZINE 4L - Sipcam	<b>varies</b>		

## **Chronology of Registration, Label Changes and Related Minnesota Activity through 2004**

- I. Atrazine was first registered in the U.S. in 1958 as an herbicide.
- II. In 1991 EPA established a Maximum Contaminant Level (MCL) of 3 ug/L (parts per billion, or ppb) for atrazine in public drinking water supplies regulated under the Safe Drinking Water Act.
- III. In 1990 the registrant began voluntarily instituting several risk reduction measures to address groundwater concerns. These included reductions in the application rate and changes in label directions for use.
- IV. In 1991, the Minnesota Department of Agriculture (MDA) determined atrazine to be commonly detected in groundwater.
- V. The MDA and its stakeholders developed a set of BMPs for atrazine use in Minnesota, and in 1992, the registrants for atrazine worked with EPA to make additional changes to the label, including incorporation of many of Minnesota's 1992 BMPs.
- VI. In November 1994, EPA initiated a Special Review for the triazine pesticides (atrazine, simazine and cyanazine).
- VII. Further labeled use restrictions in 1996 reduced environmental exposure from tile-terraced fields containing standpipes.
- VIII. It was also in 1996 that the Food Quality Protection Act (FQPA) was signed into law, which, together with 1988 amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), propelled the atrazine reregistration effort forward due to mandatory timelines for completion of specific reviews.
- IX. In August 1999, EPA was sued by the Natural Resources Defense Council and others in two separate actions: a suit challenging EPA's progress in meeting reregistration responsibilities; and a suit challenging EPA's compliance with deadlines for tolerance reassessment and establishing an endocrine disruptor screening and testing program. Various third parties intervened in the case. EPA and plaintiffs reached an agreement to settle both suits. In September 2001, the parties signed an amended consent decree that required the EPA to complete the atrazine IRED by August of 2002.
- X. In August 2002, the EPA and NRDC jointly agreed to request that the court extend the deadline for the Interim Reregistration Eligibility Document (IRED) to January 31, 2003. The EPA also agreed to bring to the FIFRA Scientific Advisory Panel issues regarding amphibian effects and carcinogenicity.
- XI. In February 2002, the MDA re-affirmed that atrazine is commonly detected in groundwater, and began the development of new BMPs.
- XII. In May 2003, the Commissioner of Agriculture also announced the decision to develop surface water BMPs for atrazine.

- XIII. In February 2004 the MDA published Core Water Quality BMPs for the use of all agricultural herbicides, and herbicide-specific BMPs for atrazine (for surface and groundwater protection) and several other herbicides.
- XIV. In January 2003, the EPA published an Interim Reregistration Eligibility Document (IREED) for atrazine and approved its reregistration subject to new labeling requirements, additional monitoring, data and mitigation requirements related to drinking water, residential risk, aggregate risk, occupational risk, environmental risk, endangered species and spray drift management.
- XV. In October 2003, the EPA published a revised atrazine IRED that addressed its conclusions regarding several human health and ecological risk concerns for atrazine: (1) The potential association between atrazine exposure and prostate cancer and other cancers in humans; (2) the potential effects of atrazine on amphibian endocrinology and development; and (3) required ecological monitoring and mitigation of atrazine in watersheds. Regarding amphibians, the EPA concluded, and an independent science advisory panel (SAP) agreed, that there is sufficient evidence to formulate a hypothesis that atrazine exposure may impact reproductive development in amphibians, but there are currently insufficient data to confirm or refute the hypothesis. The details of EPA's conclusions and next steps associated with these concerns is available at <http://www.epa.gov/oppsrrd1/reregistration/atrazine/atrazineadd.pdf> A summary of the next steps for these issues is provided below:

**A. The potential association between atrazine exposure and prostate cancer and other cancers in humans.**

- EPA will continue to review studies investigating the potential relationship between exposure to atrazine and cancer. While the Agency has not changed its conclusion that atrazine is not likely to cause cancer in humans, additional studies will be reviewed as they are received. After reviewing the studies, the Agency will convene another scientific peer review meeting concerning atrazine and these and other epidemiological studies.

**B. The potential effects of atrazine on amphibian endocrinology and development.**

- Implementation of a testing program to better evaluate the potential risk to amphibians by determining whether atrazine exposure affects reproductive system development in frogs and toads. The testing program implements the recommendations from a three-day, independent scientific advisory panel (SAP) meeting that confirmed EPA's assessment regarding the studies conducted previously on this subject. The available studies do not provide sufficient evidence to show that atrazine causes a consistent, reproducible effect on amphibian development.

**C. Required ecological monitoring and mitigation of atrazine in watersheds.**

- Monitoring of watersheds, based on a protocol developed by EPA, Syngenta (the manufacturer of atrazine), United States Department of Agriculture

(USDA), and grower groups, is outlined in the addendum. The protocol identifies 40 indicator watersheds in the United States where monitoring will be implemented during a two-year period to see if specific levels of concern are exceeded. Watersheds exceeding this level will be subject to remedies consistent with EPA's Total Maximum Daily Load (TMDL) program requirements. These watersheds are representative of over 1,100 indicator watersheds, and results from monitoring of the 40 watersheds will be used to determine if further monitoring or remedial efforts are needed. A Minnesota watershed, the Whitewater River-North Branch, has been selected as one of the 40 watersheds to be monitored.

- XVI. As a result of both the January 2003 IRED and the October 2003 revised IRED, changes to atrazine labels were required.

### **Minnesota's Atrazine Best Management Practices**

In order to protect Minnesota's water resources, the Minnesota Department of Agriculture (MDA), along with the University of Minnesota Extension Service and other interested parties, developed a set of core voluntary Best Management Practices (BMPs). The core voluntary BMPs should be adopted when applying all agricultural herbicides in Minnesota. The BMPs also refer to mandatory label use requirements.

The MDA also developed unique voluntary BMPs for the use of specific herbicides due to their presence – or the presence of their breakdown products – in Minnesota's groundwater or surface water from normal agricultural use. The herbicide-specific BMPs should be adopted when using herbicides that have been, or whose breakdown products have been, frequently detected in groundwater or surface water.

Atrazine and its breakdown products have been frequently detected in groundwater, and atrazine has been detected at concentrations of concern in surface waters of monitored vulnerable watersheds.

State and federal law can require that the use of a pesticide be limited or curtailed due to the potential for adverse impacts on humans or the environment. The Minnesota Pesticide Control Law outlines state regulatory authority to prevent these impacts. The Minnesota Groundwater Protection Act outlines a process that can lead to regulations on the use of herbicides frequently detected in groundwater. In addition, there are other state and federal laws that could lead to restrictions on the use of herbicides contributing to surface water impacts.

If the atrazine BMPs are proven ineffective, mandatory restrictions on its use and practices may be required.

The individual atrazine BMPs are available at <http://www.mda.state.mn.us/news/publications/protecting/bmps/finalcoreherbicide.pdf>

## MDA Monitoring Data Summaries

The MDA is responsible for monitoring groundwater and surface water for pesticides, for responding to groundwater contamination, and for supporting other agencies' efforts. The MN Department of Health (MDH) is responsible for developing health-based regulatory standards for drinking water and the MN Pollution Control Agency (MPCA) for developing surface water regulatory standards. The MPCA is also responsible for identifying and responding to surface waters that are "impaired" due to contamination.

The MDA has a surface water and groundwater monitoring program for pesticides that has been in operation since 1985. Atrazine is frequently detected in groundwater in areas vulnerable to contamination, and in surface waters, especially in the springtime during planting. Atrazine also is frequently detected in rainwater.

- I. **Historical Groundwater Quality:** MDA began monitoring groundwater for atrazine in the fall of 1985. A network of existing wells was sampled from 1985 through 1996. In January of 2000 the MDA implemented a new monitoring network of wells specifically installed for monitoring pesticide impacts to groundwater.

Generally, between 25 and 75 percent of the samples collected from shallow sand plain wells contain atrazine in any given quarter from 1985 to 2004 (see Figure 1 of Attachment B). The frequency of detection does not show a statistically significant change with time. However, both the 50<sup>th</sup> (median) and 75<sup>th</sup> percentile atrazine concentrations have decreased over time and are currently 0.0 ug/L, non-detect (ug/L = parts per billion, or ppb) and 0.5 ppb, respectively (see Figures 2 and 3 of Attachment B). Atrazine quarterly median concentrations are frequently below analytical limits of detection. This tendency is particularly evident in recent monitoring.

- II. **Present-day Groundwater Quality:** The MDA collects groundwater monitoring data in Minnesota through springs, a dedicated monitoring well network and from private wells. A summary of the monitoring data for atrazine in MDA's network of monitoring wells in the Central Sand Plains is presented below. A map showing monitoring locations is provided in Figure 4 of Attachment B.

	Number of Detections			Concentration of atrazine (results in ug/L or ppb; nd=statistical value results in non-detection of atrazine)								
				Median Concentration (50 <sup>th</sup> Percentile)			Concentrations at the 75 <sup>th</sup> Percentile			Maximum Concentrations		
	2001 – 188 samples (4 quarters)	2002 – 188 samples (4 quarters)	2003 – 106 samples (3 quarters)	2001	2002	2003	2001	2002	2003	2001	2002	2003
<b>Atrazine</b>	89	73	45	nd	0.025	nd	0.06	0.09	0.05	0.51	0.35	0.25
Deethylatrazine	127	120	82	0.09	0.07	0.115	0.18	0.15	0.18	1.28	0.72	0.65
Deisopropylatrazine	72	52	32	nd	nd	nd	0.10	0.10	0.10	1.91	1.98	2.15
Atrazine + Degradates	133	130	84	0.15	0.105	0.178	0.39	0.25	0.349	3.66	2.74	3.04

The current MN Department of Health "Health Risk Limit" for atrazine and its breakdown products in drinking water is 20 ppb. The MDH has proposed a new HRL of 4 ppb as part of an HRL rule revision process. The EPA drinking water standard

(called the Maximum Contaminant Level or MCL), which applies to treated public water supplies, is 3 ppb.

In the last three years of monitoring (through September 2003), no samples out of 482 collected for groundwater exceeded the proposed HRL of 4 ppb for atrazine and its breakdown products.

Preliminary results from a 2004 MDA survey of Minnesota drinking water wells (71 wells across all agricultural regions in the state) show 4 wells positive for atrazine, with a maximum concentration of 1.52 ppb. Two wells were positive for deisopropylatrazine, and ten wells were positive for desethylatrazine (both degradates of atrazine), with maximum concentrations of 0.35 ppb and 0.65 ppb, respectively.

III. **Present-day Surface Water Quality:** The MDA conducts sampling of surface water at dedicated monitoring sites in watersheds representative of a variety of agricultural settings. At these sites, samples are collected continuously during the growing season to capture “base flow” concentrations of atrazine and other herbicides, and concentrations during periods of high rainfall and field runoff (storm events). In addition, the MDA collects grab samples of other surface waters throughout the state. The following tables summarize surface water monitoring data. Figure 5 of Attachment B shows surface water sampling locations in 2003.

The MPCA establishes standards for surface water and reviews MDA monitoring data to determine if the standards have been exceeded or if a given water body is to be considered “impaired” under the federal Clean Water Act. No water body in Minnesota has been determined to be “impaired” due to atrazine.

Summary of Surface Water Atrazine Detections at MDA Dedicated Monitoring Sites in 2003								
Pesticide (Base-Neutrals)	Of 62 Storm Event Samples, Number Positive (and %) for Pesticide	Of 38 Base Flow Samples, Number Positive (and %) for Pesticide	Of 100 Total Samples, Number Positive (and %) for Pesticide	Site				
				Blue Earth River-Rapidan Dam	LeSueur River-Hwy 66	Middle Branch-Whitewater River	Minnesota River-Judson Bridge	Seven Mile Creek #3
Atrazine	51 (82%)	29 (76%)	80 (80%)	X	X	X	X	X
Deethylatrazine	39 (63%)	25 (66%)	64 (64%)	X	X	X	X	X
Deisopropylatrazine	4 (6%)	5 (13%)	9 (9%)			X	X	X

**Summary of Atrazine Concentrations and Detections  
at MDA Dedicated Surface Water Monitoring Sites in 2003**

Partial Calendar Year 2003		Storm Event Samples						Base Flow Samples				
		(concentrations in ug/L)						(concentrations in ug/L)				
Atrazine	Monitoring Station	State Water Class	# samples	% detects	Max. Conc.	Date of Max.	Median Conc.	# samples	% detects	Max. Conc.	Date of Max.	Median Conc.
Applicable MPCA 7050 Standards, Criteria, or Adv. Values <i>Note: A direct comparison between standards and concentrations presented in this table is not an appropriate evaluation of potential water body impairment. Contact the MPCA for further information.</i>												
Class 2B waters are evaluated for impacts to aquatic organisms using a standard of 10.0 ug/L averaged over 4 days	Blue Earth R.-Rap. Dam	2B	20	80%	0.98	9-Jun	0.115	3	0%	Non-detect	not applicable	Non-detect
	Le Sueur R.-Hwy66		16	75%	0.43	10-Jun	0.155	8	75%	0.14	22-Jul	0.025 Present
	Minn. R.-Judson Br.		11	82%	0.55	1-Jul	0.07	5	60%	0.11	multiple	0.025 Present
Class 1B/2A/3B waters are evaluated for human health impacts using a standard of 3.4 ug/L averaged over 30 days, and for impacts to aquatic organisms using a standard of 10 ug/L averaged over 4 days	MidBr-Whitewater R.	1B/2A/3B	4	100%	7.15	8-Jun	2.385	16	100%	5.52	25-Jun	0.16
	Seven Mile Ck. #3		11	91%	2.59	23-Jun	0.24	6	67%	0.09	9-Jul	0.05

**Summary of surface water statewide survey sampling results for atrazine and atrazine breakdown products,  
May – July 2003**

	Of 53 Grab Samples, Number Positive (and %) for Pesticide	Maximum Value Detected (ug/L)	Median Value of Samples (ug/L)
<b>Atrazine</b>	40 (75%)	6.72	0.15
Deethylatrazine	40 (88%)	0.53	0.10
Deisopropylatrazine	11 (38%)	0.27	Non-detect

IV. **Long-term rainfall monitoring, SE Minnesota:** MDA has conducted precipitation monitoring efforts to evaluate atrazine contamination in rainfall. Pesticides can enter the atmosphere during the application process through volatilization from fields, and through wind erosion of soil particles. Between May 2000 and May 2001, precipitation samples were collected at Crystal Springs Hatchery in southeast Minnesota. Atrazine was detected in 62% of the 26 samples. The median concentration of all samples was 0.04 ug/L, and the maximum was 0.77 ug/L.

V. Other local, state and federal entities have reported atrazine detections and concentrations in Minnesota groundwater or surface water.

Dakota County Environmental Services:

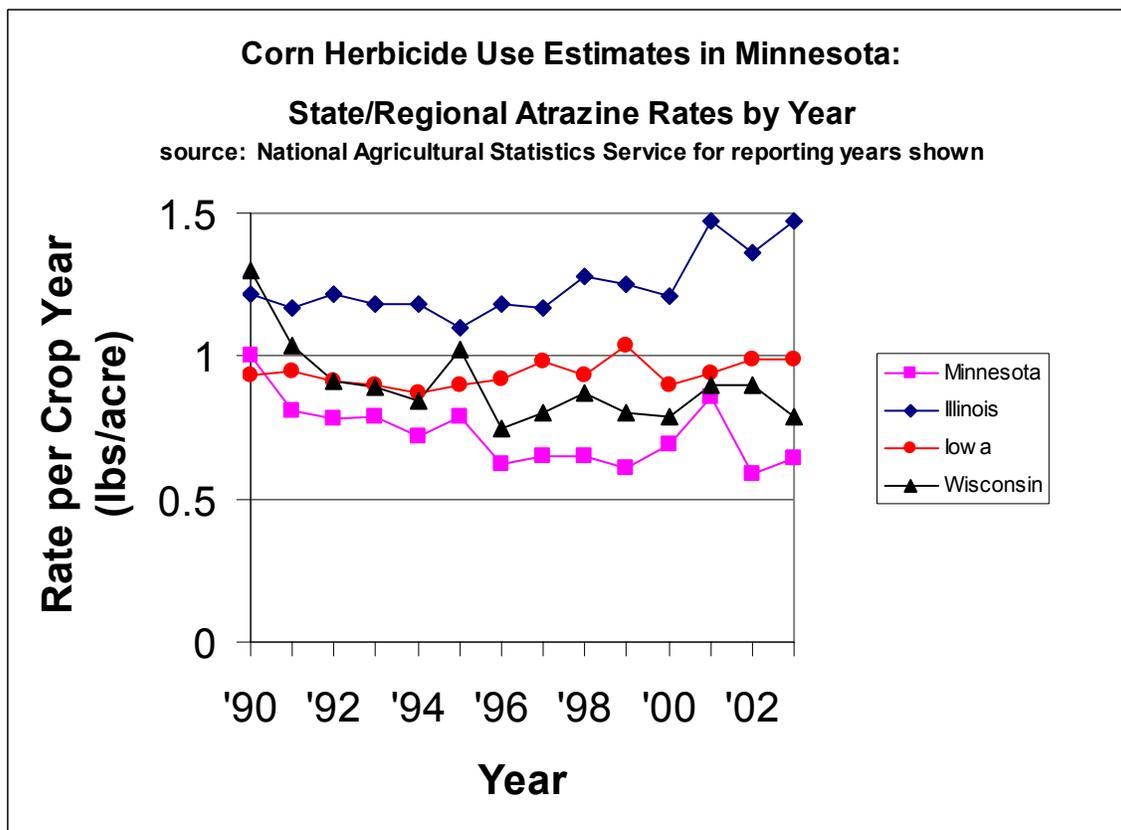
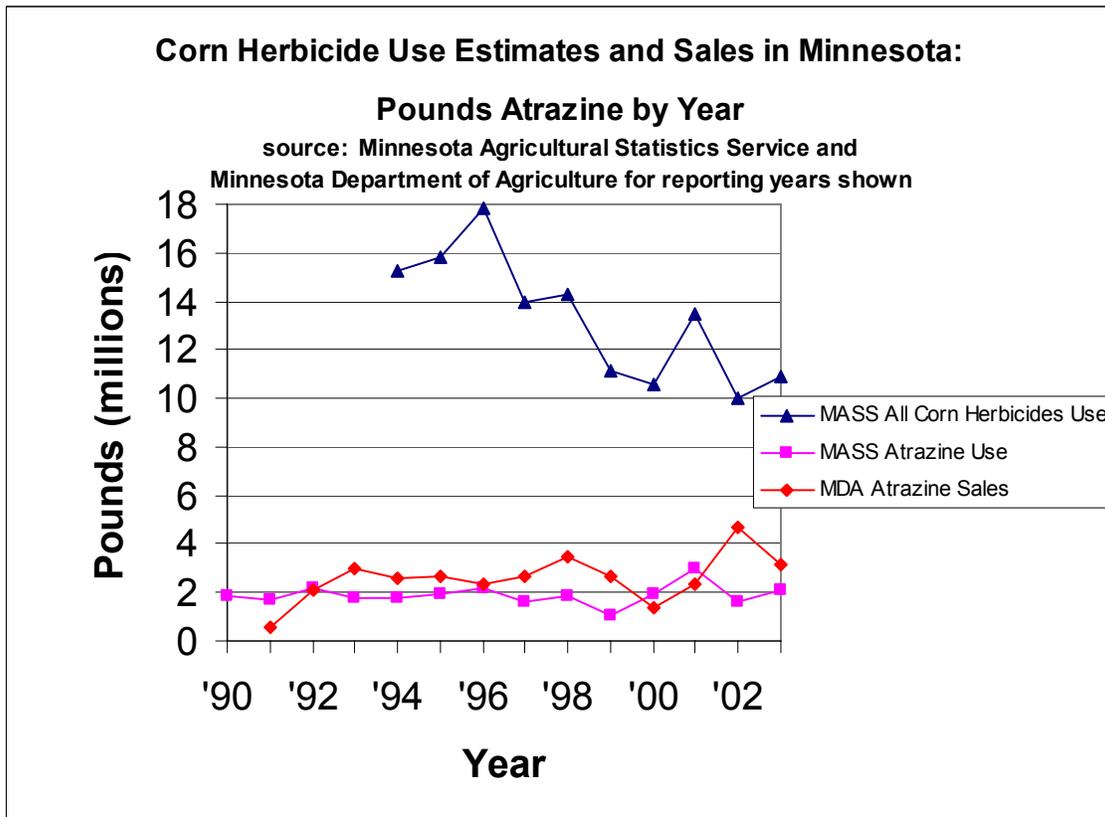
<http://www.co.dakota.mn.us/environ/water.htm>

Minnesota Pollution Control Agency:

<http://www.pca.state.mn.us/water/groundwater/gwmap/index.html>

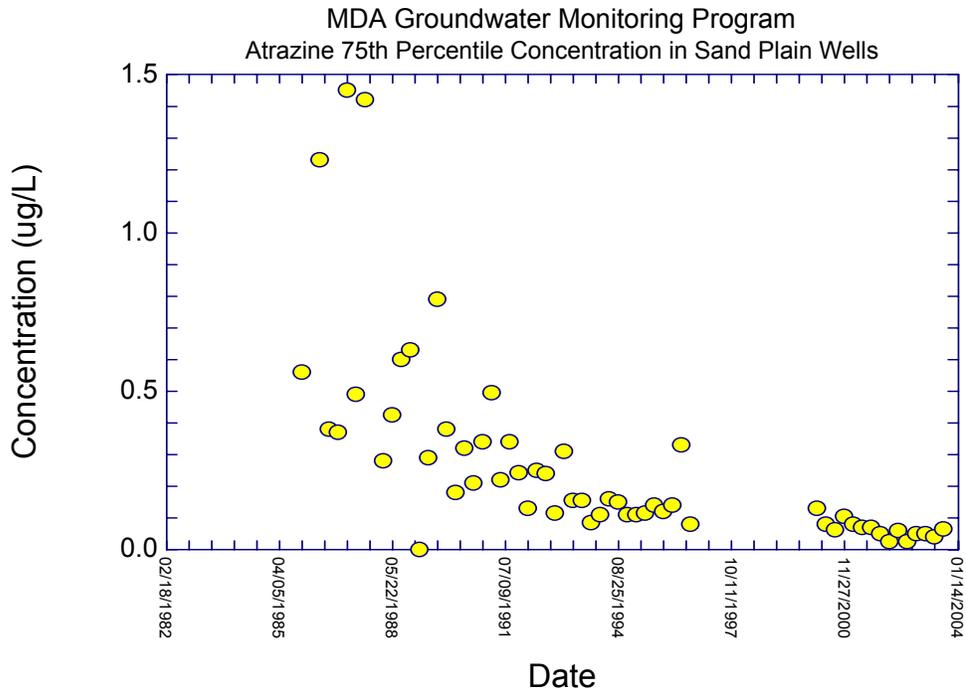
United States Geological Survey: <http://mn.water.usgs.gov/wrd/index.html>

## Attachment A





**Figure 3.** Atrazine 75<sup>th</sup> percentile concentrations in sand plain trend monitoring wells.



**Figures 4 & 5:** MDA Groundwater Monitoring Network Locations and Surface Water Monitoring Dedicated Sites

